MIDDLE EAST TECHNICAL UNIVERSITY

GENERAL CATALOG

2013-2015

ANKARA-TURKEY

ISBN 978-975-429-335-7

Published by Middle East Technical University

Ankara-Turkey

University Catalog No: 38

Prepared by Registrar's Office

Printed by METU Printing Studio

Graphic Design: METU Graphic Design Unit

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ACADEMIC UNITS

COMMUNICATION WITH METU

Address	:	Middle East Technical University 06531 Ankara/TURKEY
Telephone Central	:	(0-312) 210 20 00
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Some Useful Telephone Numbers:

		Extension	Direct	Fax
Secretary General	:	2102-2109	210 21 02	210 11 05
Asst. Secretary General	:	4117	210 41 17	210 11 05
Faculty of Architecture	:	2201	210 22 01	210 22 97
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International Cooperations Office	:	2298	210 22 98	210 71 76
METU Northern Cyprus Campus	:	11-1000	0392 661 20 00	0392 661 20 09

Note: Most University Administrative Offices are open Monday through Friday 8.30 to 12.30 and 13.30 to 17.30

MISSION STATEMENT

The mission of the Middle East Technical University is to reach, produce, apply and promote knowledge, and to educate individuals with that knowledge for the social, cultural, economic, scientific and technological development of our society and humanity. This is to be done by bringing teaching, research and social services up to universal standards..

METU HONOUR CODE

Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted.

"The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."

UNIVERSITY CALENDAR

METU Academic Calendar is available at http://oidb.metu.edu.tr/en/academic-calendar

DEGREES OFFERED AT METU

Undergraduate Degrees Offered at METU

Faculty of Architecture	
Architecture	B.ARCH.
City and Regional Planning	B.C.P.
Industrial Design	B.I.D.
Faculty of Arts and Sciences	
Biology	B.S.
Molecular Biology and Genetics	B.S.
Chemistry	B.S.
History	B.A.
Mathematics	B.S.
Philosophy	B.A.
Physics	B.S.
Psychology	B.S.
Sociology	B.S.
Statistics	B.S.
Faculty of Economic and Administrative Sciences	
Business Administration	B.S.
Business Administration	B.S. *
Economics	B.S.
International Relations	B.S.
Political Science and Public Administration	B.S.
International Relations/Political Science and Public Administration	B.S. *

*Joint Degree Program with the State University of New York at Binghamton, USA

Faculty of Education

Computer Education and Instructional Technology	B.S.
Early Childhood Education	B.S.
Elementary Mathematics Education	B.S.
Elementary Science Education	B.S.
English Language Teaching	B.A.
English Language Teaching**	B.A
Chemistry Education	M.S.***
Physics Education	M.S.***

**Joint Degree Program with the State University of New York at New Paltz, USA

*** Five-year degree programs including B.S. degree

Faculty of Engineering

Aerospace Engineering	B.S.
Chemical Engineering	B.S.
Civil Engineering	B.S.
Computer Engineering	B.S.
Electrical and Electronic Engineering	B.S.
Environmental Engineering	B.S.
Food Engineering	B.S.
Geological Engineering	B.S.
Industrial Engineering	B.S.
Mechanical Engineering	B.S.
Metallurgical and Materials Engineering	B.S.
Mining Engineering	B.S.
Petroleum and Natural Gas Engineering	B.S.

International Joint Programs

Global and International Affairs (METU-Binghamton University)	B.S.
Business Administration (METU-Binghamton University)	B.S.
Liberal Studies with a Concentration in English Language Teaching (METU-New Paltz University)	B.A.

Graduate Degrees Offered at METU

Graduate School of Natural and Applied Sciences

Aerospace Engineering	M.S. (1)	Ph.D.
Aerospace Engineering(University of Poiters-ENSMA, France)*		Ph.D.
Aerospace Engineering(University of Orleans, France)*		Ph.D.
Archaeometry	M.S. (1,2)	Ph.D.
Architecture	M.ARCH. (1)	Ph.D.
Biochemistry	M.S. (1)	Ph.D.

Biology	M.S. (1)	Ph.D.
Biology(Universite Paul Sabatier, Toulouse, France)	M.S. (1)	Ph.D.
Biomedical Engineering	M.S. (1)	Ph.D.
Biotechnology	M.S. (1)	Ph.D.
Biotechnology (Universite Claude Bernard Lyon 1, France)		Ph.D.
Building Science	M.S. (1)	Ph.D.
Cement Engineering	M.S. (1,2)	
Chemical Engineering	M.S. (1)	Ph.D.
Chemical Engineering(Instut National des Sciences Appliquees (INSA), Lyon, France)		Ph.D.
Chemical Engineering (Eindhoven University of Technology, The Netherlands)		Ph.D.
Chemistry	M.S. (1)	Ph.D.
City and Regional Planning		Ph.D.
City Planning	M.C.P. (1)	
Civil Engineering	M.S. (1)	Ph.D.
Civil Engineering (Ecole Nationale Superieure des Mines de Paris, France)*		Ph.D.
Civil Engineering(Carnegie Mellon University, Pittsburgh, USA)*		Ph.D.
Computational Design and Fabrication Technologies in Architecture (Delft University of Technology, The Netherlands)*	M.S. (1)	
Computer Education and Instructional Technology	M.S. (1)	Ph.D.
Computer Engineering	M.S. (1,3)	Ph.D.
Design Research for Interaction(Delft University of Technology, Netherlands)*	M.S. (1)	
Earth System Science	M.S. (1,2)	Ph.D.
Earthquake Studies	M.S. (1)	
Earthquake Engineering and Engineering Seismology	M.S. (1)	
Rose School, Italy*		
University of Patras, Greece*		
University of Grenoble I: Joseph Fourier France*		
Electrical and Electronic Engineering	M.S. (1)	Ph.D.
Engineering Management	M.S. (3)	
Engineering Sciences	M.S. (1)	Ph.D.
Environmental Engineering	M.S. (1)	Ph.D.
Food Engineering	M.S. (1)	Ph.D.
Food Engineering(University Bordeaux 1, France)*		Ph.D.
Geodetic and Geographic Information Technologies	M.S. (1)	Ph.D.
Geological Engineering	M.S. (1)	Ph.D.
Hydrosystems Engineering	M.S. (3)	
Industrial Design	M.S. (1)	Ph.D.
Industrial Engineering	M.S. (1)	Ph.D.
Industrial Engineering(Eindhoven University of Technology, The Netherlands)*	M.S. (1)	
Mathematics	M.S. (1,2)	Ph.D.
Mathematics(Universite Lois Pasteur-Strasbourg I, France)*		Ph.D.
Mechanical Engineering	M.S. (1)	Ph.D.
Mechanical Design and Manufacturing	M.S. (1,2)	
Metallurgical and Materials Engineering	M.S. (1)	Ph.D.
Micro and Nanotechnology	M.S. (1)	Ph.D.
Mining Engineering	M.S. (1)	Ph.D.
Occupational Health and Safety	M.S. (1)	Ph.D.

Operational Research	M.S. (1)	Ph.D.
Petroleum and Natural Gas Engineering	M.S. (1)	Ph.D.
Physics	M.S. (1)	Ph.D.
Polymer Science and Technology	M.S. (1)	Ph.D.
Regional Planning	M.C.P. (1)	
Restoration	M.S. (1)	Ph.D.
Secondary Science and Mathematics Education	M.S. (1,2)	Ph.D.
Software Engineering	M.S. (3)	
Statistics	M.S. (1)	Ph.D.
Structural Mechanics	M.S. (3)	
Urban Design	M.C.P. (1)	Ph.D.
Graduate School of Social Sciences		
Applied Ethics	M.S. (3)	
Area Studies		Ph.D.
Asian Studies	M.S. (3)	
Architectural History	M.A. (1)	Ph.D.
Asian Studies	M.S. (2)	
Business Administration	M.B.A. (1,2)	Ph.D.
Curriculum and Instruction	M.S. (1)	Ph.D.
Early Childhood Education	M.S. (1)	
Economics	M.S. (1,2)	Ph.D.
Educational Administration and Planning	M.S. (1)	Ph.D.
Educational Sciences	M.S. (1)	Ph.D.
Elementary Education		Ph.D.
Elementary Science and Mathematics Education	M.S. (1)	
English Language Teaching	M.A. (1)	Ph.D.
English Literature	M.A. (1)	Ph.D.
Eurasian Studies	M.A. (1,2)	
European Integration	M.S. (3)	
European Studies	M.S. (1,2)	
Executive Master of Business Administration	M.B.A. (3)	
Family Psychology	M.S. (3)	
Psychological Counselling and Guidence	M.S. (1)	Ph.D.
Gender and Women's Studies	M.S. (1,2)	
German-Turkish Social Sciences (METU-Humboldt University)*	M.A. (2)	
Guidance and Psychological Counseling	M.S. (1)	Ph.D.
History	M.A. (1)	Ph.D.
History of Architecture	M.A. (1)	Ph.D.
Human Resources Development in Education	M.A. (3)	
Industrial & Organizational Psychology	M.S. (2)	
International Relations	M.S.(1,3)	Ph. D
International Relations (University Lumiere Lyon 2, France)*		Ph. D
Latin and North America Studies	M.S. (1,2)	
Media and Cultural Studies	M.S. (1,2)	
Middle East Studies	M.S. (1,2)	
Philosophy	M.A. (1)	Ph.D.

Physical Education and Sports	M.S. (1)	Ph.D.
Political Science and Public Administration	M.S. (1,2)	Ph.D.
Psychology	M.S. (1)	Ph.D.
Science and Technology Policy Studies	M.S. (1,2)	Ph.D.
Settlement Archaeology	M.S. (1)	Ph.D.
Social Anthropology	M.S. (1)	
Social Policy	M.S. (1,2)	
Sociology	M.S. (1)	Ph.D.
Urban Policy Planning and Local Governments	M.S. (1,2)	Ph.D.
Graduate School of Marine Sciences		
Chemical Oceanography	M.S. (1)	Ph.D.
Marine Geology and Geophysics	M.S. (1)	Ph.D.
Marine Biology and Fisheries	M.S. (1)	Ph.D.
Physical Oceanography	M.S. (1)	Ph.D.
Graduate School of Informatics		
Cognitive Sciences	M.S. (1)	Ph.D.
Bioinformatics	M.S. (1)	
Medical Informatics	M.S. (1,2)	Ph.D.
Information Systems	M.S. (1,2)	Ph.D
Informatics Online	M.S. (3)	
Software Management	M.S. (3)	
Modelling and Simulation	M.S. (3)	
Game Technologies	M.S. (1)	
Work Based Learning (METU-Middlesex University)*	M.S. (3)	
Graduate School of Applied Mathematics		
Actuarial Sciences	M.S. (1,2)	
Cryptography	M.S. (1,2)	Ph.D.
Scientific Computing	M.S. (1)	Ph.D.
Financial Mathematics	M.S. (1,2)	Ph.D.

Undergraduate Degrees Offered at METU Northern Cyprus Campus

Business Administration	B.S.
Business Administration(State University of NY at New Paltz,USA)*	B.S.
Chemical Engineering	B.S.
Civil Engineering	B.S.
Computer Education and Instructional Technology	B.S.
Computer Engineering	B.S.
Economics	B.S.
Electrical and Electronic Engineering	B.S.
Guidance and Psychological Counseling	B.S.
Mechanical Engineering	B.S.
Petroleum and Natural Gas Engineering	B.S.
Political Science and International Relations	B.S.

Psychology	B.S.
English Language Teaching	B.A.
Graduate Degrees Offered at METU Northern Cyprus Campus	
Political Science and International Relations	M.S. (1)
Sustainable Environment and Energy Systems	M.S. (1)

(1) With Thesis
(2) Without Thesis
(3) Evening Program without Thesis

*** Joint Degree with**

ADMINISTRATION

THE COUNCIL OF HIGHER EDUCATION

The Higher Education Board consists of members directly appointed by the President of the Republic as well as those selected by the Council of Ministers, the Turkish Chief of Staff, the Ministry of Education and the Interuniversity Council and approved by the President of the Republic.

The Council of Higher Education is responsible for the organization of all higher education and institutions of higher education in Turkey. The council assures that higher education is carried out in accordance with the Constitution, that precautions are taken for the training of university staff, that cooperation and coordination are established among universities. It concerns itself with such matters as the establishment of universities and their component units, educational programs, and research activities.

THE PRESIDENT

The President of the University is appointed for a period of four years by the President of the Republic from among candidates elected by the University and proposed by the Higher Education Board. He is the chief executive officer and representative of the legal personality of the University.

VICE PRESIDENTS

Vice Presidents are appointed by the President of the University.

ASSISTANTS TO THE PRESIDENT

Assistants to the President are appointed by the President of the University.

DEANS, DIRECTORS OF GRADUATE SCHOOLS, DIRECTORS OF SCHOOLS, DEPARTMENT CHAIRPERSONS AND STAFF

The Deans of the Faculties are appointed for a period of three years by the Council of Higher Education from among three full-time professors nominated by the President of the University.

Directors of Graduate Schools and Directors of Schools are appointed for a period of three years by the President of the University.

Department Chairpersons are appointed for a period of three years by the Dean of the Faculty.

Teaching and Research Assistants, as well as foreign members of the teaching staff, are appointed on a contract basis. All other members of the teaching staff are appointed according to the relevant regulations. The staff consists of research assistants, instructors, assistant professors, associate professors, and professors.

THE UNIVERSITY SENATE

The University Senate consists of the President, the Vice Presidents, the Deans, selected representatives of each Faculty, and Directors of Graduate Schools and Schools directly attached to the Office of the President. It is the chief academic organ of the University.

THE UNIVERSITY ADMINISTRATIVE COMMITTEE

The University Administrative Committee consists of the President, the Deans and three professors to be selected by the University Senate for a period of four years.

THE UNIVERSITY ADMINISTRATIVE BOARD

ACADEMIC OFFICERS

Prof. Dr. Ahmet ACAR	:	President
Prof. Dr. Volkan ATALAY	:	Vice President
Prof. Dr. Çiğdem ERÇELEBİ	:	Vice President
Prof. Dr. H. Nevzat ÖZGÜVEN	:	Vice President
Prof. Dr. Hami ALPAS	:	Secretary General (Acting)
Prof. Dr. Belgin AYVAŞIK	:	Assistant to the President
Prof. Dr. Ayşegül DALOĞLU	:	Assistant to the President
Prof. Dr. İrem DİKMEN TOKER	:	Assistant to the President
Prof. Dr. Turgut TÜMER	:	Assistant to the President
Assoc. Prof. Dr. Lale ÖZGENEL	:	Assistant to the President
Assoc. Prof. Dr Uğur POLAT	:	Assistant to the President
Prof. Dr. Barış SÜRÜCÜ	:	Assistant to the President

MEMBERS OF THE UNIVERSITY SENATE

Ex-officio Members

Prof. Dr. Ahmet ACAR	:	President
Prof. Dr. Volkan ATALAY	:	Vice President
Prof. Dr. Çiğdem ERÇELEBİ	:	Vice President
Prof. Dr. H. Nevzat ÖZGÜVEN	:	Vice President
Prof. Dr. Ali CENGİZKAN	:	Dean of the Faculty of Architecture
Prof. Dr. Ersan AKYILDIZ	:	Dean of the Faculty of Arts and Sciences
Prof. Dr. Yaşar Eyüp ÖZVEREN	:	Dean of the Faculty of Economic and Administrative Sciences
Prof. Dr. Gölge SEFEROĞLU	:	Dean of the Faculty of Education
Prof. Dr. Uğurhan AKYÜZ	:	Dean of the Faculty of Engineering
Prof. Dr. Canan ÖZGEN	:	Director of the Graduate School of Natural and Applied Sciences
Prof. Dr. Meliha ALTUNIŞIK	:	Director of the Graduate School of Social Sciences
Prof. Dr. Ahmet Erkan KIDEYŞ	:	Director of the Graduate School of Marine Sciences
Prof. Dr. Nazife BAYKAL	:	Director of the Graduate School of Informatics
Prof. Dr. Bülent KARASÖZEN	:	Director of the Graduate School of Applied Mathematics
Prof. Dr. Ayşen YILMAZ	:	Director of the Vocational School of Higher Education
Instr. Özlem ATALAY	:	Director of the School of Foreign Languages

Elected Members

Prof. Dr. Ayhan DEMİR	:	Faculty of Education
Prof. Dr. Aydan BALAMİR	:	Faculty of Architecture
Prof. Dr. Ahmet M. ÖNAL	:	Faculty of Arts and Sciences
Prof. Dr. Fikret ŞENSES	:	Faculty of Economic and Administrative Sciences
Prof. Dr. İnci EROĞLU	:	Faculty of Engineering

MEMBERS OF THE UNIVERSITY ADMINISTRATIVE COMMITTEE

Ex-officio Members

Prof. Dr. Ahmet ACAR	:	President
Prof. Dr. Ali CENGİZKAN	:	Dean of the Faculty of Architecture
Prof. Dr. Ersan AKYILDIZ	:	Dean of the Faculty of Arts and Sciences
Prof. Dr. Yaşar Eyüp ÖZVEREN	:	Dean of the Faculty of Economic and Administrative Sciences
Prof. Dr. Gölge SEFEROĞLU	:	Dean of the Faculty of Education
Prof. Dr. Uğurhan AKYÜZ	:	Dean of the Faculty of Engineering

Elected Members

Prof. Dr. Meliha ALTUNIŞIK	:	Faculty of Arts and Sciences
Prof. Dr. Vasıf HASIRCI	:	Faculty of Arts & Sciences
Prof. Dr. Mahmut PARLAKTUNA	:	Faculty of Engineering

ADMINISTRATIVE OFFICERS

Gülhan YÜKSEL	:	Assistant to the Secretary General
Y. Talip ÖZYAZICI	:	Director of the Administrative and Financial Affairs
Ferdi AYAYDIN	:	Director of Computer Center
Assoc. Prof. Dr. Uğur POLAT	:	Director of Construction and Technical Works (Per. Pro.)
Serap KARABAYER	:	Director of Health, Culture and Sports
Cevat GÜVEN	:	Director of Library and Documentation
Selda BİLGİN	:	Director of Personnel Affairs
Nesrin ÜNSAL	:	Registrar
Ersin TATLI	:	Director of Strategy Development

GENERAL INFORMATION

Founded in 1956, METU is a state University that has the objective of training Turkish and international students in scientific, technical and professional fields of study, and of utilizing these studies in the field of pure and applied research for contributing to the economic and social necessities of Turkey and other developing countries. Since its inception the language of instruction has been English.

LOCATION

The METU Campus is located on the Ankara-Eskişehir highway and has been forested entirely through the efforts of the University employees and students since the early 1960's.

The Campus includes Lake Eymir. The lake and its surroundings meet part of the rowing, fishing and picnicking needs of the METU employees and students. The surroundings of Lake Eymir have also been forested through the efforts of the University employees and students. The fresh water for METU is being supplied from the deep wells around Lake Eymir.

All Faculties and Departments of the University are in the same campus area, except for the Graduate School of Marine Sciences located at İçel-Erdemli on the southern coast of Turkey. Since the beginning of 2005-2006 academic year, a second METU campus (METU Northern Cyprus Campus) has started serving in Northern Cyprus.

HISTORY

Giving ideas reality and fulfilling dreams is often a slow process, but the growth of METU from an envisioned concept in 1954 to a campus with more than 304.228 square meters of floor space, has been a dynamic and phenomenal exception.

The idea of a regional technical university originated in 1954 when an evaluation of housing and planning conditions in Turkey showed the need for competent technicians trained in these professions who would dedicate themselves to speed the development of the countries of the Middle East. After much discussion and advice from various groups, the School of Architecture and City Planning, with 40 students and 4 teachers, was opened in 1956.

From 1957, when the Turkish Grand National Assembly gave the new university legal standing with a provisional law, until 1962, the METU campus consisted of temporary buildings on grounds in the city. The Charter of Middle East Technical University was approved by the Turkish Grand National Assembly in 1959.

Construction began on the new campus area in 1962. In a year and a half all the basic facilities of the University were completed. The building programs, originally planned to meet the needs of 12.000 students, have continued to progress rapidly. Classes were opened on the new campus in October, 1963.

Besides the construction of buildings, METU has concerned itself with the reforestation and landscaping of its campus. It has been estimated that 10 million trees have been planted (many by the students themselves) since 1962.

METU's modern campus, equipped with the most advanced scientific and technical facilities, now serves more than 23.000 students from all parts of the world. In the past decades, METU's dream has been realized and its impact has been felt throughout the region.

LABORATORIES

Because practical work and demonstration is considered a necessary part of a university education METU has installed the finest equipment in its modern laboratories. Besides laboratory work, there are other facilities for research and work in all of the faculties.

RESEARCH ACTIVITIES

METU, as a research university, places high priority on research and consulting as vital parts of faculty activity. With its highly qualified internationally recognized staff and well structured infrastructure, METU contributes considerably to the advancement of science and technology as well as national development by carrying out research in its research centers, institutes and laboratories. The total number of applied and theoretical research projects under way in a single year is over 700. More than half of these are contract research projects sponsored by industries in the public and private sectors. The remaining consists of research grants awarded by national and international organizations and by the University Research Fund. The total budget for active projects runs over $70 million.

Following is general information about METU's Research and Application Centers Reporting Office of the President.

Up-to-date list of research centers is available at www.metu.edu.tr

Applied Ethics Research Center (UEAM)

The Center was established in 2002. The aims of the Center are:

a) To increase the awareness and consciousness of ethics in Turkey,
b) To develop research projects in accordance with its aims,
c) To conduct institution based studies and to spread and publish the results of these studies.

The mission of the Center is to increase the awareness of ethics and to generate sensitivity within the society concerning everyday activities and decision making process.

Audio-Visual Systems Research and Production Center (GİSAM)

Established in 1993, its aim is to carry METU's pioneering role in science and technology to the media and to come up with innovations rather than following what is already available. GİSAM brings technology, aesthetics and knowledge together, to create alternatives that are key to the scientific and artistic productivity. Artists, media professionals, and scientists can carry out both educational activities and create high quality productions simultaneously in GİSAM's high-tech studios.

Black Sea and Central Asian Countries Research Center (KORA)

The Center for Black Sea and Central Asia (KORA) is a research center of Middle East Technical University (METU), Ankara-Turkey. KORA was established in 1992 and has become a leading research institute conducting research on Caucasian, Central Asian, East and Central European countries.

The main objective of this Center is to collect reliable and systematic information about the region and develop technical cooperation with the countries of the region through various projects and research oriented activities particularly in the process of social and economic transformation these countries have been undergoing. Most of our research projects reflect a comparative perspective where academics from different departments in social sciences such as sociology, political science, international relations, economics and management, education and natural sciences. All of our research projects are based on long-term fieldworks in the region. KORA has worked in close collaboration with many national and international organizations in conducting its activities providing funds to our research projects.

KORA has also had major experience in the organization of national and international conferences. KORA provides consultancy for the private sector, and is particularly specialized in development studies and social impact assessment. In its social impact assessment projects, KORA was particularly keen on combining different perceptions of the private sector, government and non-governmental organizations, and other stakeholders and successfully managed to establish deliberations among different sections of society.

CAD/CAM/Robotics Application and Research Center (BİLTİR)

BİLTİR was established in 1992, with the purpose of developing and applying advanced technologies for the Turkish industry, as well as designing, manufacturing and doing robotics related research at METU. In 1999, BİLTİR was restructured and has become an interdisciplinary research and application center of the University. BİLTİR has five interdisciplinary units which are; Industrial Design-Production (BİLTİR/ETÜ)Automation-Robotics-Electrical-Electronics (BİLTİR/ORE), Numerical Modelling-Analysis-Design (BİLTİR/SMAT), Defence Systems (BİLTİR/SAVSİS) and Product Usability (BİLTİR/UTEST). The center provides interdisciplinary qualified human resources which includes about 100 academic staff from 15 different disciplines.

BİLTİR has latest technological infrastructure. In the center, various CAD/CAM/CAE and industrial design software on CAD workstations are being used. Various high-tech equipment: EOSINT P380 Laser Sintering Rapid Prototyping Machine, DIMENSION 3-D Printer Rapid Prototyping Machine, MAZAK Variaxis 630 5-Axis 25000 rpm High Speed CNC Machining Center, 5-Axis DECKEL CNC Milling Machine 4-Axis HITACHI–SEIKI CNC Turning Center 5-Axis SODICK CNC Wire-EDM, 3-Axis SODICK CNC EDM, DEA Coordinate Measuring Machine (CMM), 6-Axis FANUC and ABB Industrial Robots are in service in main building of the center.

In BİLTİR/UTEST, while state-of-the-art equipment ensures accuracy in monitoring and recording of user-product interaction, powerful observation and analysis tools help to maintain a rational and scientific approach in evaluation. BİLTİR/UTEST Product Usability Unit is a newly established usability laboratory that is aimed to provide service to industry as well as promoting academic studies. In order to address and gain insight about the potential difficulties and problems in real life, tests are conducted with the involvement of the actual/ potential users in controlled lab environment or in the field. The collaboration with industry consists of both R&D activities and evaluation, embracing military and consumer products such as military equipment/systems, softwares, kiosks/ATMs, consumer durables, and electronic appliances. Encompassing such a broad field of research, the research team consists of experts having diverse academic backgrounds.

BİLTİR, with its central units and expert human resources, serves as a bridge to bring together industry, university and public institutions.

Center for Research and Assessment of Historical Environment (TAÇDAM)

In 1966, scholars from various universities and scientific institutions of Turkey joined together under the leadership of the former Rector of Middle East Technical University, Mr. Kemal Kurdaş, to establish a research institute to undertake the Keban Archeological Project. It was a co-operative effort towards salvaging the historical monuments and sites of a region that had to be flooded during the construction of Keban Dam in 1970s. After 1975, the Project extended its study area to include the Lower Euphrates Region. In addition, to display the artifacts recovered during the excavations carried out in the archeological sites of the METU Campus, with the initiation of this group, the University Museum was established. The museum also serves to disseminate the information revealed by excavations.

This institute, re-structured in 1995 as a Center of Research and Assessment of Historical Environment (TAÇDAM) continued its original mission: to motivate undertakings of salvage archaeology and documentation of historical environment by means of the most advanced methods and techniques for those areas under risk. Now, among advanced institutions of archaeology in Turkey, TAÇDAM stands as one of the leading research units concerning historic environmental matters with a multi-disciplinary vision. Directed on research matters by a managing committee formed by representatives from several academic units at Middle East Technical University - archaeometry, geology, restoration of historical monuments, city and regional planning- TAÇDAM serves as an interdisciplinary research center to survey and excavate archeological sites in threatened areas of Turkey, publish their results and promote education and training in cultural heritage management issues.

Central Laboratory – R&D-Training Center Molecular Biology and Biotechnology Research Center (MERKEZLAB)

The METU Central Laboratory is a research and development center on advanced material characterization and molecular biology-biotechnology. The facilities of the laboratory are open to all researchers at METU. The Central laboratory also provides service to other universities, research institutions, and private industry. The objective for establishing the central laboratory is to supply state-of-the-art instrumentation for use by the research people at METU in order to promote collaboration among the researchers and strengthen the research activities. Central laboratory houses a large number of capital-intensive instruments for structural, chemical, thermal, and elemental analysis, particle characterization, and mechanical, rheological, and physical property determination for research activities on advance materials; and molecular genetics, large scale purification, characterization and sequencing of proteins, enzyme activity determinations, and animal and plant tissue for molecular biology-biotechnology. The experts, who carry the requested work, are trained and experienced in sample preparation, data collection, and data analysis. Central Laboratory was accredited by TURKAK for ISO 17025 standard in 2013.

Continuing Education Center (SEM)

Complex and high-tech systems of modern industry require not only educated but also expert human resource. Continuing Education Center (SEM) was established in 1991, with the aim of meeting the education and expertise needs of both industry and business. The Center is a member of IACEE (International Association for Continuing Engineering Education) and EUCEN (European Universities Continuing Education Network).

Disaster Management Implementation and Research Center (AFET)

AFET provides consultancy and project support to domestic and international institutions with a multidisciplinary approach for mitigation of natural and man-made disasters. AFET organizes seminars, training courses and in-service training programs to officials or to community within the framework of disaster management. In accordance with its aim, the Center also conducts research about disaster management.

Entrepreneurship Research Center (GİMER)

The aim of the center is to enhance the creative, innovative, and entrepreneurial skills of students and graduates. Entrepreneur graduates will become more productive individuals and create new employment opportunities to improve Turkish economy. The center intends to diffuse entrepreneur life styles into society.

Modeling and Simulation Research Center (MODSİMMER)

MODSIM was founded in 2001 with the collaborations of Turkish Armed Forces, Ministry of Defense Undersecretariat for Defense Industries and Chief of Staff to meet the modeling and simulation demands of the Turkish Armed Forces. To achieve this goal and also conduct R&D projects, the Center closely follows the latest developments in the area of modeling and simulation.

Petroleum Research Center (PAL)

Petroleum Research Center (PAL) is established in 1991 as the first fuel quality control laboratory in Turkey. Routine fuel quality control analyses are performed in the laboratories of the center for gasoline, diesel, biodiesel, fuel oil, LPG, lubricating oil, used lubricating oil and natural gas. PAL laboratories are accredited according to ISO 17025. Research Centre is the only institution that manages inter-laboratory proficiency testing schemes in between national fuel analysis laboratories. The participant laboratories receive twice a year gas-oil, gasoline, biodiesel, fuel oil, lubricating oil, jet fuel and LPG samples. PAL is also accredited according to ISO 17043. The statistical evaluation and reporting of these schemes are performed at METU-PAL.

Center is also conducting researches related to oil/ gas and geothermal reservoir evaluations. Several field case studies were conducted on natural gas storage fields in Turkey , Kızıldere and Germencik geothermal reservoirs and some oil fields in Azerbaijan and Kazakhstan.

Recently PAL has led a national research project jointly with Turkish Petroleum Corporation about the assessment of the availability of Turkey's geologic CO2 storage sites. The center has been involved in the European 7th Framework project named as Pan-European Coordination Action on CO2 Geological Storage.

Facilities of METU PAL include well-equipped laboratories with analytical equipments as well as core tomography which are used for academic purposes as well as for contracted research. Computerized tomography equipment is used for characterizing core samples.

Research Center for Science and Technology Policy (TEKPOL)

METU-TEKPOL was founded in 1997 at the Middle East Technical University with the explicit objective to supply science and technology policy related human capital for the government bodies and other related organizations and to conduct research in science, technology and innovation policy issues.
TEKPOL is the only research center in Turkey that can coordinate education and research concurrently. Our students are employed in major government institutions such as the Ministry of Science, Industry and Technology, Ministry of Development, The Scientific and Technological Research Council of Turkey (TUBITAK), Undersecretariat of Defence and various development agencies. Students who pursued further studies have found placements in reputable programs such as Technology and Policy Program of MIT; Sussex Policy Research Unit (SPRU) of Sussex University, UNU-MERIT of Maastricht University; Innovation, Management and Policy Department of Manchester University and CIRCLE of Lund University.
METU-TEKPOL has experience in commissioned research as well as national and international projects as coordinator and partner. TEKPOL has vast experience in science, technology and innovation related issues in general and policy making such as impact assessment, clustering, high-tech industry studies such as defence, automotive and ICT, and more traditional industry studies such as furniture and technology transfer.
Through joint-projects, organization of conferences, consultancy activities and alumni placement METU-TEKPOL is a central node in the national network of science, technology and innovation policy. The research center is linked to ministries, development agencies, TUBITAK, Undersecretariat of Defense, Turkish Patent Institute (TPE), Technology Development Foundation of Turkey (TTGV), major defense industry companies such as TAI and ASELSAN, Industrial Districts such as OSTIM and IVEDIK, Technology Development Zones such as METU-TECH and CYBERPARK. METU-TEKPOL is linked to many reputable international universities, research institutes and organizations such as the European Commission, UNU-MERIT, GLOBELICS, IPTS-JRC and FEMISE.

Science and Society Center (TBM)

Science and Society Center was established in 2006. The aims of the center are:

- To create an awareness in society about science,
- To heighten the interest of society on science,
- To disseminate all aspects of scientific perspective into daily life,
- To strengthen the cooperation and collaboration between university and society,
- To organize activities for the society in universities,

The center especially visits rural elementary schools in Turkey and makes hands-on experiments within its science bus. The students are able have the chance of seeing and experiencing some interesting scientific facts during those visits. The students can also visit the Science and Technology Museum at METU throughout the year.

Welding Technology and Non-Destructive Testing Research Center (KAYNAK)

WT and NDT Center has its own quality assurance system which is based on the requirements of EN 45001 "General Criteria for the Operation of Testing Laboratories". The aims of the Center are to provide the realization of all kinds of scientific, technological and industrial research for improving production quality;

train and certify personnel working in the field of welding and non-destructive testing in keeping with the related European and International standards.

Welding Technology Research Center has two divisions namely Welding Technology and Non-Destructive Testing. The divisions were established by Turkish-German cooperation in 1988, on the METU Campus. The main activity at the moment of the Center is to give education, certification, consultancy and research services to the industry where welding and NDT is a developing technology in Turkey.

Micro-Electronic-Mekanical Systems Research and Application Center (METU-MEMS)

METU-MEMS Facilities is a microelectronics fabrication facility for 4" and 6" wafer processing. It has 1000 sq. meters of class 100 and class 1000 clean room area for fabrication and 300 sq. meters of class 10000 clean room area for electrical testing of IC's and active discrete components. The factory is operated by 22 technical personnel and supported by 14 researchers from Department of Electrical and Electronics Engineering.

METU-MEMS Facilities are currently being used to develop a number of MEMS products for commercial applications, including piezoresistive pressure sensors, capacitive pressure sensors, humidity sensors, and surface and bulk micromachined gyroscopes and accelerometers and also RF MEMS devices. The design team in EEE Department is working to implement various sensors using post-CMOS process, including CMOS thermopiles and uncooled infrared detector arrays. Design environment includes Cadence, CoventorWare (MEMCAD), MEMSCAP, and Ansys software tools.

Maximum capacity of the factory is such that 144 wafers can be processed in one shift (8 hours) per day. Considering a 2mmx2mm die production, it is possible to produce 7 million working dies per year with one shift per day (assuming an 85% yield and a 7-mask process). Two or three shifts per day are also possible.

The technology in the factory is suitable for fabrication of various other linear products (voltage regulators, OpAmps, etc.) and discretes (diodes, power transistors, rectifiers, thyristors, etc.). The factory has know-how packages to fabricate small signal transistors and various Analog/Linear ICs, as listed in the Product Spectrum. The facility can also be considered for fabrication of various integrated circuits, like ASICs, gate arrays, and bipolar logic gates (TTL, ECL, etc.) along with MEMS products.

Metu Center for Wind Energy (RÜZGEM)

"METU Center for Wind Energy - METUWIND" is established in 2011 in the leadership of the Dept. of Aerospace Engineering at the Middle East Technical University (METU) and is a collaborative effort of eight METU departments including Aerospace, Mechanical, Electrical-Electronics, Materials and Civil Engineering as well as Department of Architecture, Department of City and Regional Planning and Department of Business Administration. The center is funded through a three-year multi-million dollar project provided by the State Planning Agency of Turkey (The Ministry of Development).
METUWind is established with the vocation of becoming the center of attraction at the national and international level with its innovative and competent designs/accreditation activities as well as its scientific and technological research on the wind energy.
METUWind Center’s test facilities and state-of-the-art measurement equipment for wind energy related research are in four main laboratories equiped with most up-to-date technology: Aerodynamics Laboratory, Structures and Materials Laboratories (Composite Materials Laboratory, Structural Mechanics and Materials Laboratory, Structural Dynamics Laboratory), Electromechanics Laboratory, High Performance Computing Laboratory.

Potential areas of research include rotor blade aerodynamic and structural design and optimization, unsteady rotor aerodynamics, integrated design of wind turbine systems, wind farm design and optimization, topographical analysis and micrositing, energy storage, power electronics and smart grid systems, innovative control techniques and adaptive control, smart structures, composites (thermoplastics), mechanics of composite materials, material characterization, damage mechanics, structural optimization, structural dynamics and aeroelasticity, innovative manufacturing techniques for composite blades, tower and foundation design, architectural integration.

METUWind is part of a number of national and international organisations. At the national level, METUWind has membership of *Renewable Energy, Eco-systems and Sustainability Research Platform* of METU (YESAP), *Turkish Wind Energy Association* (TWEA/TÜREB) and *Wind Energy Technologies Platform* (RETEP). At the international level, METUWind takes part at the pioneering wind energy platforms in Europe such as the *European Energy Research Alliance* – Wind Energy Joint Program (EERA JP Wind) (associate member) and the *European Academy of Wind Energy* (EAWE) (full member).

Biomaterials and Tissue Engineering Research Center (BİOMATEN)

Establishment of the Center of Excellence In 2010 BIOMATEN, the Center of Excellence in Biomaterials and Tissue Engineering was established at METU with a grant supported by the Ministry of Development (formerly the State Planning Organization). Then in the same year The Biomaterials and Tissue Engineering Application and Research Center was established after the approval of METU Senate, the Higher Education Council of Turkey and publication in the Official Gazette. The two centers share the acronym BİOMATEN and have the same goals and functions. BIOMATEN has members from the Departments of Biological Sciences, Chemistry, Mechanical Engineering, Metallurgical and Material Engineering, Engineering Sciences, and Biotechnology of METU and has the advisory committees from GATA (Gulhane Military Medical Academy), OSTIM and SEIS, two NGOs from the medical sector. Center of Excellence has a broader membership profile; in addition to academic members from METU, there are also members from Hacettepe, Yeditepe, Kocaeli, İTÜ, Çukurova and Acıbadem Universities. Professors from world famous universities from the USA (Harvard, MIT, Drexel, and Tufts), Germany (Johannes Gutenberg) and UK (London) are also supporting us as our International Advisory Board. In addition, Biomaterials and Tissue Engineering Society of Turkey, established in 2008, is one of the non-governmental organizations that support the centers.

The Center for Solar Energy Research and Applications (GÜNAM)

The Center for Solar Energy Research and Applications (GÜNAM) is an interdisciplinary center of excellence in the area of solar energy science and technology. It has recently received significant support through State Planning Organization (SPO) and Ministry of Industry and Commerce of Turkey. GÜNAM considers itself as the major national center in the development of solar cell technologies including photovoltaic and solar thermal system for energy production and aims to serve all interested institutions and individuals in Turkey.

Primary aims of GÜNAM are:

Improve the solar energy technologies that convert solar energy to electrical energy at an affordable price;
create a technological infrastructure for national industry and eliminate the possible negative effects of the incentive systems;
become an institution that guides and creates synergy of innovation at national and international level;
increase public awareness and consciousness on the usage of solar energy;
and train and educate necessary man power.

Confucius Institute (CI)

The Confucius Institute (CI) at the Middle East Technical University (METU) is the first of its kind in Turkey. It operates under an agreement between the Middle East Technical University and the Office of Chinese Language Council International (HANBAN) in China, in partnership with Xiamen University. The Confucius Institute at METU is a result of a long term consultation and cooperation between HANBAN, Xiamen University and the Middle East Technical University with the help of the Chinese Embassy in Ankara. An agreement between METU and HANBAN for the establishment of the Confucius Institute at the Middle East Technical University was signed in Ankara on June 4th, 2007. The Implementation Agreement to Cooperate in the Establishment of a Confucius Institute at Middle East Technical University was signed by Prof. Ahmet Acar, President of METU, and Prof. Zhu Zhiwen, Chairman of Xiamen University Council, on November 27th, 2008. The Confucius Institute was inaugurated on November 28th, 2008 with the attendance of Jia Qinglin, Chairman of the Chinese People's Political Consultative Conference (CPPCC).

The Confucius Institute at METU is attached to the Presidency Office. The administrative board of CI at METU consists of 6 professors, including Turkish and Chinese directors. The daily coordination and

management is regulated and administrated by the Chinese and Turkish directors. Besides the administrative board, there is an assistant to the directors, and teachers of Chinese.

Yapılı Çevre ve Tasarım Uygulama ve Araştırma Merkezi (YTM-MATPUM)

OFFICE OF SPONSORED PROJECTS

The Office of EU Affairs, established in 2000 within the body of the Rectorate, has been renamed as the Office of Sponsored Projects in 2009 with a newly defined set of assignments.

The Office of Sponsored Projects, within the body of the Research Coordination and Liason Office, consists of two sub-divisions; one dealing with national and the other with international projects. These divisions provide consultancy and assistance throughout the project development and implementation process, including project idea formulation, project development, project writing, submission, management and termination.

Functions of the Office and further information about project processes are available at the Office of Sponsored Projects webpage (www.pdo.metu.edu.tr).

LIBRARY

Being the most important support unit for research and education, and with the aim of being a modern university library, ODTÜ Library (http://www.lib.metu.edu.tr/) since its establishment, has strived to enable students, faculty, and the community on the whole to benefit from new information technologies. The basic aim of the Library is to meet the information needs of both METU users and non-METU researchers and industrial corporations. Answering readers' inquiries is among the most important duties of the library staff. The Library has been certificated with the ISO 9001:2008 Quality Management System on 25 April 2012.

ODTÜ Library covers an area of 12.058 m² with its eight reading and two meeting halls. The Library serves 1.277 simultaneous sitting readers. According to the 2013 Annual Activity Report of METU, there are overall 665.704 publications; of these 479.501 are books and 186.203 are bound periodicals. The Library subscribes to 1.228 periodicals and has access to over 49.500 full-text e-journals, proceedings, 179.849 e-books in 163 databases. Also a visual media archive was formed in the end of 2010.

All METU faculty, students, personnel and retired personnel are natural members of the Library. Public can use the Library materials but can not borrow. The Library is open from 08:45 to 23:30 in weekdays and from 09:00 to 21:00 at weekends in the academic semester. During the period between the end of final examinations and summer school, the Library is open from 08:45 to 22:00 in weekdays and from 09:00 to 21:00 at weekends, and during the vacation period and the semester holiday, the Library is open from 08:45 to 17:15 in weekdays and from 09:00 to 21:00 at weekends.

The Library makes use of the latest technological developments in providing automated services to the users. The Library uses an international automation system called Innovative Millennium. Also LibREF RFID system has been used to facilitate the collection management activities in the Library since the end of 2011. Access to the OPAC (Online Public Access Catalogue) is possible through the terminals that are in the Library and also from any other place that has internet connection. The OPAC is in service of our users on http://library.metu.edu.tr/. Many of the library services are also available on the mobile application which is accessible by smart phones using Android operating system or IOS. The application can be found and downloaded by searching as "LibAnywhere". Also the wap portal of the Library can be accessed at http://wap.lib.metu.edu.tr.

Users are directed to the library resources and services so as to ensure effective use of library resources through the reference services. In this context, reference services are provided face to face or

through phone, e-mail and online chat. Libguides at http://libguides.lib.metu.edu.tr is also intended to help researchers to find information resources they need by providing links to articles and images in library resources, i.e. databases, print resources, and other reference tools. Also an application called CNA, Call Number Application has been developed to make finding books in shelves easier. Moreover, with the aim of reaching different user groups the Library has been located at some social networking sites since 2011.

There are protocol agreements between ODTÜ Library and the libraries of Ankara, Atılım, Bilkent, Çankaya, Gazi, Hacettepe, TED University, University of Turkish Aeronautical Association, Yıldırım Beyazıt University, TOBB Economics and Technology Universities, MTA (General Directorate of Mineral Research and Exploration), TODAİE (Public Administration Institute for Turkey and the Middle East), and the Turkish Court of Accounts.

ODTÜ Library is a member of ANKOS (Anatolian University Libraries Consortium), IATUL (International Association of Technological University Libraries), LIBER (The Ligue des Bibliothèques Européennes de Recherche), COAR (Confederation of Open Access Repositories) and AMS (American Mathematical Society).

COMPUTER CENTER

METU Computer Center (METU-CC) defines priorities, develops strategies and undertakes the pursuit of technological advancements; firstly, to render them as central computing and networking resources that are responsive to IT needs of the University users, and secondly, to support computing, especially in the following fields,

- Academic research
- Educational programs
- Administration,

and finally, to take the initiatives to achieve the technology standards & architecture of the IT facilities of the world's leading institutions. The Computer Center is located on the campus shuttle route between the Computer Engineering and Civil Engineering buildings. METU campus computing environment is comprised of central servers of various sizes located in METU-CC, PC Rooms and the departmental computers connected to a campus-wide gigabit network, the “METU-NET”. METU-NET is cabled with single-mode fiber optic technology. The local networks of administrative and academic units have 1 Gbps connection capacity to the METU-NET.

The campus local area network has a wireless network extension. In METU, the wireless network runs on all available accepted standards IEEE 802.11a/b/g/n. To connect mobile users to the campus network, coverage areas have been created on various locations of the University. The main halls and floors inside the library, all the halls and the foyer inside the Cultural and Convention Center (CCC), areas where mobile use is necessary, inside the academic departments and administrative units, residences for academic and administrative staff and dormitories are mostly covered with 802.11a/b/g/n wireless networks. Two SSIDs (wireless broadcasts) are available throughout the campus: eduroam and ng2k. eduroam SSID is part of the eduroam project which is a secure network running on 802.1x, whereas the ng2k network is open and uses MAC addresses of the users for authentication.

METU Library has many digital resource subscriptions and these resources are available to METU IP addresses. For users who would like to access these resources outside the campus, METU-CC has a web caching service. Users need to get a one-time password from http://netregister.metu.edu.tr and make a simple web browser configuration to use this service.

METU-CC also provides ftp service running on more than 2 terabytes of disk space and is the official mirror of Debian, Kernel, Ubuntu, Pardus, OpenSUSE. This service is accessible via ftp://ftp.metu.edu.tr and http://ftp.metu.edu.tr addresses.

METU-NET provides its Internet connection through TUBITAK's ULAKNET (Turkish Academic Network and Information Center.) Besides this connection, a spare connection is kept ready to be used in case of a problem. Mersin Erdemli **Institute of Marine Sciences and Northern Cyprus Campus** which are not parts of the main campus are connected to METU-NET through MetroEthernet connection.

Other than designing and maintaining the METU web site (http://www.metu.edu.tr) and the social networks (METU Facebook Page: http://www.facebook.com/MiddleEastTechnicalUniversity, METU Twitter Page: https://twitter.com/#!/METU_ODTU, METU YouTube Page: http://www.youtube.com/middleastechuniv), METU-CC provides various informatics services by which the users acquire alternative methods of obtaining knowledge and building communication. Web tools such as the METU Survey Service (http://metusurvey.metu.edu.tr), the electronic lists service (https://mailman.metu.edu.tr/mailman/listinfo), METU Blog Service (http://blog.metu.edu.tr) and METU Google Map (http://map.metu.edu.tr) are some of those services. METU-CC also designs, develops and maintains some automation and information systems, such as "Library Information Services System", "Student Affairs Information System", "Academic Personal Information System", "Personnel Office Automation System", "Graduate Program Application and Evaluation System", etc.

METU-CC operates 16 PC Rooms for general user access to University computing facilities. These PC Rooms have a total capacity of 444 computers as well as many printing facilities to help students and researchers with their academic studies. METU-CC also provides some licensed software to METU staff and students (for more information please visits http://software.cc.metu.edu.tr). The students can use these programs in the PC Rooms and the staff can download them from the FTP site (ftp://ftp.cc.metu.edu.tr).

METU-CC operates extensive general-purpose computing facilities on Unix/Linux based servers. All internet services and administration programs run on these servers. These systems serve approximately 40.000 users. Each staff and student in METU are given a user code and a password to make use of services offered by METU-CC such as; e-mail, scientific computation software available on central servers, FTP (File Transfer Protocol), user code management, web ftp services, online course registration, use of PC Rooms etc.

The Computer Center operates the Smart Class, located in the Physics department, in which interactive users can meet, join or give online seminars, use the video conference system etc. CC also maintains the broadcasting infrastructure of METU-TV which is designed as a web service over which videos can be watched on demand and is a suitable interface to broadcast the seminars, interviews, lessons live on the Internet from the Campus. Moreover, CC carries on a webinar system that enables people to have online meetings, seminars, and interviews by sharing audio and video among them (http://www.webinar.metu.edu.tr).

HCI Lab (Human Computer Interaction lab) offers a lab environment for the researchers to test and develop the usability of the web interfaces and/or software as well as providing eye tracking device used in many academic research areas like linguistics education, psychology and computer science (for more information please visit http://hci.cc.metu.edu.tr).

METU-CC provides several other services such as card services. METU users can use their METU identity cards as e-wallets at several smart points on campus. They can load money and spend it for dining, sports and other services provided by the university. Another application of this service is as e-identification for access control of several buildings and PC Rooms on campus. For more information about this service, www.smartcard.metu.edu.tr can be visited. Another card service provided by METU-CC is Metupass. With this service, METU users and some authorized visitor groups can access the campus with the stickers posted on their cars which have embedded RFID tags. These tags are recognized at the entrance of the campus and open the barriers to authorized users. Metupass also allows METU users to report their visitors' information to the campus entrance which facilitates their access process. For more information about this service, www.metupass.metu.edu.tr can be visited.

For problems and questions regarding computing, IT Support Service phone number 210 33 55 can be called or an e-mail can be sent to hotline@metu.edu.tr . In addition to these, FAQ service is also available on the METU-CC website (http://faq.cc.metu.edu.tr). The consultancy service is available during weekdays between 09:00-17:00 at B Floor, Office No: B-14. For detailed information about the CC services, Computer Center website (http://www.cc.metu.edu.tr) can be visited.

ACCOMODATION

There are a total of 18 dorms, two of them being private (EBİ 1, EBİ 2), in METU Campus. Total bed capacity of the dorms is around 7 thousand. All the students can apply to the dorms in accordance with a grading system but students coming from places outside Ankara have a priority. Duration of staying in the dorms is accepted as normal training period plus one year extra.
There are computer labs, study halls, drawing rooms, cantines and modern equipped kitchens in the dorms, open 24 hours. All dorms have washing machines, drying machines and ironing tables which may be used free of charge.

FOOD SERVICE

There is a variety of food service options on the campus. Lunch and dinner table d'hote service is available at modest prices seven days a week in the Main Cafeteria. Additionally, fast food restaurants and canteens open for lunch and snacks can be found throughout the campus

THE METU MUSEUM

METU is probably the only university in the world which has an archaeological museum housing material discovered on its own grounds. The Yalıncak excavation site, which lies about 4 kilometers south of the dormitory buildings, was dug by archaeologist B. Tezcan between the years 1962 and 1965 and subsequently, by Prof. C. Bayburtoğlu and S. Buluç in 1966. The finds from the Late Phrygian, the Hellenistic, Galatian, Roman, Byzantine and Islamic periods point to a continual inhabitation in this area since the 6th century B.C.

The Koçumbeli excavation site, which is farther south of Yalıncak, was also dug by the same archaeologists between the years 1964 and 1966. The Koçumbeli excavation has revealed only one inhabitation level which has been dated to the Early Bronze Age, that is, to the later part of the 3rd millennium B.C. The finds of this settlement such as bone and stone implements, various types of pottery seals, small animal figurines, idols and spindle whorls show close similarities with the finds of other Early Bronze Age settlements of the Central Anatolia region. Objects found at Yalıncak and Koçumbeli, belonging to different periods and cultures, are exhibited on the upper floor of the Museum.

In 1967 an excavation was made of three tumuli (a tumulus is an artificial mound with a burial chamber in it) within a Phrygian Necropolis situated between the Çiftlik and Bahçelievler districts of Ankara. Objects found within the burial chambers have been dated to the 7th century B.C. and are all displayed on the second floor of the museum.

In addition to the excavation finds, the museum has show-cases displaying archaeological objects purchased by the university and a small room arranged with ethnographic material given to the museum by the Departments of Architecture and Restoration.

BANKING AND POSTAL SERVICES, SHOPPING

There are branch offices of Türkiye İş Bankası, T.C. Ziraat Bankası, T.C. Yapı Kredi Bankası, Vakıfbank, Akbank, Garanti Bankası and their ATM services, the ATM services of HSBC, Finansbank, OYAK Bank and a Post Office. In the dormitories and at various locations on campus are paid telephone facilities for local and trunk calls.

The Shopping Center across the tennis courts includes a mall with a variety of clothing and stationary shops, a bookstore and 2 pharmacies as well as many fast food restaurants. A hairdresser shop, a barber shop, a tailor shop, a shoe repair shop and a dry cleaning shop are located next to the mall. There is also a supermarket where fresh fruits and vegetables, a wide variety of foods and items for household and personal needs are available.

In addition to the mall, there are a number of fast food restaurants and canteens around the campus that are open during weekdays.

BOOKSTORE

Since the training and education are carried out in the English language, textbooks are imported and sold by the Bookstore to students at prices that are almost equal to their costs. Besides textbooks, University publications / periodicals, publications of the School of Foreign Languages and the publications of other Institutions are also sold by the Bookstore at reduced prices. METU Bookstore is located at the shopping center. Office Hours: 08:45 to 17:00 from Monday to Friday excluding official holidays.

HEALTH AND COUNSELING SERVICE

There is one medical center on the METU campus offers diagnosis treatment services to all University employees and students. The health center is located close to the Sports Saloon. Full-time and part-time doctors receive patients from 09.00-15.00 / 09.00-17.00 during the day. The center is available for emergency situations for 24 hours. Employees and students apply to Health center directly with their identification card. International students are recommended to have a private insurance for their referral to any other medical center or hospital in case.

There are 15 specialists, 8 practitioners, 4 dentists, 6 psychologists, 4 counselors, 3 physiotherapist, 15 nurse, 4 health staff, 1 emergency medical technician, 6 technician and an adequate number of support personnel employed. The health center is equipped with 5 dentistry units, a computerized ocular unit, a conventional X-ray, biochemistry and microbiological laboratories, psychological counseling centers are established in a campus where students can easily access professional support for their psychological well-being.

TRANSPORTATION SERVICE

Off-campus transportation is available in a variety of forms. Scheduled buses to and from various districts of Ankara are provided in the mornings and evenings. EGO and public buses also operate to the city center every hour from 06.30 a.m. to 11.30 p.m. every day (including holidays). The bus schedules are announced at the beginning of every semester.

Additionally, double deckers and dolmuş (mini-vans operating on a fill-and-leave basis) run between the Campus and the city center.

In campus buses are available throughout the year free of charge.

CULTURAL ACTIVITIES

Within the structure of the Directorate of Cultural Affairs, 80 different student clubs carry out miscellaneous cultural, artistic and scientific activities and organize panels, open discussions, conferences, and conversations. METU Cultural Affairs Office has been founded in 1984, and recently there are 80 Clubs activating under the organization of this office. Many activities organized by our students, still continue to be "the first and the unique" in Turkey. All the clubs organize many national and international activities coordinated by the Directorate of Cultural Affairs. Some of these activities could be listed as International Spring Festival, Theater Festival, Folk Dances and Folk Music Festival, Contemporary Dance Days, Classical Guitar Days, Rock Music Days, etc.

About 5000 students participate in the activities of the following clubs: Aeronautics Club, Amateur Astronomy Club, Amateur Photography Club, Archaeology Club, Architecture Club, Atatürk’s Thought Club, Bird-Watching Club, Book Club, Business Ethics Club, Chemistry Club, Cinema Club, Classical Guitar Club, Communication Club, Computer Club, Construction Club, Contemporary Dance Club, Economy Club, Education Club, Environment Club, Euro-Asia Club, European Students Forum Club, Fine Arts Club, Foreign Policy and International Relations Club, Geology Club, Go Club, History Club, Humor Club, International Youth Club, Literature Club, Management Club, Materials Engineers Club, Mathematics Club, Music Clubs, Musical Club, Physics Club, Political Science Club, Productivity Club, Psychology Club, Radio Club, Robotics Club, Science Fiction and Fantasy Club, Sociology Club, Statistics Club, Strategic Research Club,

Theater Club, Turkish Classical Music Club, Turkish Folklore Club, Japanese Cultur Club, International Student Club etc.

SPORTS ACTIVITIES

Sports and recreational activities in the METU campus are being carried out by the Directorate of Sports within the framework of the Office of Health, Culture and Sports. The Directorate consists of 12 sports clubs (Aikido, Bridge, Capoeira, Chess, Couple Dances, Life Saving and First Aid, Metu Scouts, Motorsports and Traffic, Mountaineering and Winter Sports, Outdoor Sports, Subaqua) in various fields and 32 branches made up of indoor and outdoor sports.

For those who would like to do sports the following facilities exist in the METU campus: 3 Gymnasiums, a soccer field made up of artificial turf covering running track with 6 lanes and a seating capacity of 13.000, 5 soccer field in various sizes and 3 artificial soccer field, 16 tennis courts, outdoor basketball and volleyball courts, rooms for table tennis, 2 running tracks, 2 fitness center, 1 gymnastics saloon, 1 Indoor Pool (Olympic), 2 beach volley fields, 1 outdoor swimming pool, 1 boat house with rowing facilities and running tracks around lake Eymir.

All the students can use these facilities in the frame work of separate schedules arranged for these working out alone or in the company of a trainer. Students can also join anyone of METU's sports Clubs and tournaments coordinated by Directorate of Sports.

The METU campus hosts the following organizations throughout the year; Mountain Bike Race, Lake Festival, Rowing Races, Soccer Tournament for the international students, Intra-dormitory Volleyball, Soccer and Basketball Tournaments, Spring Semester Basketball Tournament, Basketball Tournament for prep class, Streetball, Intra-Departments Basketball Tournament, Chess, Tennis and Squash Tournaments, Intra-departmental organizations and organizations for the entire university. In addition to these activities, the directorate of sports holds various courses like Aikido, Table Tennis, Taekwondo, Karate, Judo, Volleyball and Health care sports programs for the participation of METU members.

METU also maintains ski lodges for use by university students and staff at Elmadağ, 30 kilometers from the METU and at Uludağ, a popular ski area near the city of Bursa.

INTERNATIONAL COOPERATIONS OFFICE (ICO)

Founded in 1992, International Cooperations Office coordinates METU's international mobility programs such as Erasmus+, Overseas Exchange, Mevlana and International Summer School; in particular, incoming and outgoing student and staff mobility as well as internship programs are carried out. ICO is also responsible for initiating and implementing collaborative agreements and organizing programs for international delegations visiting METU at the university administration level. The office also works for the Office of the President regarding the international collaborative initiations which result in non-degree programs as well as deal with international memberships to networks and institutions which do not fall under an academic field at the university.

For more information, please check: http://www.ico.metu.edu.tr

CAREER PLANNING CENTER (CPC)

The center was established in 1980 under the name of "Office for Placement of Graduates" with the aim of establishing a link between new and future graduates of METU and their potential employers. The center was further developed and reorganized in 1996 as the "Career Planning Center (CPC)" with expanded functions and responsibilities, reporting directly to the President's Office.

The aim of the center is to help new graduates to find positions where they will improve themselves using their knowledge and abilities. Another aim of the Center is to help graduates, dissatisfied with their present working conditions, to find new career opportunities appropriate for their experiences. Besides, CPC organizes activities in order to inform students about the sectors & firms, starting from the beginning of their education at METU and to prepare them for the business world.

Interactive Career System: The Center can be reached at http://www.kpm..metu.edu.tr for further information. Graduates can also apply for jobs by filling out the Center's "Job Application Form" through the Internet. Registered companies have access to the database and can reach the job applications of METU graduates for 24 hours a day. Besides, companies can attach their advertisements for available vacancies.

ODTÜ Career Fair: The Career Fair is held once or twice every year, in March and/or in November. This activity, aims to introducing all students to "business life" at early stages of their university education, and to give them guidance and perspective on their future career decisions. The Fair is visited by over 10.000 students.

ODTÜ Graduate Programs Information Days

For two days, Students/Alumni have the chance to be informed of our graduate programs and get to know the alternative paths within which they can specialize during their career. ODTÜ Graduate Programs Information Days where they are be greeted by more than 40 master and PhD programs and become acquainted with new opportunities regarding the professional and academic life.

Company Presentations: Company Presentations are held every year November through June to introduce graduate candidates to companies and organizations for many challenging career opportunities.
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Career Development Seminars and one to one counselling: The CPC prepares students for business life via several programs designed to teach them crucial subjects such as writing a resume/CV, preparing an attractive cover letter, fundamentals of interview techniques etc. Approximately 45 minutes lomg interviews or 2 hours long group seminars are held with the students or alumni by appointments.

THE OFFICE OF LEARNING AND STUDENT DEVELOPMENT

The Office of Learning and Student Development was established in 2009. The Office collaborates with all units and departments across campus to contribute to student development and to enhance the learning environment of METU. The Office aims to (a) provide broad range of services and resources to support personal, social, academic, and career development of undergraduate and graduate students, (b) conduct research on student learning and development, (c) provide variety of services and resources to faculty in an effort to contribute to university teaching and professional development, and (d) conduct research on teaching and faculty professional development. Services provided to students include individual and group counseling, career counseling, referral, academic support, and outreach services (various student development and educational life enhancement seminars, workshops and resources). Services given to faculty consist of consultation, new faculty orientation program and professional development programs.

For more information please visit: www.ogeb.metu.edu.tr

ADMISSION

ENTRANCE REQUIREMENTS FOR FRESHMEN

Turkish Students

METU accepts Turkish students graduated from high schools or equivalent institutions through the central entrance examination conducted by the Student Selection and Placement Center (ÖSYM).

International Students

Students who have graduated from high schools, lyceums or equivalent institutions and who satisfy the application criteria may directly apply to Middle East Technical University. METU's admission criteria generally include an acceptable score from one of the internationally recognized examinations (such as SAT, GCE, IB etc.), or from university entrance examinations of some countries (Syria, Iran, China etc.).

For detailed information about application instructions to undergraduate programs, please visit the following web page: http://oidb.metu.edu.tr/en/application-admission

ENTRANCE REQUIREMENTS FOR UNDERGRADUATE TRANSFER STUDENTS

Students who have completed two semesters of the curriculum of a university or university-level institution may apply to be admitted to the University as transfer students with advanced standing at their second year of study or above. In order to qualify for admission, applicants must have 2,50/4,00 average or its equivalent, and their previous studies must be related to the courses given at METU. Applicants having these qualifications must submit a certified transcript or equivalent documentary evidence of their academic report together with their application. After having consulted with the faculty of the department concerned, the Registrar will refer such applicants to the Administrative Board of the concerned Faculty for a final decision. Detailed information about transfer application is available at:
http://oidb.metu.edu.tr/en/transfer-applications

ENTRANCE REQUIREMENTS FOR GRADUATE PROGRAMS

Those who hold (or expect to hold within a year) a Bachelor's degree from a four year undergraduate program may apply for a Master's degree or Ph.D. on B.S. degree. Besides, those who hold (or expect to hold within a year) a Master degree, may apply for a Ph.D. degree.

The decision to admit an applicant to a graduate program is made by the Administrative Board of the Graduate School upon the recommendation of the Department Chair concerned. Applicants must fill out the online application form available at the web sites of the Graduate Schools. The form and the related information can also be downloaded from these sites. The application form should be filled and submitted/sent together with other required documents to Graduate Admission Office.

General information about application to graduate programs, graduate programs and degrees offered at METU, and links to Graduate Schools is available at:

http://oidb.metu.edu.tr/en/graduate-programs

Required documents for application may vary according to the program, however they generally include:

i) Official transcripts for all graduate and undergraduate level coursework completed up to the time of application, notarized or attested.(For application purposes an official transcript is defined as a record which bears the signature of the registrar and the seal of the institution),

ii) Letter of intention prepared by the applicant describing his/her background and goals in graduate study,

iii) Letter of recommendation,

iv) Graduate examination score (GRE, GMAT, ALES etc.),

v) English Proficiency Test result (METU EPE, TOEFL, IELTS).

Applicants should check out the respective web pages of Graduate Schools to find out the required documents to apply for the program they wish to study in.

Graduate examinations accepted by METU are ALES (Academic Staff and Graduate Education Entrance Examination) given in Turkey by ÖSYM and GRE (Graduate Record Examination) given worldwide by Educational Testing Services (ETS). The applicant therefore should apply either to ALES or GRE. Applicants to graduate programs in Business Administration must take GMAT (Graduate Management Admission Test).

English Proficiency Tests accepted by METU are METU-EPE (English Proficiency Examination) given by METU School of Foreign Languages, TOEFL (Test of English as a Foreign Language) and IELTS (International English Language Testing System) given worldwide.

Applications to graduate programs will not be considered complete without the official graduate examination and English proficiency scores. Therefore the applicants must make sure that their scores are forwarded to METU. (The institution code numbers are GRE: 0692-4 TOEFL: 0692-189) Exemption from these exams is possible only in special cases, details of which may be obtained from the relevant graduate school.

Applications are accepted by the end of December for Spring Semesters and by the end of May for Fall Semesters. All correspondence concerning the admission should be addressed to the relevant Graduate School.

International students eligible for admission should obtain a student visa from the nearest Turkish Consulate; an official letter of acceptance, indicating the category of admission, will be provided to them for this purpose.

New international student is expected to contact the International Student Advisor in the Registrar's Office upon arrival.

ENTRANCE REQUIREMENTS FOR SPECIAL STUDENTS

The University offers a special students program for students who want to take a limited number of courses to improve their knowledge about subject/subjects.

Special students may be admitted to the University under the following conditions.

1. Applicants must be studying in a higher education institute on the date of application. Graduate students of higher education institutes are also welcome to apply.

2. Applicants must satisfy the Chairperson of the concerned Department that their qualifications will allow them to profit from the courses. Students dismissed from universities or other institutions for disciplinary reasons and/or due to poor academic performance are not accepted.

3. Applications will be made to the Registrar who will refer the matter to the Chairperson of the Department concerned. Recommendations of the Chairperson are subject to the approval of the Dean of the Faculty for undergraduate studies, or the approval of the Director of Graduate School for graduate studies.

Special students are not accorded any of the rights recognized to regular full time students of the University, nor are they awarded any degree or diploma. The number of courses for which they can register is determined by the Chairperson of the Department concerned.

International students must hold a valid student visa and/or residence permit to be registered as a special student.

All correspondence concerning admission as a transfer or special student should be addressed to:

MIDDLE EAST TECHNICAL UNIVERSITY

Registrar's Office

06800 ANKARA / TURKEY

ACADEMIC RULES AND REGULATIONS CONCERNING UNDERGRADUATE STUDENTS

PART I
Aim, Scope, Basis and Definitions of Terms

Aim

ARTICLE 1 – (1) The aim of this document is to regulate the procedures and principles for student admissions and registration to the undergraduate programs offered at Middle East Technical University, and the conduct of undergraduate education, examinations and assessment.

Scope

ARTICLE 2 – (1) This document comprises the regulations concerning student admissions and registration to the undergraduate programs offered at Middle East Technical University, and the conduct of undergraduate education, examinations and assessment.

Basis

ARTICLE 3 – (1) This document has been drawn up based on article Articles 14, 43, 44 and 46 of the Higher Education Act 2547 dated 4 November 1981.

Definitions of Terms

ARTICLE 4 **– (1) Wherever the following terms appear in this document, they shall be taken to refer to:**

a) The concerned faculty board: Middle East TechnicalUniversity faculty boards

b) The concerned administrative board: Middle East Technical University faculty administrative boards

c) EPE: Middle East Technical University School of Foreign Languages English Proficiency Exam

d) Undergraduate program: a higher education program consisting of a minimum of eight semesters

e) The RO: Middle East Technical University Registrar's Office

f) The President: President of Middle East Technical University

g) The Senate: Middle East Technical University Senate

h) DBE: Middle East Technical University Department of Basic English

i) International joint-degree program: an undergraduate program jointly carried out with an institution of higher education abroad

j) The University/METU: Middle East Technical University

k) The University Administrative Board: Middle East Technical University Administrative Board.

l) SFL: Middle East Technical University School of Foreign Languages

m) Regulation: Middle East Technical Universitya cademic rules and regulations for undergraduate period of study

PART II
Regulations Concerning the Conduct of Undergraduate Education

Medium of Instruction

ARTICLE 5 – (1) The medium of instruction in METU's undergraduate programs is English. Yet, courses that are to be conducted in Turkish or any other language are determined by the Senate.

(2) Students are registered to the undergraduate programs their proficiency in English is documented.

(3) The English proficiency level of students placed in, admitted or transferred from another institution to undergraduate programs is assessed, and the education at the DBE Preparatory Class is conducted in accordance with the "Middle East Technical University School of Foreign Languages Department of Basic English Regulations for DBE Preparatory Class" published in the Official Newspaper No. 28457 dated November 04, 2012. (*)

(4) Undergraduate students who have discontinued their education for two consecutive academic years (four semesters) by obtaining leave of absence or by failing to re-register are required to document their English proficiency through EPE or an equivalent exam recognized by the Senate so as to be able to re-register. However, this rule does not apply to students who have documented that they have studied and were successful at an English-medium institution of higher education within the country or abroad for a minimum of one semester in the last four semesters.

Duration of undergraduate programs

ARTICLE 6 – (1) The normal duration of an undergraduate program is four years (eight semesters), and this duration is five years (ten semesters) for programs offering a master's degree along with an undergraduate degree.

(2) The maximum duration of an undergraduate program is seven years (fourteen semesters), and this duration is nine years (eighteen semesters) for programs offering a master's degree along with an undergraduate degree.

(3) The extended duration is the two-year period (four semesters) granted to students unable to graduate in their maximum duration so that they might meet the requirements for graduation.

(4) The period of study which is spent at the DBE is not included in the normal, maximum and extended durations of study.

(5) The semesters for which students are granted a leave of absence by the concerned administrative board are not included in the normal, maximum and extended durations of study.

(6) All the semesters during which the students have been registered since they first enrolled in an undergraduate program or which have been spent unregistered due to failure to re-register are included in the normal, maximum and extended durations of study.

(7) The semesters which have been spent in institutions of higher education in the country or abroad as part of student exchange programs are included in the normal, maximum and additional extended durations of study. (*)

Academic year

ARTICLE 7 – (1) One academic year consists of two 16-week semesters including the final examination periods.

(2) Summer School may be offered within an academic year. The principles regarding the conduct of education in Summer School are determined by the Senate. (*)

(3) The duration and dates of the registration, courses, examinations and other similar activities within an academic year are specified in the academic calendar.

(4) The weekly course schedules within a semester and summer school are prepared and announced by the concerned chairpersons in coordination with the RO.

(5) The courses to be offered in a semester and Summer School are determined by the concerned chairpersons and approved by the concerned administrative boards. The course sections, capacities and criteria are determined by the concerned chairpersons.

Undergraduate programs

ARTICLE 8 – (1) An undergraduate program is drawn up by the concerned department(s), and offered by recommendation of the concerned faculty board, decision of the Senate and approval by the Higher Education Council.

(2) The curriculum of an undergraduate program comprises studies such as theoretical work, laboratory work, practical work, workshop(s), studio work, practical training and the distribution of these as courses among semesters.

(3) The changes to the title and duration of an undergraduate program are drawn up by the concerned department, and confirmed by the Senate following the recommendation of the concerned faculty board.

(4) The amendments to the curriculum of an undergraduate program and the guidelines for the adjustment of students to these are arranged by the concerned department and set by the concerned faculty board.

International joint-degree programs

ARTICLE 9 – (1) International joint-degree programs may be offered together with the institutions of higher education abroad.

(2) Education in the existing programs is conducted in accordance with the Regulations Governing the Studies in Middle East Technical University- State University of New York (SUNY) International Joint-degree Programs published in the Official Gazette No.25711 dated 29 January 2005.

Double Major Programs

ARTICLE 10 – (1) Students enrolled in an undergraduate program at METU may concurrently enroll in another undergraduate program. The second undergraduate program is designated as a "Double Major Undergraduate Program". The students who complete this program are awarded a "Double Major Diploma" in addition to the diploma they receive from the undergraduate program in which they are enrolled. The principles governing the double major programs are determined by the Senate.

Minor programs

ARTICLE 11 – (1) Students enrolled in an undergraduate program at METU may additionally enroll in a "Minor Program", which incorporates a certain number of courses offered by another undergraduate program at METU or a certain number of interdisciplinary courses. A minor program is not an undergraduate program. The students who complete this program receive a certificate. The principles governing minor programs are determined by the Senate.

Exchange programs

ARTICLE 12 – (1) Within the framework of mutual agreements, exchange programs may be arranged between METU and institutions of higher education within the country or abroad. The principles governing such programs are determined by the Senate.

Certificate program

ARTICLE 13 – (1) The principles concerning certificate programs are determined by the Senate.

Special students

ARTICLE 14 – (1) Special students are students who are not registered to any program at METU, but who are expected to fulfill the requirements of the limited number of courses they are registered to. The principles governing these programs are determined by the Senate.

Admission to undergraduate programs

ARTICLE 15 – (1) Admission to undergraduate programs is carried out in accordance with the principles determined by the Senate within the framework of the Higher Education Act 2547 dated 04 November 1981 and of the regulations and decisions of the Higher Education Council.

(2) The principles governing the application, admission and registration procedures of foreign students and students applying from abroad are determined by the Senate.

(3) The principles governing the application and admission of undergraduate transfers from within or outside the university are determined by the Senate.

Initial enrollments

ARTICLE 16 – (1) The registration of students placed in or admitted to undergraduate programs is carried out by the RO on the dates indicated in the academic calendar.

(2) The below-mentioned requirements are sought for the finalization of the enrollment of students to the university:

a) Holding a document certifying that the student is qualified to receive a diploma from a high school or an institution, in the country or abroad, which is recognized as the equivalent of a high school by the Ministry of Education.

b) Fulfilling the provisions regarding tuition and education fees.

c) For international students, not having a student visa problem.

d) Fulfilling other requirements as announced by the University.

(3) Only the originals of the documents required for registration, or their approved copies upon presentation to the University are accepted. Regarding compulsory military service and judicial records, the application is processed based on the candidate's declaration. In case students who have earned the right for registration with false or misleading declarations and documents are detected, they will not be registered. If they have already been registered, the registration will be cancelled regardless of the semester they are in, all documents issued to them, including diplomas, will be declared null and void, and legal action will be taken against them. Those in this position are deemed not to have earned a student status and cannot enjoy any rights granted to students in the future. (*)

(4) Those students who have completed registration procedures are provided with a student ID card. The ID cards contain personal information about students.

(5) Those who have not completed their registration within the declared period are deemed to have waived their student rights and thereafter may not claim any of those rights.

Courses and Course Credits

ARTICLE 17 – (1) The courses within undergraduate programs are of two types: compulsory and elective. Compulsory courses are specified in the curriculum and must be taken and. Elective courses are courses whose numbers, types and groups are specified in the curriculum and are selected by students.

(2) The course titles, codes, contents, credits, categories, prerequisites, co-requisites, midterm exams, final exams and other similar features and amendments to be made to these features are determined by recommendation of the concerned department and the decision of the concerned administrative board.

(3) Pre-requisite and co- requisite courses may be specified in order for a course to be taken.

a) A course to be taken prior to another course and in which at least the letter grade DD or S is to be earned is called the pre-requisite of that course.

b) A course which must be taken together with another course is called the co-requisite of that course.

(4) Apart from the pre-requisite and co-requisite courses, additional conditions may be determined by the department chairs in order that a course might be taken.

(5) In case of exemption from the pre-requisite or co-requisite course of any course, the pre-requisite or co-requisite provision of that course is deemed to have been met.

(6) The credit value of a course consists of all of its weekly theoretical course hours plus half of the weekly hours of laboratory, practical, studio, practical application and other similar work related to that course.

(7) Weekly theoretical and practical course hours of non-credit courses are specified ; however, a credit value is not allocated for such courses.

Course Loads

ARTICLE 18 – (1) The normal course load of an undergraduate program is the number of credit courses existing in the semester with the highest number of credit courses according to the curriculum of that program.

(2) A student's course load in a semester is limited to the normal course load. The normal course load

a) may be increased by only one course upon the students' request and with the approval of the advisor, if their Cumulative Grade Point Average is at least 2.00.

b) may be increased by up to 2 courses at most upon the students' request and with the approval of the advisor, if their Cumulative Grade Point Average is at least 2.50.

(3) Students may not change their course load stated in the curriculum during the first semester of their enrollment in a program.

(4) The minimum course load of students in a semester is three credit courses. In justifiable situations, this load may be reduced with the approval of the advisor and the chair of the concerned department.

(5) For students who are able to fulfill the requirements for graduation at the end of the registered semester, the minimum course load provision is not sought.

Adjustment to undergraduate programs and counting courses

ARTICLE 19 – (1) The procedures related to the adjustment of students to undergraduate programs and/or counting of courses in the below mentioned situstions are carried out by the concerned administrative board by recommendation of the concerned department chair.

a) Undergraduate transfers.

b) Vertical transfers.

* c) In the adjustment procedures conducted at the termination of the extended duration of study, which of the courses with the grades DD and above, S or with their equivalent grades are to be counted towards the program, and which are to be retaken is determined.

d) In other adjustment and course counting procedures, which of the courses with the grades CC and above, S or with their equivalent grades are to be counted towards the program, and which are to be retaken is determined.

e) All courses with the grades FD, FF, NA W, U or their equivalent grades are to retaken. (*)

(2) The below-mentioned rules are applied in adjustments and counting courses:

a) Adjustment procedures are conducted in accordance with the current curriculum.

b) Courses which have been taken in the previous program but which do not in exist in the current curriculum are excluded from the adjustment.

c) Courses with the grades CC and above, S or with their equivalent grades are to be counted towards the program, and which are to be retaken is determined.

d) All courses with the grades FD, FF, NA W, U or their equivalent grades are to retaken.

e) In order for the pre-requisite or co-requisite provision to be met, the previous grades in such courses must be CC or above, S or an equivalent grade. (*)

f) The semester(s) considered spent from the maximum duration is/are calculated according to the courses counted towards the program and deducted from the student's maximum duration. In this procedure, the normal course load of the concerned program is considered as equivalent for one semester.

(3) The principles regarding counting courses and the validity periods of courses are determined by the Senate.

Extra-curricular courses

ARTICLE 20 – (1) Extra-curricular courses are credit courses that do not exist in the curriculum of the undergraduate, or double-major/minor program a student is enrolled in, but which the student additionally takes. The following rules apply for extra-curricular courses:

a) Such courses are to be taken in NI status.

b) The courses taken in NI status are counted towards the course load of the student in the related semester.

c) Maximum two courses may be taken in NI status per semester.

d) The status of courses falling into the NI status cannot be altered after the registration procedures of the concerned semester are completed.

e) The courses taken in NI status cannot be counted towards the program(s) in which the student is enrolled within the semester they are taken.

f) The status of courses not taken in NI status cannot be rendered NI after the registration procedures of the concerned semester are completed.

g) Courses taken in NI status may be repeated only once in the same status.

h) Courses taken in the NI status are not included in Grade Point Average calculations.

i) The courses taken in NI status are indicated in the transcript along with the earned letter grade.

Semester registrations

ARTICLE 21 – (1) Each semester students must re-register on the online registration dates indicated in the academic calendar. However, students who enroll in a graduate program for the first time may also register in the add/drop week indicated in the academic calendar. Students who fail to register on the designated dates are deemed unregistered and may not enjoy the rights of registered students.

(2) Semester registration procedures consist of the following phases:

a) The student pays the tuition or education fee and fulfills any other financial obligation (dormitory fee, library fee, etc.) pertaining to previous years, if any.

b) The student registers for the new semester.

c) The student meets his/her advisor to obtain approval for the online semester registration.

(3) Students cannot delay taking the first-semester courses in the curriculum.

(4) The following priorities are observed in determining the courses to be taken during semester registrations provided that the pre-requisites requirements are met; however, these priorities may be changed with the approval of the academic advisor.

a) Courses which must be repeated.

b) Courses pertaining to previous years which were not taken.

c) Courses which must be taken in accordance with class order in the curriculum, those students want to take in order to increase the grade and/or to take in NI status.

(5) Students who have completed their semester registration during the online registration period may add or drop courses or change course sections during the add/drop period stated in the academic calendar. Advisor approval is required in order for the changes to be valid.

(6) Among students who fall into the unregistered status, those who wish to register for a semester must apply to the chair of the concerned department by stating and documenting a valid reason before the termination of the designated add/drop period for that semester. The student whose excuse is accepted by the concerned administrative board and who meets the requirements for the semester registration is re-registered by the RO.

(7) Students who fall into the unregistered status may register for ensuing semesters on dates indicated for the online registrations in the academic calendar. However, these students must submit a petition to the RO latest by the date online registrations start. The applications are processed through evaluation within the framework of the rules and regulations in this document in terms of English proficiency, maximum duration and adjustments to undergraduate programs.

Course withdrawal

ARTICLE 22 – (1) Students may withdraw from courses they are enrolled in according to the following rules:

a) Course withdrawal is processed after the termination of the add/drop period and within the first ten weeks of the semester concerned.

b) Approvals of the course instructor and the academic advisor are required for course withdrawal.

c) Course withdrawal may be processed for only one course in a semester.

d) Course withdrawal may be processed for maximum six courses throughout the duration of study.

e) Course withdrawal is processed in the first two semesters of the curriculum.

f) Course withdrawal is processed for repeated courses, courses that were previously withdrawn, those in NI status or non-credit courses.

g) Course withdrawal is not allowed for students taking the minimum course load or below in a semester.

PART III
Examinations, Assessment and Graduation

Attendance and Examinations

ARTICLE 23 – (1) Students must attend the theoretical and practical class hours, examinations and other academic studies as required by the instructors.

(2) The attendance records of students are kept by the instructors.

(3) The effect of student attendance on the right to take mid-term and final examinations and on the letter grades for a semester; mid-term examinations, homework assignments, practical applications and other similar studies for which the students are responsible and the effect of these on the letter grades for a semester; the requirements to take the final examination, if any, are determined by the instructors and announced to the students at the beginning of the semester.

(4) At least one mid-term examination and one final examination are given for each course. The courses which do not require a mid-term and/or final examination are determined by the department concerned and the RO is informed of these.

(5) Students are informed of their success in each course within a semester by the instructor of that course. While doing so, instructors follow the principle of privacy of personal information.

(6) The examination dates of the courses for which mid-term examinations are given are determined by department chairs upon the recommendation of the course instructors and announced within the first four weeks of a semester. The changes in the examination dates are made and announced by department chairs upon the recommendation of the course instructors. In compulsory multi-section courses offered for different undergraduate programs, the examination dates are determined and announced by the concerned department chairs in coordination with the RO.

(7) All exams other than the mid-term and final examinations may be given with no predetermined date.

(8) In courses for which final examinations are given, the arrangement of the final exams is made as follows:

a) The times and dates of the final examinations are determined and announced by the RO following negotiations with the concerned departments.

b) The pre-announced final examination dates may be changed by the RO upon the justified request of the concerned department provided that the new dates are within the period of final examinations. This procedure is carried out before the period of final examinations starts.

(9) If deemed necessary, courses and exams may be held after weekly working hours and/or on Saturdays and Sundays.

(10) The concerned instructors and proctors are responsible for the administration of the exams in accordance with the rules.

(11) The principles regarding the procedures to be applied for students who have failed to sit an examination are determined by department chairs.

Assessment and Grades

ARTICLE 24 – (1) Students are given a letter grade for each course at the end of the semester they are registered.

(2) This letter grade is at the discretion of the instructor offering the course.

(3) In determining the letter grade, the students' mid-term and final examination grades, their success in their studies within the semester and their attendance during course and practical work are taken into consideration.

(4) The courses for which an exemption exam is to be administered, the requirements for exemption and the implementation principles are determined by the Senate upon the recommendation of the concerned faculty board.

(5) The coefficients of the letter grades and the score intervals used in the calculation of Grade Point Average are indicated below:

a)

Letter Grade	Coefficient	Score intervals	Status
AA	4,00	90-l00	Passing
BA	3,50	85-89	Passing
BB	3,00	80-84	Passing
CB	2,50	75-79	Passing
CC	2,00	70-74	Passing
DC	1,50	65-69	Conditionally Passing
DD	1,00	60-64	Conditionally Passing
FD	0,50	50-59	Failing
FF	0,00	0-49	Failing
NA	0,00	*	Failing

b) The grade NA is designated by the course instructor to students who have been deemed unsuccessful due to one of the conditions below. The grade NA is processed as FF in the calculation of Grade Point Average.

1) Not qualifying to take the final exam due to failure in fulfilling the attendance requirements.

2) Not qualifying to take the final exam due to failure in fulfilling the provisions regarding course practices. .

3) Having taken none of the mid-term and final examinations.

(6) Grades which are not included in the Grade Point Average are as follows:

a) The grade S (satisfactory) is designated to students who are successful in non-credit courses

b) The grade U (unsatisfactory) is designated to students who are not successful in non-credit courses.

c) The grade EX (exempt) is designated to students who have been exempted from certain courses in the curriculum.

d) The grade I (incomplete) is designated to students who are not able to complete the course requirements by the end of the semester or the summer school for a reason found valid by the course instructor. The grade "I" must be converted to a letter grade within a week from the last day of grade submissions for the semester or summer school. In special cases, however, this period may be extended latest until the date registrations start for the following semester, when it must be converted to a letter grade. These special procedures are conducted by recommendation of the department chair offering the course and the approval of the concerned administrative board. In case of failure to convert the grade "I" to a letter grade within the required period, the grade "I" will be automatically converted to the grade "FF" or "U". The dates concerning the letter grade "I" are indicated in the academic calendar.(*)

e) The grade W (Withdrawn) is designated to students who withdraw from a course.

Submitting and announcing grades and grade corrections

ARTICLE 25 – (1) Final grades for the semester are submitted by course instructors on the dates stated in the academic calendar.

(2) The grades are announced on the related Internet address to be opened to the access of students on the date indicated in the academic calendar.

(3) Any errors in grading are corrected with the approval of the concerned GSD chair upon the course instructor's application for correction within a week from the last day for the submission of semester or summer school final grades. In cases where this period is exceeded, the correction of errors must be made by recommendation of the chair of the department which offers the course and the approval of the concerned administrative board. The dates concerning grade corrections are indicated in the academic calendar. (*)

Course success and course repeats

ARTICLE 26 – (1) Students must earn a passing grade from a course to be considered successful. Grades AA, BA, BB, CB, CC and S are passing grades.

(2) Grades DC and DD are conditionally passing grades. Courses with such grades may be required to be repeated in the maximum duration of a program and in the adjustments made in the extended duration granted after this period. In other adjustment procedures and in course counting, these courses must be repeated. (*)

(3) Grades FF, FD, NA, and U are failing grades. (*)

(4) Courses from which the letter grades FF, FD, NA, U, and W have been earned are those that must be repeated. Instead of the elective courses which must be repeated students may enroll in other elective courses included in the curriculum.

(5) Excluding students in probation, courses from which the letter grade DD or above has been earned may be repeated within the three consecutive semesters following the semester in which the courses were taken. (*)

(6) The grade earned in the repeated course is valid regardless of the previous grade.

Grade Point Averages

ARTICLE 27 – (1) Students' semester Grade Point Averages and Cumulative Grade Point Averages are calculated at the end of each semester and their standing related to success is determined.

(2) The total credit points obtained from a course are calculated by multiplying the credit value of the course and the coefficient corresponding to the letter grade earned from the course at the end of the semester.

(3) The Semester Grade Point Average is calculated through the division of the total credit points obtained from all the courses the student has taken in the concerned semester by the total credit values of those courses.

(4) The Cumulative Grade Point Average is calculated through the division of the total credit points obtained from all the courses the student has taken up to that time, the semester concerned inclusive, by the total credit values of those courses.

(5) The Grade Point Averages obtained in these calculations are expressed by rounding them off to the second digit after the decimal point. In rounding the numbers off, the second digit after decimal point does not change if the third digit is smaller than 5, but it increases by 0.01 if the third digit is 5 or greater.

Successful students

ARTICLE 28 – (1) Students whose Cumulative and Semester Grade Point Averages are at least 2.00 and who have not received a failing grade in the concerned semester are qualified as follows according to their Semester Grade Point Averages:

a) Of the students who are within their maximum period of study and who have taken at least three credit courses in the semester concerned, the ones whose Semester Grade Point Averages are 3,50 – 4,00 are qualified as High Honor Students, and the ones whose Semester Grade Point Averages are 3,00 – 3,49 are qualified as Honor Students. Students who fulfill the Grade Point Average requirement but who fail to fulfill the requirement for three credit courses are considered Satisfactory in their standing.

b) Students who are within their maximum period of study and whose Semester Grade Point Averages are 2,00 – 2,99, or students who have exceeded the maximum period of study and whose Semester Grade Point Averages are at least 2,00 are considered Satisfactory in their standing.

(2) Students whose Cumulative Grade Point Averages and Semester Grade Point Averages are at least 2,00 but who have obtained a failing grade from a course in the semester concerned are considered Sufficient in their standing.

Unsuccessful students

ARTICLE 29 – (1) Students whose Cumulative Grade Point Averages and/or semester Grade Point Averages are below 2,00 are considered Unsatisfactory in their standing.

Probation students

ARTICLE 30 – (1) Students whose Cumulative Grade Point Averages are below2,00 in two consecutive semesters are qualified as Probation students.

(2) Probation students may not enroll in the courses which they have not previously taken, or from which they have earned the grade W. These students must first repeat the courses they have previously taken, primarily those which they have earned failing grades (FF, FD, NA, U). (*)

(3) Probation students may enroll in an elective course they have not previously taken on the condition that it replaces the previous elective course.

(4) The minimum course load requirement mentioned in this document is not valid for probation students.

(5) The Cumulative Grade Point Average of probation students must be at least2,00 inthe ensuing semester in order for them to be considered in Satisfactory standing.

Graduation requirements and dates

ARTICLE 31 – (1) The following requirements must be fulfilled in order to be eligible for graduation from an undergraduate program:

a) All the courses included in the curriculum must be completed with at least the letter grades DD or S.

b) The Cumulative Grade Point Average must be at least 2,00.

c) With the exception of the international joint degree programs conducted with contracted universities abroad, students are required to have obtained at least half of the total credit points of the curriculum from the courses offered at METU.

d) With the exception exchange programs and international joint degree programs conducted with the contracted universities abroad, the last two semesters must be spent at METU on registered status.

(2) The date of graduation from undergraduate programs is determined as follows:

a) In undergraduate programs, the graduation date is the announcement date of the letter grades for the concerned semester or Summer School as indicated in the academic calendar. For those who graduate after the announcement of grades as a result of the correction of an erroneous grade, the conversion of the grade "I" to a letter grade, or by exercising the right for a make-up, the graduation date is the date on which the letter grade is finalized.

b) For students who wish to leave the university by receiving an Associate Degree Diploma before becoming eligible for graduation from an undergraduate program, the graduation date is the announcement date of the letter grades for the semester in which the student has obtained the right to receive an Associate Degree Diploma.

Resit examinations

ARTICLE 32 – (1) The principles regarding resit examinations are determined by the Senate.

Diplomas, certificates and other documents

ARTICLE 33 – (1) Diplomas, certificates awarded and other documents issued to students, and the provisions regarding the issuance of these are as follows:

a) Undergraduate Diploma: This diploma is awarded to students who meet the graduation requirements of an undergraduate program.

b) Double Major Diploma: This diploma is awarded to students who are deemed eligible for an undergraduate diploma and who also meet the graduation requirements of the double major program they are registered in.

c) Associate Degree Diploma: This diploma is awarded to students who wish to leave the University before being entitled to graduation provided that they apply for it and complete the registration withdrawal procedures. In order to qualify for an Associate Degree Diploma, students must have earned the letter grades of at least DD or S in all the courses in the curriculums of the first four semesters, and their Cumulative Grade Point Averages must be at least 2,00.

d) Provisional Certificate of Graduation: This document is issued only once as a substitute for a diploma to students who are deemed eligible for graduation, and it is valid until the date of the commencement ceremony of the academic year concerned.

e) Diploma Supplement: This is a document accompanying diplomas which aims at the international recognition of the academic and professional competences of its holder.

f) Certificate of High Achievement: This is a certificate which is awarded to high ranking graduates in undergraduate programs. The principles regarding the rank ordering of such students are determined by the Senate.

g) Minor Program Certificate: This diploma is awarded to students who are deemed eligible for an undergraduate diploma and who also successfully complete the minor program they are registered in.This certificate is not a diploma.

h) Transcript: This document is a complete official record of the courses taken each semester, their credits values and the grades earned, the grade point averages for the concerned semesters, the cumulative grade point averages and the standing of a student starting from the student's admission to the university.

i) Semester Success Certificate: This is a document given to "Honors" or "High Honors" students at the end of a semester.

j) Student Certificate: This is a document which shows the University registration status of a student.

(2) Diplomas, certificates and other such documents are signed by the below-mentioned authorities:

a) Associate degree, undergraduate degree, double-major degree diplomas and minor certificates are signed by the President and the concerned Deans and the Heads of Departments.

b) Provisional certificate of graduation is signed by the concerned Head of Department and authorized RO staff.

c) Certificates of High Achievement and Semester Success Certificates are signed by the President.

d) Diploma supplements, transcripts and student certificates are signed by authorized RO staff.

(3) Students' faculties, departments and programs are indicated on the diplomas, certificates and other documents.

(4) Students who complete undergraduate and/or double major programs with Grade Point Averages of 3,00 – 3,49 are qualified as "Honors" and those with Grade Point Averages of 3,50 or above are qualified as "High Honors" graduates. These qualifications are stated in the diplomas.

(5) The format, size and information to be written on diplomas are specified by the Senate.

(6) In the event of the loss of a diploma, a replacement copy is issued once only.The replacement copy bears the notation "second copy". (*)

(7) In the event of a change in the name and/or surname of the graduate after the graduation date, replacement copies of diplomas and/or certificates are not issued, nor is the information on them changed

PART IV
Advisorship, Disciplinary Procedures, Student Grants, Health Service, Tuition fees, Student Leave, Registration Cancellation and Student Notifications

ARTICLE 34 – (1) Department chairs assign an academic advisor from among full time faculty to each student registered in an undergraduate program.

(2) The duties/responsibilities of the academic advisors are stated below:

a) They inform the students about the courses they are to take each semester and provide guidance in choosing them.

b) They approve semester registrations after evaluating the courses to be taken with the student according to her/his academic standing.

c) They provide information and guidance to the student in adapting to university life, professional development and career choices.

Disciplinary Procedures

ARTICLE 35 – (1) The disciplinary procedures regarding students are carried out in accordance with the provisions of the Rules and Regulations Governing the Disciplinary Procedures in Institutions of Higher Education published in the Official Gazette No. 28388 dated 18 August 2012. (*)

Student grants and aids

ARTICLE 36 – (1) The provisions governing the distribution of student grants and aids obtained from various sources are determined by the Senate.

Health service

ARTICLE 37 – (1) The provisions governing the health services offered to students are determined by the Senate.

Tuitions and other fees
ARTICLE 38 – (1) Tuitions, education fees other fees are determined by the University Administrative Board within the framework of the Council of Ministers decree.

Leaves of absence

ARTICLE 39 – (1) Students may be granted a leave of absence from the University for a maximum period of two semesters with the decision of the concerned administrative board based on obligations related to health, military service, education in an institution of higher education in Turkey or abroad, or financial and familial obligations.

(2) Students who wish to be granted a leave of absence must apply to the chair of the concerned department with a petition stating valid grounds for the request and the necessary documents latest by the end of the add-drop week of the related semester. However, no time restrictions exist for application in the event that the grounds for permission arise after the end of the add-drop week.

(3) The department chair sends the student's request for permission to the concerned administrative board along with their own opinion and the opinion of the student's academic advisor.

(4) The concerned administrative board sends their decision to the RO, which processes the decision and notifies the student and the concerned academic and administrative units.

(5) The academic status of the students whose leave periods have ended is evaluated by the RO within the framework of the related articles in this Regulation. Students who meet the registration requirements may register for the new semester on the dates stated in the academic calendar.

(6) Students who wish to return to University earlier than the termination of the leave period must apply with a petition to the concerned department chair before interactive registrations start. The application is resolved with the decision of the concerned administrative board upon the opinion of the student's advisor and recommendation of the department chair, and it is sent to the RO. The status of the student is evaluated within the framework of the related articles in this Regulation. Students who meet the registration requirements may register for the new semester on the dates stated in the academic calendar.

Withdrawal of registration

ARTICLE 40 – (1) Students who wish so may withdraw their registration by applying to the RO.

(2) Students who withdraw their registration or are dismissed on grounds of disciplinary action must follow the procedures for registration withdrawal specified by the university and fulfill their financial obligations

(tuition or education fee, dormitory fee, library debt, etc.) in order that they may receive their diplomas or their personal documents in the RO files.

(3) Students who withdraw their registration from an undergraduate program by receiving an Associate Degree Diploma or without meeting the graduation requirements forfeit all their rights in the university and may never register again in the program from which they have withdrawn in order to get an undergraduate degree.

Notifications

ARTICLE 41 – (1) All types of notification to students are sent to their postal address in the students' official records or to the e-mail addresses provided to them by the University.

(2) Students are obliged to follow the messages sent to their e-mail addresses provided by the University.

PART V
Miscellaneous and Final Issues

Northern Cyprus Campus
ARTICLE 42 – (1) The procedures and principles regarding the implementation of these rules and regulations to the graduate programs carried out at the Northern Cyprus Campus are determined by the Senate.

Invalidated Regulations
ARTICLE 43 – (1) The regulation entitled *Middle East Technical University Rules and Regulations Governing Undergraduate Studies* published in the Official Gazette no. 22013dated June 08, 1994 has been invalidated.

Articles Governing the Transition Period

TEMPORARY ARTICLE– (1) Students who started an undergraduate program before the 2012 – 2013 academic year and are deemed unsuccessful under the Articles 29 and 30 of the mentioned regulations here are subject to the provisions invalidated by the Article 43, only for once during the first and second semesters of the 2012 – 2013 academic year.

Validity
ARTICLE 44 – (1) This regulation is effective as of the date of its publication (Official Gazette no. 28387 dated August 17, 2012) and is to be implemented starting the beginning of the 2012-2013 academic year.
Implementation

ARTICLE 45 – (1) The provisions of this regulation are implemented by the President of Middle East Technical University.

(*) The changes in the regulation published in Official Gazette no.28882 dated January 1, 2014.

ACADEMIC RULES AND REGULATIONS GOVERNING GRADUATE STUDENTS

PART I
Aim, Scope, Basis and Definition of Terms

Aim

ARTICLE 1 – (1) The aim of this document is to regulate the procedures and principles regarding admissions and registration to the programs offered by the graduate schools of Middle East Technical University and the conduct of graduate education, examinations and assessment.

Scope

ARTICLE 2 – (1) This document comprises the regulations concerning admissions and registration to the graduate programs offered b Middle East Technical University and those governing the conduct of graduate education, examinations and assessment.

Basis

ARTICLE 3 – (1) This document has been drawn up based on article 14 of the Higher Education Act 2547 dated November 4, 1981.

Definition of Terms

ARTICLE 4 – (1) Wherever the following terms appear in this document, they shall be taken to refer to:

a) ALES: Academic Personnel and Graduate Education Exam,

b) Maximum duration: One year (two academic semesters) for academic deficiency programs, three years (six academic semesters) for Master's programs, six years (twelve academic semesters) for Doctoral programs, seven years (fourteen academic semesters) for Ph.D. on Bachelor's degree programs,

c) CEDS: Comprehensive Examination for Doctoral Students,

d) GSD: A department under a graduate school,

e) GS Chair: The chair of a department under a graduate school,

f) GS: Graduate schools affiliated to the university,

g) GMAT: The international *Graduate Management Admission Test*,

h) GRE: The international *Graduate Record Examinations*,

i) Concerned GSB: Graduate school boards of Middle East Technical University

j) Concerned GSAB: The graduate school administrative boards of Middle East Technical University,

k) EPE: Middle East Technical University School of Foreign Languages English Proficiency Exam,

l) Graduate program: Master's and Doctoral programs,

m) Program duration: One year (two academic semesters for academic deficiency programs, two years (four academic semesters) for Master's programs, four years (eight academic semesters) for Doctoral, five years (ten academic semesters) for Ph.D. on Bachelor's degree programs,

n) RO: The Directorate of Middle East Technical University Registrar's Office,

o) Academic staff: Faculty and instructors,

p) Faculty: Academic staff holding a title of Assistant Professor and higher,

q) President: The President of Middle East Technical University,

r) Senate: The Middle East Technical University Senate,

s) TAC: A thesis advisory committee,

t) International joint graduate program: A graduate program jointly conducted with an institution of higher education abroad,

u) IUC: Inter-university Council of Turkey,

v) University (METU): Middle East Technical University,

w) University Administrative Board: Middle East Technical University Administrative Board,

x) SFL: Middle East Technical University School of Foreign Languages

y) HEC: Higher Education Council.

PART II
Provisions Concerning the Conduct of Graduate Education

Medium of Instruction

ARTICLE 5 – (1) The medium of instruction in METU's graduate programs is English. Yet, courses that are to be conducted in Turkish or any other language are determined by the Senate.

(2) In order to apply to graduate programs, candidates have to document their proficiency in English. The candidates' English proficiency is assessed through EPE. Scores obtained from international language exams whose equivalences have been determined by the Senate may also be used to this end.

(3) English proficiency documentation is not required from nationals of countries whose official language is English and who have graduated from an English-medium institute of higher education.

(4) Candidates registered to a graduate program at METU for at least one semester within the past four semesters as of the date of their application to a graduate program are not required to document their proficiency in English provided that they hold the score determined by the GSD they are applying to.

(5) Graduate students who have discontinued their education for two consecutive academic years (four semesters) or more by obtaining a leave of absence or by failing to re-register are required to document their English proficiency through EPE or an equivalent exam recognized by the Senate so as to be able to re-register. However, this rule does not apply to students who document that they have studied for a minimum of one semester within the past four semesters and were successful at an English-medium institution of higher education within the country or abroad.

(6) The validity period of EPE scores and scores obtained from exams deemed equivalent by the Senate is two years as of the exam dates. This period of validity should not have been exceeded on the date of application to a graduate program. A document which is valid on the date of application will remain valid on the date of registration.

Period of education

ARTICLE 6 – (1) The normal and maximum periods of study for graduate programs are effective as described in the related articles of this regulation.

(2) All the semesters during which the students have been registered since they first enrolled in a graduate program or which have been spent unregistered due to failure to re-register are included in the normal, maximum and additional periods of study.

(3) The period spent in the academic deficiency program is not included in the maximum period of study of the program

(4) Semesters for which students have been granted a leave of absence by the concerned administrative board are not included in the normal, maximum and additional periods of study.

(5) Semesters which have been spent in institutions of higher education within the country or abroad as part of student exchange programs are included in the normal, maximum and additional periods of study.

Academic year

ARTICLE 7 – (1) One academic year comprises two semesters each of which is minimum sixteen weeks, including the period for final exams.

(2) Summer School may be offered within an academic year. The principles regarding the conduct of education in Summer School are determined by the Senate.

(3) The duration and dates of registration, courses, examinations and other similar activities within an academic year are indicated in the academic calendar.

(4) The weekly course schedules within a semester and during Summer School are prepared and announced by the concerned GSD chair in coordination with the RO.

(5) The courses to be offered during a semester and Summer School are specified by the concerned GSD chair and approved by the concerned administrative board. The sections, capacities and criteria of these courses are determined by the concerned GSD chair.

Graduate education

ARTICLE 8 – (1) Graduate education encompasses Masters with or

without a thesis, Doctoral and Ph.D. on Bachelor's degree programs.

(2) A graduate program is drawn up by the concerned GSD. It is offered after its recommendation to the Senate by the concerned GSB, its approval by the Senate and the issuance of consent by the HEC.

(3) The curriculum of a graduate program comprises studies such as course work, laboratory and applied work, workshops, studios, practicum, seminars and thesis work and the distribution of these throughout the academic years.

(4) The changes to the title and period of study of a graduate program are drawn up by the concerned GSD, and determined by the Senate following the recommendation of the concerned GSB.

(5) The amendments to the curriculum of a graduate program and the guidelines for the adjustment of students to these are arranged by the concerned GSD and set by the concerned GSB.

International joint-degree programs

ARTICLE 9 – (1) International joint-degree programs may be opened with institutions of higher education abroad.

(2) Education in such programs is carried out in accordance with the provisions of the Regulation published in the Official Gazette No. 26390 dated 28 December 2006 concerning The Establishment of Joint Educational Programs by Institutions of Higher Education with Designated Institutions of Higher Education Abroad.

Exchange students

ARTICLE 10 – (1) Exchange programs may be offered between METU campuses and institutions of higher education in the country or abroad within the framework of mutual agreements. The regulations governing these programs are determined by the Senate.

Special students

ARTICLE 11 – (1) Special students are students who are not registered to any program at METU, but who are expected to fulfill the requirements of the limited number of courses they are registered to. The regulations governing these programs are determined by the Senate.

Application and admission to graduate programs

ARTICLE 12 – (1) Student applications and admissions to graduate programs are carried out in accordance with the principles set by the Senate.

(2) At the end of each semester, each GSD recommends, to the GS they are affiliated to, the provisions regarding applications (EPE, ALES etc.) for the following semester. These recommendations are assessed and resolved by the concerned GSAB and are announced on the official website of the concerned GS and/or GSD.

(3) Applications to graduate programs are made to the concerned GS Directorates within the period announced in the academic calendar.

(4) Applicants to graduate programs are to fulfill all the requirements

specified and announced by the concerned GSD.

(5) Only the originals of the documents required for registration, or their approved copies upon presentation to the University are accepted. Applications with missing documents are taken into account. Regarding compulsory military service and judicial records, the application is processed based on the candidate's declaration. In case students who have earned the right for registration with false or misleading declarations and documents are detected, they will not be registered. If they have already been registered, the registration will be cancelled regardless of the semester they are in, all documents issued to them, including diplomas, will be declared null and void, and legal action will be taken against them. Those in this position are deemed not to have earned a student status and cannot enjoy any rights granted to students in the future.

(6) Candidates who have completed or are in their final semester of their undergraduate studies may apply to Masters' with or without thesis programs or to Ph.D. on Bachelor's degree programs, whereas candidates applying to Ph.D. programs are required to have completed or be in their final semester of their graduate studies

(7) In order to be eligible for application, candidates are to hold an ALES score determined by the GSD which is no lower than the base score specified in the Graduate Education Regulation of the IUC published in the Official Gazette no. 22683 dated July 07, 1996.

(8) A recent ALES score is not required from those who dropped out from any graduate program, but are applying to a program once again after a one-semester lapse, provided that they hold an ALES score which is no lower than that announced by the GSD they are applying to.

(9) Instead of an ALES score, candidates may submit a score obtained on an international exam (such as GRE or GMAT) whose equivalence has been announced by the concerned GSD. If conditions regarding the ALES score have not been announced by the concerned GSD, a score obtained on an international exam equivalent to the base ALES score as announced by the HEC may be submitted for application.

(10) The validity period of ALES scores or scores obtained on equivalent international exams is the period designated by the institution that owns the exam and is effective as of the date the candidate took the exam. The validity should not have expired on the date of application to a graduate program. A document which is valid on the date of application will remain valid on the date of registration.

(11) For admission to a graduate program, along with the fulfillment of the general provisions, the candidate should be deemed satisfactory in the scientific evaluation carried out by the concerned GSD. Scientific evaluation may be carried out through such methods as a written and/or oral examination and/or a output portfolio.

(12) Admission of students is determined by the concerned GSAB by

recommendation of the concerned GSD.

Special case student admissions

ARTICLE 13 – (1) The principles governing graduate program applications and admissions of candidates with foreign nationality and Turkish nationals who reside abroad are determined by the university Senate.

Student transfers between graduate programs

ARTICLE 14 – (1) Student transfers between graduate programs under the same GSD are made in accordance with the principles determined by the concerned GSB.

The academic deficiency program

ARTICLE 15 – (1) The academic deficiency program is a program aiming at correcting the academic deficiencies of students and enabling them to adjust to the program they have applied to.

(2) Academic deficiency students are to follow an academic deficiency program specified by the concerned GSD comprising prerequisite courses.

(3) An academic deficiency program lasts maximum one academic year (two semesters). This period is not included in the maximum duration of education for the concerned graduate program.

(4) The total amount of course credits in an academic deficiency program may not exceed 18 credits.

(5) An academic deficiency program must be drawn up at admission

to a graduate program and should include all the prerequisite courses specified for that program.

a) An academic deficiency program for graduate studies consists of undergraduate and/or graduate level courses. The credits of graduate courses may not exceed 1/3 of the total credits of courses taken in an

academic deficiency program. Such credits are not included in the course load of the concerned graduate program.

b) An academic deficiency program for doctoral studies consists of MA/MS level courses and these credits are not included in the course load of the concerned doctoral program.

c) During an academic deficiency program, students may enroll in graduate courses with NI status by recommendation of the concerned GSD and approval of the concerned GSAB.

(6) For students to be deemed successful in an academic deficiency program and start their graduate studies, they must earn at least the letter grade CC in the undergraduate and CB in graduate courses they have taken and complete the program with a Cumulative Grade Point Average of minimum 2.50.

(7) Academic deficiency students who are unsuccessful in the academic deficiency period may not continue with the academic deficiency program and may not start the related graduate program.

Initial Enrollment to a program

ARTICLE 16 – (1) The registration of students admitted to graduate programs are conducted by the RO within the period specified in the academic calendar.

(2) The requirements listed below should be fulfilled for the finalization of the enrollment of students admitted to graduate programs:

a) Holding an undergraduate diploma for those admitted to graduate or Ph.D. on Bachelor's degree programs and holding a Master's diploma for those admitted to doctoral programs.

b) For international students, not having a student visa problem.

c) Fulfilling the provisions regarding tuition and education fees.

d) Fulfilling other requirements announced by the University.

(3) Originals of documents required for registration or their copies approved by the University upon presentation of the originals are accepted. Regarding compulsory military service and judicial records, the application is processed based on the candidate's declaration. In case students who have earned the right for registration with false or misleading declarations and documents are detected, they will not be registered. If they have already been registered, the registration will be cancelled regardless of the semester they are in, all documents issued to them, including diplomas, will be declared null and void, and legal action will be taken against them. Those in this position are deemed not to have earned a student status and cannot enjoy any rights granted to students in the future.

(4) Students who have completed the registration procedures are provided with a student ID card. The ID cards contain personal information about students.

(5) Those who have not completed their registration within the announced period are deemed to have waived their student rights and thereafter cannot claim any of those rights.

Courses and course credits

ARTICLE 17 – (1) Courses within graduate programs are of two types: compulsory and elective. Compulsory courses are those that are defined in the curriculum and thus must be taken. Elective courses are those whose numbers, types and groups are defined in the curriculum and are selected by students.

(2) Course titles, codes, contents, credits, categories, prerequisites, co-requisites, midterm exams, final exams and other similar features and amendments to be made to these features are determined by recommendation of the concerned GSD and decision of the concerned GSB.

(3) A course which must be taken and successfully completed before a specific course might be taken is called a prerequisite course, whereas a course which must be taken simultaneously with another course during a semester is called the co-requisite course.

(4) The credit value of a course consists of all of its weekly theoretical course hours plus half the weekly hours of laboratory, workshop, studio,

practicum and other similar work related to that course.

(5) The weekly theoretical and practicum hours of non-credit courses like seminars, fields of specialization, term projects are specified; however, a credit value is not allocated for such courses.

Extra-curricular courses

ARTICLE 18 – (1) Extra-curricular courses are credit courses that do not exist in the graduate program a student is enrolled in, but which the student additionally takes.

a) Such courses are considered in the status NI (not included in the Grade Point Average).

b) The status of courses falling into the NI status cannot be altered after the registration procedures of the concerned semester are completed.

c) Courses falling into the NI status cannot be counted for the program or programs the student is enrolled in during the semester they are taken.

d) The status of courses not taken in the NI status cannot be rendered NI after the registration procedures of the concerned semester are completed.

e) A course taken in the NI status can only be repeated in the same status.

f) Courses taken in the NI status are not included in Grade Point Average calculations.

g) Courses taken in the NI status are indicated in the transcript along with the earned letter grade.

Semester registrations

ARTICLE 19 - (1) Each semester students must re-register on the online registration dates indicated in the academic calendar. However, students who enroll in a graduate program for the first time may also register in the add/drop week indicated in the academic calendar. Students who fail to register on the designated dates are deemed unregistered and may not enjoy the rights of registered students.

(2) Semester registration procedures consist of the following phases:

a) The student pays the tuition or education fee and fulfills any other financial obligation (dormitory fee, library fee, etc.) pertaining to previous years, if any.

b) The student registers for the new semester.

c) The student meets his/her advisor to obtain approval for the online semester registration.

(3) Students who have completed their semester registration during the online registration period may add or drop courses or change course sections during the add/drop period indicated in the academic calendar. Advisor approval is required in order for the changes to be valid.

(4) Students who have been granted an additional period in any phase of the graduate program must re-register for the additional period.

(5) Among students who fall into the unregistered status, those who wish to register for a semester must apply to the chair of the concerned GSD by stating and documenting a valid reason before the termination of the designated add/drop period for that semester. The student whose excuse is accepted by the concerned GSAB and who meets the requirements for the semester registration is re-registered by the RO.

(6) Students who fall into the unregistered status may register for ensuing semesters on dates indicated for the online registrations in the academic calendar. However, these students must submit a petition to the RO latest by the date online registrations start. The applications are processed through evaluation within the framework of the rules and regulations in this document in terms of English proficiency, ALES, maximum duration and adjustments to graduate programs.

(7) When students who have not registered consecutively for two semesters, or intermittently for three semesters or more in any phase of graduate programs re-register, their thesis topic and/or thesis supervisor will change by recommendation of the chair of the GSD and the approval of the concerned GSAB. The provisions under Part 6 of this Regulation apply for those whose maximum period has expired.

Course withdrawal

ARTICLE 20 - (1) Graduate students cannot withdraw from courses.

PART III
Examinations and Assessment

Attendance and examinations

ARTICLE 21 - (1) Students are to attend the courses, practical work, examinations and other academic studies as required by the instructors.

(2) The attendance records of students regarding courses, practical work and similar studies are monitored by the instructor.

(3) The contribution of student attendance to, if applicable, their eligibility to take mid-term and final examinations and their letter grade for the semester, the contribution of mid-term examinations, homework assignments, practical work and other similar studies for which the students are responsible to their letter grade for the semester, and if applicable, provisions for being eligible to take the final exam are determined by the instructor offering the course and all of these are announced to the students at the beginning of the semester.

(4) At least one interim assessment such as a written examination, a project submission, a homework submission, an oral presentation is carried out for each course. The dates of such assessments are announced by the concerned instructor within the first month of the semester.

(5) Students are informed of their semester standing for each course

by the concerned instructor. In issuing this information, the confidentiality regarding the personal information of students is protected.

(6) In each course, at least one end-of-the-term assessment such as a written examination, a project submission, a homework submission, an oral presentation is done in each course.

a) In courses for which a final exam is given, the date and hour are specified and announced by the RO upon obtaining the opinion of the concerned GSD.

b) Announced examination dates may be changed by the RO based on the recommendation of the concerned GSD provided that they are within the period of final examinations for that semester. This change is made before the period of final examinations for that semester starts.

(7) A make-up opportunity is given to students who have not participated in the required assessment of any course such as taking a written examination, submitting a project or homework or making an oral presentation provided that their excuse is deemed valid by the concerned instructor.

(8) If deemed necessary, courses and exams may be held after weekly working hours and/or on Saturdays and Sundays.

Assessment and grades

ARTICLE 22 - (1) Students are given a letter grade for each course at the end of the semester they are registered.

(2) This letter grade is at the discretion of the instructor offering the course.

(3) In determining the letter grade, the students' mid-term and final examination grades, their success in their studies within the semester and their attendance during course and practical work are taken into consideration.

(4) The coefficients of the letter grades and the score intervals used in the calculation of Grade Point Average are indicated below:

a)

Letter Grade	Coefficient	Score intervals
AA	4.00	90-l00
BA	3.50	85-89
BB	3.00	80-84
CB	2.50	75-79
CC	2.00	70-74
DC	1.50	65-69
DD	1.00	60-64
FD	0.50	50-59
FF	0.00	0-49
NA	0.00	*

b) The grade NA (not attended) is designated by the instructor to students who have not fulfilled the specified attendance requirements or the provisions regarding the course practices and who have not participated

in the assessments conducted within the semester. The grade NA is processed as FF in the calculation of Grade Point Average.

(5) Grades which are not included in the Grade Point Average are as follows:

a) The grade S (satisfactory) is designated to students who are successful in non-credit courses and/or thesis work.

b) The grade U (unsatisfactory) is designated to students who are not successful in non-credit courses and/or thesis work.

c) The grade P (progressing) is designated to students who are successfully carrying on their non-credit courses and/or thesis work.

ç) The grade EX (exempt) is designated to students who have been exempted from certain courses in the curriculum. Principles regarding exemptions are determined by the Senate.

d) The grade I (incomplete) is designated to students who are not able to complete the course requirements by the end of the semester or the summer school for a reason found valid by the course instructor. The grade "I" must be converted to a letter grade within a week from the last day of grade submissions for the semester or summer school. In special cases, however, this period may be extended latest until the date registrations start for the following semester, when it must be converted to a letter grade. These special procedures are conducted by recommendation of the chair of the GSD offering the course and the approval of the concerned GSAB. In case of failure to convert the grade "I" to a letter grade within the required period, the grade "I" will be automatically converted to the grade "FF" or "U". The dates concerning the letter grade "I" are indicated in the academic calendar.

Submitting and announcing grades and grade corrections

ARTICLE 23 – (1) Final grades for the semester are submitted by course instructors on the dates stated in the academic calendar.

(2) The grades are announced on the related Internet address to be opened to the access of students on the date indicated in the academic calendar.

(3) Any errors in grading are corrected with the approval of the concerned GSD chair upon the course instructor's application for correction within a week from the last day for the submission of semester or summer school final grades. In cases where this period is exceeded, the correction of errors must be made by recommendation of the chair of the GSD which offers the course and the approval of the concerned GSAB. The dates concerning grade corrections are indicated in the academic calendar.

Course success and course repeats

ARTICLE 24 – (1) Provisions regarding success in a course and repeating a course are as follows:

a) Students must earn a passing grade in a course to be considered successful. Grades AA, BA, BB and S are passing grades.

b) In Master's programs, CB and CC are "conditionally passing" grades. In doctoral programs, CB is "conditionally passing".

c) In Master's programs, the grades DC, DD, FD, FF, NA and U, and in doctoral programs the grades CC, DC, DD, FD, FF, NA and U are failing grades.

d) In the adjustment procedures for graduate programs, a "conditionally passing" grade is considered as "failing" and must be repeated.

e) Students who have failed in a course or have/could not enroll in a course indicated in the curriculum must take it the first semester it is offered. Courses within the framework of the curriculum and found appropriate by the advisor may replace elective courses that are to be repeated.

f) Students may repeat the course /courses in which they were successful in order to increase their Cumulative Grade Point Averages with the approval of the instructor offering the course. The grade earned in the repeated course is valid regardless of the previous grade.

Grade Point Averages

ARTICLE 25 – (1) Students' semester Grade Point Averages and their Cumulative Grade Point Averages are calculated at the end of each semester and their standing related to success is determined.

(2) The total credit points obtained from a course are calculated by

multiplying the credit value of the course and the coefficient corresponding to the letter grade earned from the course at the end of the semester.

(3) The Semester Grade Point Average is calculated through the division of the total credit points obtained from all the courses the student has taken in the concerned semester by the total credit values of those courses.

(4) The Cumulative Grade Point Average is calculated through the division of the total credit points obtained from all the courses the student has taken up to that time, the semester concerned inclusive, by the total credit values of those courses.

(5) The Grade Point Averages obtained in these calculations are expressed by rounding them off to the second digit after the decimal point. In rounding the numbers off, the second digit after decimal point does not change if the third digit is smaller than 5, but it increases by 0.01 if the third digit is 5 or greater.

Graduation requirements and dates

ARTICLE 26 – (1) The following requirements must be fulfilled in order to be eligible for graduation from a graduate program:

a) The success requirements indicated in the concerned provisions of this Regulation should have been fulfilled.

b) The registered final semester must be spent at METU, with the exception of international joint degree programs conducted in collaboration

with contracted universities abroad.

(2) The date of graduation from graduate programs is determined as follows:

a) In Master's programs with a thesis, the graduation date is the date on which the thesis examining committee convenes and the student defends the thesis and is successful.

b) In non-thesis Master's programs, the graduation date is the announcement date of the letter grades for the concerned semester or Summer School as indicated in the academic calendar. For those who graduate as a result of the correction of an erroneous grade, the conversion of the grade "I" to a letter grade, or by exercising the right for a make-up, the graduation date is the date on which the letter grade is finalized.

c) In doctoral programs, the graduation date is the date on which the thesis examining committee convenes and the student defends the thesis and is successful.

Re-sit examinations

ARTICLE 27 – (1) The principles regarding re-sit examinations are determined by the Senate.

Plagiarism

ARTICLE 28 – (1) The principles regarding the prevention of plagiarism in Master's and Doctoral theses are regulated by the concerned GS in accordance with the recommendations

of the METU Scientific Publications and Ethics Committee.

PART IV
Provisions Regarding Master's Programs

Aim and scope

ARTICLE 29– (1) Master's programs are conducted in two modes, namely, Master's programs with a thesis and non- thesis Master's programs.

(2) The aim of Master's programs with a thesis is to have students access knowledge through scientific research, evaluate and interpret this knowledge and convert this acquisition into an academic product in the form of a thesis.

(3) The aim of non-thesis Master's programs is to have students gain expert-level knowledge in the related field and the ability to use their existing knowledge in professional applications.

The duration of Master's programs with a thesis

ARTICLE 30 – (1) The normal duration of a Master's program with a thesis is two academic years (four semesters). Students who fulfill all the requirements indicated in this Regulation may graduate in a shorter period of time.

(2) The maximum duration of a Master's program with a thesis is three academic years (six semesters).

(3) In cases where the examining committee deems necessary, students whose work is found insufficient during their thesis defense may be granted an additional three months to enable them to complete their thesis work.

Course loads and success in Master's programs with a thesis

ARTICLE 31 – (1) The phases of a Master's program with a thesis consist of at least seven credit courses with a cumulative total of twenty-one credits, one seminar course, thesis work and the defense of the thesis before of an examining committee.

(2) In Master's programs with a thesis, courses coded 3XX and 4XX may be taken provided that they were not taken during undergraduate education. However, only two of these courses may be counted in the course load of the program.

(3) Master's programs with a thesis must be successfully completed with a Cumulative Grade Point Average of at least3.00 inmaximum two academic years (four semesters).

Master's thesis supervisor

ARTICLE 32 – (1) The thesis supervisor is assigned by recommendation of the concerned GSD and approval of GSAB latest by the end of the second semester.

(2) The thesis supervisor is selected from full-time METU faculty holding a Doctoral degree.

(3) In cases where the nature of the thesis work calls for more than one supervisor, a second supervisor may be assigned as co-supervisor by recommendation of the concerned GSD chair and approval of GSAB.

(4) The co-supervisor must hold at least a Master's degree.

(5) Provisions concerning the assignment and replacement of a supervisor or a co-supervisor are determined by the concerned GSB.

Preparation and finalization of a Master's thesis

ARTICLE 33 – (1) The Master's thesis comprises the phases of thesis work, and following this, its defense before of an examining committee.

(2) Each semester, the student must register for the thesis work and the related courses as of the beginning of the semester following the assignment of the thesis supervisor.

(3) Students who receive the letter grade "U" twice consecutively, or three times intermittently in their thesis work or related courses within the maximum duration are deemed unsuccessful and become subject to the relevant provisions under Part 6 of this Regulation.

(4) Students are expected to successfully complete their thesis work within the maximum duration.

(5) The student whose thesis work has been approved as successfully completed by the thesis supervisor must put her/his findings in English on paper in accordance with the principles indicated in the METU Thesis Manual. The provisions regarding thesis defense are as follows:

a) The student who has completed her/his thesis applies to the chair of the GSD for the thesis defense. The chair of the GSD sends a copy of the unbound thesis and the list of recommended examining committee members to the concerned GS. For each semester, the latest date on which students may defend their thesis is indicated in the academic calendar.

b) The thesis examining committee is appointed by recommendation of the GSD chair and the decision of the concerned GSAB. The examining committee is composed of three or five members, one being the thesis supervisor of the student. In addition to the thesis supervisor, at least one committee member should be from the same GSD. At least one of the committee members should be from a different GDS of the University, a member of academic staff from another university, or a specialist holding at least a Master's degree in the related field. If the examining committee is composed of three members, the co-supervisor cannot be a member of the committee.

c) The examining committee members convene within one month as of the date they receive the thesis to have the student defend the thesis. The thesis defense, which must be conducted in English, is open to an audience and comprises the presentation of the thesis work and the consecutive question and answer session.

d) The date on which the thesis defense is to take place is announced on the official Web page of the concerned GSD.

(6) After the thesis defense is completed, the examining committee decides in the absence of the audience and in absolute majority, whether the result is "approval", "revision" or "refusal". The concerned GS is notified of the decision of the examining committee latest within three days with an official exam report.

(7) Students who are asked to review their theses after the defense may be given an extension of maximum three months by the examining committee. The student makes the required revisions and defends the thesis once again before the same examining committee. At the end of this period, students who fail to stand before the committee for a defense, or whose thesis is not approved after the defense are deemed unsuccessful. The thesis topic and/or thesis supervisor of student in the maximum period of study change(s).

(8) Students who fail to stand for the defense of their thesis before the maximum duration expires are deemed unsuccessful. An additional period is not granted to such students and they become subject to the provisions under Part 6 of this Regulation.

(9) Within one month from the date of the defense, the student found successful in her/his thesis defense must submit to the concerned GS directorate, at least three bound copies of the thesis found appropriate as per format by the concerned GS, and signed by the examining committee and the GSD chair.

(10) A student whose official thesis report has been submitted to the RO after being signed by the concerned GS director is entitled to a Master's degree.

The duration of a non-thesis Master's program

ARTICLE 34 – (1) The maximum duration of a non-thesis Master's program is three academic years (six semesters). Students who fulfill all the requirements indicated in this Regulation may graduate in a shorter period of time.

Course loads and success in non-thesis Master's programs

ARTICLE 35 – (1) A non-thesis Master's program consists of at least ten courses with a total of thirty credits, and a Semester Project course.

(2) The student must register for the semester project in the semester indicated by the concerned GSD and submit a written report at the end of that semester.

(3) In non-thesis Master's programs, courses coded 3XX and 4XX may be taken provided that they were not taken during undergraduate education. However, only two of these courses may be counted in the course load of the program.

(4) Non-thesis Master's programs must be successfully completed with a Cumulative Grade Point Average of at least3.00 inmaximum three academic years (six semesters). A student who is successful is entitled to a Master's degree without thesis.

(5) Students who are not able to complete their studies at the end of this period or whose Cumulative Grade Point Averages are below 3.00 are deemed unsuccessful and they become subject to the relevant provisions under Part 6 of this Regulation.

PART V
Provisions Regarding Doctoral Programs

Aim and scope

ARTICLE 36 – (1) The aim of Ph.D. programs is to equip students with the skills of doing independent research, interpreting scientific phenomena with broad and in-depth analysis and determining the necessary steps that will lead to new syntheses. The authentic thesis to be prepared following doctoral work must bear at least one of the qualities below:

a) Introducing innovation to science by generating new knowledge.

b) Developing a new method of scientific research and applying this.

c) Developing a new application of a well-known method and applying this.

The duration of a Ph.D. program

ARTICLE 37 – (1) The normal duration of a Ph.D. program for students who hold a Master's degree is four academic years (eight semesters), whereas for students who are admitted to the program with an undergraduate degree, it is five academic years (ten semesters). Students who fulfill all the requirements indicated in this Regulation may graduate in a shorter period of time.

(2) The maximum duration of a Ph.D. program for students who hold a Master's degree is six academic years, whereas for students who are admitted to the program with an undergraduate degree, it is nine academic years.

(3) In cases where the examining committee deems necessary, students whose work is found unsatisfactory during their doctoral thesis defense may be granted an additional six months to enable them to complete their thesis work.

Course loads and success in Ph.D. programs

ARTICLE 38 – (1) A Ph.D. program consists of the phases of at least seven credit courses with a cumulative total of twenty-one credits, non-credit courses as required by the program, the doctoral comprehensive examination, the thesis proposal, thesis work, and the defense of the thesis before of an examining committee.

(2) The phases of Ph.D. on Bachelor's degree programs consist of at least fourteen credit courses with a cumulative total of forty-two credits, one seminar course, the doctoral comprehensive examination, the thesis proposal, thesis work, and the defense of the thesis before of an examining committee.

(3) In Ph.D. on Bachelor's degree programs, courses coded 3XX and 4XX may be taken provided that they were not taken during undergraduate education. However, only two of these courses may be counted in the course load of the program.

(4) Courses in Ph.D. programs must be successfully completed in maximum two academic years, and those in Ph.D. on Bachelor's degree programs in maximum three academic years, both with a Cumulative Grade Point Average of at least 3.00.

(5) Students who are not able to complete their studies at the end of the four semesters or whose Cumulative Grade Point Averages are below 3.00 are deemed unsuccessful and they may not sit the doctoral comprehensive examination. However, it is possible to sit the doctoral comprehensive examination without successfully completing all the courses in the program with the decision of the concerned GSB by request of the concerned GSD chair, on condition that the Cumulative Grade Point Average is higher than 3.00.

Ph.D. thesis supervisor

ARTICLE 39 – (1) The thesis supervisor is assigned by recommendation of the concerned GSD and approval of GSAB latest by the end of the second semester.

(2) The thesis supervisor is selected from full-time METU faculty holding a Doctoral degree.

(3) In cases where the nature of the thesis work calls for more than one supervisor, a second supervisor may be assigned as co-supervisor by recommendation of the concerned GSD chair and approval of GSAB.

(4) The co-supervisor must hold at least a doctoral degree.

(5) Provisions concerning the assignment and replacement of a supervisor or a co-supervisor are determined by the concerned GSB.

The doctoral comprehensive examination

ARTICLE 40 – (1) The doctoral comprehensive examination (DCE) is administered twice a year, in May and November. The names of applicants for the DCE are submitted by the chair of the GSD to the concerned GS.

(2) Comprehensive examinations are arranged and administered by a Doctoral Comprehensive Board of five faculty members from the concerned GSD who are assigned for a three-year term by recommendation of the chair of the GSD and approval of the concerned GSAB. This board forms examining committees which comprise three or five members, one of whom is the student's thesis supervisor. The function of the examining committees is to prepare exams in varied fields, and administer and evaluate these exams. An examining committee member must hold a doctoral degree.

(3) The DCE consists of written and oral examinations that will assess the students' competence in the related field and their disposition towards research. The DCE is conducted in English in its entirety.

(4) PhD program students must exercise their first right to sit the DCE in the semester following the one they have sucessfully completed the courses in the program.

(5) Students who fail their first exam re-sit the exam in the ensuing semester.

(6) Students who fail to sit any phase of the DCE are considered to have exercised their right to take that exam and are deemed unsuccessful in that phase.

(7) The Doctoral Comprehensive Board decides, in absolute majority, whether a student is to be deemed "successful", "provisionally successful" or "unsuccessful" by evaluating the results of the written component in conjunction with the results of the oral component. The concerned GS is notified of this decision latest within three days in an official report.

(8) The Doctoral Comprehensive Board may require a student who is successful in the DCE to take a course / courses additional to those taken even if the course load requirements have been fulfilled. The student must earn the letter grade BB minimum in the additional credit courses which are taken in NI status.

(9) Students who exercise their DCE rights but are unsuccessful may not defend their thesis proposals.

The thesis advisory committee (TAC)

ARTICLE 41 – (1) A TAC is assigned, within one month, to a student who is successful in the DCE by recommendation of the chair of the GSD and approval of the concerned GSAB so as to approve the student's doctoral thesis proposal and to monitor the course of the thesis work in ensuing semesters.

(2) The TAC is composed of three members, one being the thesis supervisor of the student and at least one being from another GS within the University or from outside the University.

(3) The TAC members may be replaced by recommendation of the chair of the GSD and approval of the concerned GSAB.

(4) The first TAC meeting is held within six months after the date of their assignment.

(5) The TAC convenes twice a year, once between January and June and once between July and December.

(6) The co-supervisor may participate in the TAC meetings but is not a member.

(7) The student submits a written report to the TAC members at least fifteen days prior to their meeting date. In this report, a summary of the work covered thus far and the work plan for the next semester are given.

(8) The letter grade for the student's thesis work is determined as P or U by the TAC.

Defense of the thesis proposal

ARTICLE 42 - (1) During the first TAC meeting, the student orally defends her/his thesis proposal which comprises the purpose of the thesis work, the research method and the future work plan in English.

(2) The TAC decides, with absolute majority, to "approve" or "reject" the presented thesis proposal. The concerned GS is notified of this decision by the chair of the GSD latest within three days after the thesis proposal in an official report.

(3) Students who fail to attend the thesis proposal defense session, or whose thesis proposals are rejected, defend their proposal once again latest within the ensuing six months. In case of failure to attend the thesis proposal defense session, or rejection of the thesis proposal a second time, the students' thesis topics and/or supervisors change.

Preparation and finalization of a Doctoral thesis

ARTICLE 43 – (1) The Doctoral thesis comprises the phases of thesis work, and following this, its defense before of an examining committee.

(2) As of the beginning of the semester following the assignment of the thesis supervisor, the student must register for the thesis work and the related courses each semester.

(3) The student whose thesis proposal has been accepted starts research on her/his thesis topic under the supervision of the thesis supervisor and, if applicable, the thesis co-supervisor.

(4) Students who receive the letter grade "U" twice consecutively, or three times intermittently in their thesis work or related courses within the maximum duration are deemed unsuccessful and their thesis topics and/or supervisors change.

(5) The student whose thesis work has been approved as completed by the thesis supervisor must put her/his findings on paper in accordance with the principles indicated in the METU Thesis Manual. The regulations regarding the thesis defense are as follows:

a) The student who has completed her/his thesis applies to the chair of the GSD, which in turn, sends a copy of the unbound thesis and the list of recommended examining committee members to the concerned GS. The latest date on which students may defend their thesis for each semester is indicated in the academic calendar. In order to defend the thesis, the student should have successfully completed all the courses in the program.

b) The thesis examining committee is appointed by recommendation of the GSD chair and the decision of the concerned GSD chair. The committee is composed five members of faculty including those in the TAC. At least one member must be from a different institution of higher education and one from the same GSD as the thesis supervisor. The co-supervisor may not be a member of the examining committee.

c) The examining committee members convene within one month as of the date they receive the thesis so as to have the student defend the thesis. The thesis defense, which must be conducted in English and shall comprise the presentation of the thesis work and a consecutive question and answer session, is open to an audience.

d) The date on which the thesis defense is to take place is announced on the official Internet page of the concerned GSD and GS.

(6) After the thesis defense is completed, the examining committee decides in the absence of the audience and in absolute majority, whether the result is "approval", "revision" or "rejection". The concerned GS is notified of the decision of the examining committee with an official thesis report latest within three days of the defense by the chair of the GSD.

(7) Students who are asked to review their theses after the defense may be given an extension of maximum six months by the examining committee. The student makes the required revisions and defends the thesis once again before the same examining committee. Students who fail to stand before the committee for a defense, or

whose thesis is not approved after this defense are deemed unsuccessful. The thesis topic and/or supervisor of students whose maximum period of study has not expired change.

(8) Students who are unsuccessful and whose theses are rejected become subject to the provisions under Part 6 of this Regulation.

(9) Students who fail to stand for the defense of their thesis before the maximum duration terminates are deemed unsuccessful and become subject to the provisions under Part 6 of this Regulation.

(10) The student found successful in her/his thesis defense must submit, to the concerned GS directorate, maximum three bound copies of the thesis found appropriate as per format by the concerned GS, and signed by the examining committee and the GSD chair, within one month as of the date of the defense.

(11) A student whose official thesis report has been submitted to the RO after being signed by the concerned GS director is entitled to a Doctoral degree.

PART VI
Adjustment Procedures Applicable

Upon Expiry Of The Maximum Duration Of Education

Master's programs with a thesis

ARTICLE 44 – (1) In Master's programs with a thesis, the following procedures are applicable for students who have failed to complete their courses in six academic, whose cumulative grade point averages are below 3.00, who have failed to stand before the committee for the defense of their thesis, or who have been deemed unsuccessful in their defense.

a) The student's maximum duration is reinitiated.

b) The courses in which the student was successful in the past, but must re-take due to amendments in the curriculum, changes in course content without a change in the name of the course, or a long time lapse despite no changes in course content are determined by the chair of the GSD. The semester(s) considered spent in the maximum duration are calculated according to the number of courses counted in the program and these semesters are deducted from the student's reinitiated maximum duration. In this calculation, the number of courses that corresponds to one semester is specified by the concerned GSAB.

c) Courses in the categories fail or conditionally pass are repeated.

d) The thesis topic of the student changes.

e) The student may be required to take new courses, or repeat those in which she/he was successful previously by recommendation of the concerned GSD and approval of the concerned GSAB.

f) On condition that the student has fulfilled the course credit load, a written project and similar requirements of the non-thesis Master's program, the student may be entitled to a non-thesis Master's diploma upon her/his request and the approval of the concerned GSAB, and thus, her/his contact with the program is terminated.

g) The recommendation regarding the adjustment of a student is finalized with the decision of the concerned GSAB.

(2) Students deemed provisionally successful in their thesis defense after the three-month extension may receive an additional three-month extension based on a report of the examining committee justifying the situation. Those who are deemed unsuccessful at the end of this period are subject to the adjustment procedures.

(3) The thesis supervisor and/or thesis topic of a student change(s) if she/he receives the letter grade U twice consecutively or three times intermittently in thesis related courses.

(4) In case of failure, the procedure is repeated.

Non-thesis Master's programs

ARTICLE 45 - (1) In non-thesis Master's programs, students who have failed to complete their courses in the maximum duration, or whose cumulative grade point averages are below 3.00 are re-adjusted to the program and the following procedures apply:

a) The student's maximum duration is reinitiated.

b) The courses in which the student was successful in the past, but must re-take due to amendments in the curriculum, changes in course content without a change in the name of the course, or a long time lapse despite no changes in course content are determined by the chair of the GSD. The semester(s) considered spent in the maximum duration are calculated according to the number of courses counted in the program and these semesters are deducted from the student's reinitiated maximum duration. In this calculation, the number of courses that corresponds to one semester is specified by the concerned GSAB.

c) Courses in the categories fail or conditionally pass are repeated.

d) The project topic of the student may be changed and the student may be required to take new courses, or repeat those in which she/he was successful previously by recommendation of the concerned GSD and approval of the concerned GSAB.

(e) In case of failure, the procedure is repeated.

Doctoral programs

ARTICLE 46 – 1) In Doctoral programs, the following procedures are applicable for students who have failed to complete their courses within the maximum duration, whose cumulative grade point averages are below 3.00, who have failed the DCE, or to stand before the examining committee for the defense of their thesis, or who have been deemed unsuccessful in their defense:

a) The student's maximum duration is reinitiated.

b) The courses in which the student was successful in the past, but must re-take due to amendments in the curriculum, changes in course content without a change in the name of the course, or a long time lapse despite no changes in course content are determined by the chair of the GSD. The semester(s) considered spent in the maximum duration are calculated according to the number of courses counted in the program and these semesters are deducted from the student's reinitiated maximum duration. In this calculation, the number of courses that corresponds to one semester is specified by the concerned GSAB.

c) Courses in the categories fail or conditionally pass are repeated.

d) The thesis topic of the student changes. This student has to defend the new thesis.

e) The student may be required to take new courses, or repeat those in which she/he was successful previously and re-sit the DCE by recommendation of the concerned GSD and approval of the concerned GSAB.

f) A student admitted to a Doctoral program with an undergraduate diploma and unsuccessful in the thesis phase may be entitled to a non-thesis Master's diploma upon her/his request and the approval of the concerned GSAB, and thus, her/his contact with the program is terminated.

g) The recommendation regarding the adjustment of a student is finalized with the decision of the concerned GSAB

(2) Students deemed provisionally successful in their thesis defense after the six-month extension may receive an additional six-month extension based on a report of the examining committee justifying the situation. Those who are deemed unsuccessful at the end of this period are subject to the adjustment procedures.

(3) The thesis supervisor and/or thesis topic of a student change(s) if she/he receives the letter grade U twice consecutively or three times intermittently in thesis related courses.

(4) In case of failure, the procedure is repeated.

PART VII
Diplomas and Documents, Academic Advisors, Disciplinary Procedures, Student Grants, Health Services, Tuitions and Other Fees, Leaves of Absence, Withdrawal of Registration and Student Notifications

Diplomas and documents

ARTICLE 47 – (1) Diplomas, certificates awarded and other documents issued to students and alumni, and the provisions regarding the issuance of these are as follows:

a) Master's with a Thesis Diploma: This diploma is awarded to those who meet the graduation requirements of a Master's program with a thesis.

b) Master's without a Thesis Diploma: This diploma is awarded to those who meet the graduation requirements of a Master's program without a thesis.

c) Ph.D. Diploma: This diploma is awarded to those who meet the graduation requirements of a Doctoral program or a Ph.D. on Bachelor's degree program.

d) Provisional Certificate of Graduation: This document is issued only once as a substitute for a diploma to students who are deemed eligible for graduation, and it is valid until the date of the commencement ceremony of the academic year concerned.

e) Diploma Supplement: This is a document accompanying diplomas which aims at the international recognition of the academic and professional competences of its holder.

d) Transcript: This document is a complete official record of the courses taken each semester, their credits values and the grades earned, the grade point averages for the concerned semesters, the cumulative grade point averages and the standing of a student starting from the student's admission to the university.

e) Student Certificate: This is a document which shows the University registration status of a student.

(2) Diplomas, certificates and other such documents are signed by the below-mentioned authorities:

a) Diplomas are signed by the President, the concerned GS director and the chair of the GSD.

b) Provisional certificate of graduation is signed by the concerned GS director, the chair of the GSD and authorized RO staff.

c) The diploma supplement, transcript and student certificate are signed by authorized RO staff.

(3) The name of the graduate school, the graduate school department, and/or if applicable, the program the student enrolled are indicated on diplomas and documents.

(4) The format, size and information to be written on diplomas are specified by the Senate.

(5) In the event of the loss of a diploma, a replacement copy is issued, once only. The replacement copy bears the notation “second copy”.

(6) In the event of a change in the name and/or surname of the graduate after the graduation date, replacement copies of diplomas and/or certificates are not issued, nor is the information on them changed.

Academic advisors

ARTICLE 48 – (1) Chairs of each GSD assign an academic advisor from among full-time faculty to each student admitted to a graduate program

(2) The duties/responsibilities of the academic advisors are stated below:

a) They inform students about the courses they are to take each semester and provide guidance in choosing them.

b) They approve semester registrations after evaluating the courses to be taken with the student according to her/his academic standing.

c) They provide information and guidance to the student in adapting to university life, professional development and career choices.

Disciplinary procedures

ARTICLE 49 – (1) The disciplinary procedures regarding students are carried out in accordance with the provisions of the Rules and Regulations Governing the Disciplinary Procedures in Institutions of Higher Education published in the Official Gazette No. 28388 dated 18 August 2012.

Student grants

ARTICLE 50 – (1) The provisions governing the distribution of student grants and aids obtained from various sources are determined by the Senate.

Health services

ARTICLE 51 – (1) The provisions governing the health services offered to students are determined by the Senate.

Tuitions and other fees

ARTICLE 52 – (1) Tuitions, education fees other fees are determined by the University Administrative Board within the framework of the Council of Ministers decree.

Leaves of absence

ARTICLE 53 – (1) Students may be granted a leave of absence from the University for a maximum period of two semesters with the decision of the concerned GSAB based on obligations related to health, military service, education in an institution of higher education in Turkey or abroad, or financial and familial obligations. In obligatory cases, this period can be extended by the concerned GSAB.

(2) Students who wish to be granted a leave of absence must apply to the concerned GSD chair with a petition stating valid grounds for the request and the necessary documents latest by the end of the add-drop week of the related semester. The GSD chair submits the student’s leave of absence request to the concerned GSAB

along with the views of both student's academic advisor/thesis supervisor and the GSD chair. Excluding unexpected circumstances, applications made after the add-drop week are not processed.

(3) The decision of GSAB is sent to the RO, which processes the decision and notifies the student and the concerned academic and administrative units.

(4) The academic status of the students whose leave periods have ended is evaluated by the RO within the framework of the related articles in this Regulation. Students who meet the registration requirements may register for the new semester on the dates stated in the academic calendar.

(5) Students who wish to return to University earlier than the termination of the leave period must apply with a petition to the concerned GSD chair before interactive registrations start. After the application is evaluated by the student's academic advisor/thesis supervisor, the GSD chair and the GS directorate, it is sent to the RO. The status of the student is evaluated within the framework of the related articles in this Regulation. Students who meet the registration requirements may register for the new semester on the dates stated in the academic calendar.

Withdrawal of registration

ARTICLE 54 – (1) Students who wish so may withdraw their registration by applying to the RO.

(2) Students who withdraw their registration or are dismissed on grounds of disciplinary action must follow the procedures for registration withdrawal specified by the university and fulfill their financial obligations (tuition or education fee, dormitory fee, library debt, etc.) in order that they may receive their diplomas or their personal documents in the RO files.

(3) Students who have withdrawn their registration but wish to return to University may re-apply to the related program. This application is evaluated by the concerned GSD chair within the framework of the provisions for application and admission to programs.

Notifications

ARTICLE 55 – (1) All types of notification to students are sent to their postal address in the students' official records or to the e-mail addresses provided to them by the University.

(2) Students are obliged to follow the messages sent to their e-mail addresses provided by the University.

PART VIII
Miscellaneous and Final Provisions

Northern Cyprus Campus

ARTICLE 56 – (1) The procedures and principles regarding the implementation of these rules and regulations to the graduate programs carried out at the Northern Cyprus Campus are determined by the Senate.

Invalidated regulation

ARTICLE 57 – (1) The regulation entitled *Middle East Technical University Rules and Regulations Governing Undergraduate Studies* published in the Official Gazette no. 28457 dated November 04, 2012 has been invalidated.

Articles Governing the Transition Period

Validity

ARTICLE 58 – (1) This regulation is effective as of the date of its publication (Official Gazette no. 28907 dated February 08, 2014).

Implementation

ARTICLE 59– (1) The provisions of this regulation are implemented by the President of Middle East Technical University.

SCHOOL OF FOREIGN LANGUAGES

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DİNO, Naz; Instructor ***(Associate Director)***: B.Arch., M.Arch., METU; Dipl. R.S.A.-D.O.T.E.
ÖTKÜR, Ayşem Şebnem; Instructor ***(Associate Director)***: B.A., M.A, METU.

The School of Foreign Languages (SFL) provides students studying at METU with English language education at international standards by coordinating and monitoring the academic work in its departments, namely DBE (Department of Basic English) and DML (Department of Modern Languages). The primary goal of the SFL is to enable the students at METU, where the medium of instruction is English, to follow their departmental courses, to access and effectively use all kinds of resources related to their academic studies and to use English in their professional lives by communicating in written and oral contexts. The SFL also aims at equipping each METU student with language skills that will enable him/her to carry out similar tasks in other foreign languages. Additionally, SFL contributes to the quality of English teaching and learning in the whole country by offering language courses of high standards to the community.

Within the framework above, the SFL is also responsible for:

I) preparing and administering the METU English Language Proficiency Exam, through which undergraduate and graduate students who are to be newly admitted to METU, students who want to transfer to METU from other universities, and special students who want to take courses at METU can demonstrate their proficiency in English. The METU English Language Proficiency Exam is administered three times each year.

II) enabling the smooth operation of the Academic Writing Centre, which provides free consulting services to graduate students and the METU faculty through face-to-face tutorials. The mission of the Academic Writing Centre is to help individuals improve their writing skills and critical thinking skills and thus become more confident and effective writers.

III) offering courses of high standards to the public and private sectors.

Among these courses are:

a. the SFL Foreign Language Certificate Program, which is a special intensive program designed with
the purpose of improving the English language proficiency levels of university graduates in Turkey,

b. weekend language courses offered to the public,

c. language training programs specifically designed for institutions upon request.

IV) preparing test batteries for private and public institutions and operating as a TOEFL IBT Test Center,

V) offering Language Teacher Training Programs.

DEPARTMENT OF BASIC ENGLISH

GENERAL STATEMENT AND PROGRAMS OF STUDY

The Department of Basic English provides basic academic English education for METU students whose level of English is below the proficiency level required of freshman students. It aims to bring the students' English proficiency level to a degree that will enable them to follow and fulfill the requirements of the first-year courses as well as to prepare them for the social and academic environment at the university.

The program at the Department of Basic English is designed so as to emphasize the language and academic skills that will be required of the students during their first year courses. These skills comprise reading and listening for different purposes, note-taking, writing short texts as required by various departments and speaking. These skills are practiced in a meaningful academic context with grammar and vocabulary input being provided so as to enable the students to expand their knowledge of the language while mastering academic skills.

The Department of Basic English also offers self-study opportunities to assist students in becoming autonomous learners. With its library, computer and audio-visual laboratories, silent study room, and its popular website, the Self-Access Center creates opportunities for students to improve their various language skills.

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DESCRIPTION OF COURSES

The students' performance in the Proficiency or Placement exam determines the course that they will take during the first semester. The course that they will take during the second semester depends on how well they complete the requirements of their first semester course. Students whose in-semester achievement grade is borderline are given the Achievement Test at the end of the first semester and are placed in the appropriate group according to their performance on this test.

DBE 101 Beginner Level
The 300 hours of this 400-hour course is designed to equip students with the basic language and vocabulary required for them to practice academic skills. The remaining contact hours are dedicated to introducing students to reading, listening, writing and speaking for academic purposes.

DBE 102 Pre-Intermediate Level
This second semester 550-hour course, which is designed as the continuation of the DBE 101 course, aims to bring the students to a level that will enable them to fulfill the requirements of their first-year courses. The focus is primarily on practicing academic skills. Further language and vocabulary reinforcement is provided through exposure to academic texts, both written and spoken.

DBE 201 Elementary Level
This 320-hour course is designed to provide students with 150 hours of initial language and vocabulary input followed by a 170-hour practice in reading, listening, writing and speaking for academic purposes.

DBE 202 Intermediate Level
This 320-hour course is the follow-up to the DBE 201 course. The aim is to provide students with further language practice through exposure to advanced-level spoken and written texts. The course is designed so that there is ample opportunity for the students to further practice in an integrated way the academic skills that they will need in order to fulfill the requirements of their first-year courses.

DBE 301 Intermediate Level
In this 320-hour course, the academic skills that will be required during the first-year courses are introduced. These skills include reading for academic purposes, listening and note-taking, writing short texts based on the information from their readings and listening input, as well as speaking. While practicing these skills, the students are also provided with the opportunity to expand their knowledge of language use and vocabulary.

DBE 302 Upper-Intermediate Level
This 240-hour course, which is the continuation of the DBE 301 course, aims at bringing the students to the proficiency level required by the departments. The primary objective of this course is to enable students to purposefully use the language through skill integration. Language and vocabulary are treated as a means to extract meaning and facilitate task completion.

DBE 401 Upper-Intermediate Level
This 240-hour course is designed to cater for the needs of upper-intermediate level students, whose proficiency level is only slightly below the level required by the university. The aim of this course is to provide students with meaningful language practice through the use of the four skills.

DBE 402 Advanced
This 240 hour course, which is the continuation of the DBE 401 course, aims to perfect the skills and language necessary to practice academic skills at their faculties.

DBE 601-602 Repeat
This level is designed for students in their second year at the DBE and focuses on revising their prior knowledge as well as improving their reading, writing, listening and speaking skills.

DEPARTMENT OF MODERN LANGUAGES

INSTRUCTORS

AKALAN, Pelin: B.A., Ankara University.
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AKMAN, Sevda: B.A., METU.
ALGAN, Serkan: B.A., Ege University, M.A., Southern Illinois University
ALPTOĞAN, Sumru: B.A., Boğaziçi University.
ARSLAN, Berna: B.A., M.A., Ankara University.
ATASEVER, Reyhan: B.A., M.A. METU.
AYAN, Didem: B.A., Hacettepe University, M.A., METU
AYDIN, Murat: B.A., METU, M.A., Katholieke Universiteit Belgium
AYKEN, E. Serra: B.A., Ankara University, M.A., METU
AYYILDIZ Sönmez Gülhan:B.A. Hacattepe University.
BALBAY, Seher: B.A., M.A., METU.
BAŞARAN, Filiz: B.A., Hacettepe University
BÜR, Sinem: B.A., METU., M.A., Bilkent University.
ÇANGA, Derem: B.A.,M.A., METU.
ÇAVUŞOĞLU, Cahide E.: B.A., METU; M.A., Çukurova University.
DEMİROK, Nilgün Nur: B.A., Ankara University, M.A., Gazi University, M.A., Keele University, Ph.D., Stirling University
DİLMEN, Tuğba: B.A. Ankara University.
DOĞAN, Buket: B.A.,M.A., METU.
DUZAN, Canan ***(Vice Chair)***: B.A., M.A., METU.
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ERDEM, H. Esin: B.A., Hacettepe University. M.A., Bilkent University. Ph.D. METU.
ERGENEKON, Begümşen: B.S., METU; Cand. Polit., University of Bergen.
ERGİN, Sezar Erkin: B.S., METU.
ERGÜVEN ORHAN, Tamay: B.A., METU., MSc. METU.
ETİZ, Filiz: B.A., Hacettepe University; B.A., Ankara University; M.A., METU.
FIRAT Arzu: B.A.Hacettepe University.
GACAN, Pınar: B.A., METU.
GRAVES, Aylin: B.A., Hacettepe University, M.A., METU.
GÜLCÜ ÖZDÖKMECİ, Meriç: B.A., Hacettepe University, M.A. METU
GÜLEN, Gonca: B.A., METU.
GÜLENER, Aslı: B.A., İstanbul University, M.A., Leicester University.
GÜNTEK, Duygu: B.A., M.A., METU.
GÜNEŞER GÖÇMEN, Seyhan : B.A., M.A., Çukurova University.
HASANBAŞOĞLU, Burçin: B.A., METU., M.A. Bilkent University.
SUBAŞI, Meltem: B.A., M.A. METU.
İYİDOĞAN, Figen ***(Department Chair)****:* B.A., METU (ELT), B.A., Ankara University (Russian), M.A. Bilkent University
İZGÖREN, A. Meltem : B.A., M.A., METU.
KARADAĞ ÖTKÜR, Ayşem (***Associate Director of the SFL):*** B.A., M.A., METU.
KARBİ, Gamze: M.A., PhD, Hacettepe University.
KARAGÖZ, Ceyda: B.A., M.A., METU.
KIZILCIK, Hale: B.A., M.A., PhD, METU
KIZILIRMAK, Serap: B.A., Ankara University; M.A., METU.
KORKUT, Esin: B.A., Ankara University, M.A., Ankara University, PhD candidate, METU
KÖSE, Özgür: B.A., Selçuk University, M.A., Minnesota State University, PhD candidate, METU
MISIR OSMANOĞLU, Nil: B.A., METU., M.S., METU.
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MEJUTO GONZALEZ, Sonia Maria: B.A., Autonomous University of Barcelona, M.A., University of Michigan
MEKİK, Çiğdem: B.A., Hacettepe University, M.A., University of Toronto.

MUSIC, Esra: B.A., Hacettepe University, M.A.: King's College, London
NALBANTOĞLU, İpek: B.A., METU., M.A., Bilkent University.
NICOLOSI, Alessandra: Ca Foscari University, University of Catania.
ODABAŞI, Aslı: M.A., PhD, Ankara University.
ÖĞÜTÇÜ, Yaprak Güleç: B.A., METU.
ÖZGÜVENÇ, Elif: B.A., Ankara University, M.A. Universite de Provence.
POLAT, Özlem: B.A., Hacettepe University.
SARIHAN, Sevim: B.A., Hacettepe University.
SAVAŞ, Duygu: B.A., M.A., METU.
SERT TOKDEMİR, Gökçe B.A., Bilkent University, M.A., METU, PhD candidate, METU
SEZGİNER, Oya Y.: B.A., Marmara University; M.A., METU.
SIĞINAN, Özlem: B.A., Ankara University, M.A., METU.
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ŞAHİN, Ebru: B.A., METU; M.A. Bilkent University.
ŞAHİN, Vildan: B.A., Anadolu University., M.A., METU, Ph. D., METU
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TARHAN, Şahika: B.A., Hacettepe University; M.A., Bilkent University., Ph.D., METU.
TOLUNAY, Ayşe: B.A., Hacettepe University
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VOLK, Andreas:B.A. RWTH Aechen University.
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YAŞAR, Azer Özlem: B.A., Hacettepe University
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YILIK, Mehmet Ali: B.A., M.A., PhD candidate, METU
YILDIRIM, Mukaddes: B.A. Hacettepe University.
YILMAZ, Mümin: B.A., Hacettepe University.

GENERAL INFORMATION

The main goal of the Department of Modern Languages is to improve students' foreign language skills through compulsory and elective courses at various levels. There are ten branches in the Department: English, French, German, Arabic, Japanese, Italian, Russian, Spanish, Greek, Chinese and Turkish as a Foreign Language.

COURSES OFFERED

ENG	101	English for Academic Purposes I	(4-1)4	CHIN	201	Basic Chinese I	(4-1)4
				CHIN	202	Basic Chinese II	(4-1)4
ENG	102	English for Academic Purposes II	(4-1)4	FREN	201	Beginning French I	(4-1)4
				FREN	202	Beginning French II	(4-1)4
ENG	201	English-Turkish Translation	(3-1)3	FREN	203	Intermediate French I	(4-1)4
ENG	202	Turkish-English Translation	(3-1)3	FREN	204	Intermediate French II	(4-1)4
ENG	211	Academic Oral Presentation Skills	(3-1)3	FREN	205	Advanced French	(4-1)4
				GERM	201	Basic German I	(4-1)4
				GERM	202	Basic German II	(4-1)4
ENG	212	Writing Term Papers	(3-1)3	GERM	203	Intermediate German I	(4-1)4
ENG	311	Advanced Communication Skills	(3-1)3	GERM	204	Intermediate German II	(4-1)4
				GERM	205	Advanced German I	(4-1)4
ENG	411	English in the Media	(3-1)3	GERM	206	Advanced German II	(4-1)4
ARAB	201	Beginning Arabic I	(4-1)4	GERM	207	Advanced German III	(4-1)4
ARAB	202	Beginning Arabic II	(4-1)4	GERM	208	German Advanced IV	(4-1)4
ARAB	203	Intermediate Arabic I	(4-1)4	GERM	210	Wırtschaftsdeutsch Syllbus	(4-1)4
ARAB	204	Intermediate Arabic II	(4-1)4	GRE	201	Basic Greek I	(4-1)4

GRE	202	Basic Greek II	(4-1)4	RUS	202	Basic Russian II	(4-1)4
ITAL	201	Basic Italian I	(4-1)4	RUS	203	Intermediate Russian	(4-1)4
ITAL	202	Basic Italian II	(4-1)4	RUS	204	Intermediate Russian II	(4-1)4
ITAL	203	Intermediate Italian I	(4-1)4	SPAN	201	Basic Spanish I	(4-1)4
ITAL	204	Intermediate Italian II	(4-1)4	SPAN	202	Basic Spanish II	(4-1)4
ITAL	205	Advanced Italian	(4-1)4	SPAN	203	Intermediate Spanish I	(4-1)4
JA	201	Basic Japanese I	(4-1)4	SPAN	204	Intermediate Spanish II	(4-1)4
JA	202	Basic Japanese II	(4-1)4	TFL	271	Beginning Turkish I	(3-1)4
JA	203	Intermediate Japanese I	(4-1)4	TFL	272	Beginning Turkish II	(3-1)4
JA	204	Intermediate Japanese II	(4-1)4	TFL	273	Advanced Turkish I	(3-1)4
RUS	205	Advanced Russian	(4-1)4	TFL	274	Advanced Turkish II	(3-1)4
RUS	201	Basic Russian I	(4-1)4				

DESCRIPTION OF COURSES

I. ENGLISH COURSES

A. REQUIRED:

ENG 101 English for Academic Purposes I **(4-1)4**

The course reinforces academic reading skills (finding the main idea, skimming, scanning, inferring information, guessing vocabulary from context, etc.) through reading selections on a variety of topics. It also aims at developing critical thinking, which enables students to respond to the ideas in a well organized written format.

ENG 102 English for Academic Purposes II **(4-1)4**

The course reinforces academic writing skills. Students write different types of essays based on the ideas they are exposed to in the reading selections. The emphasis is on the writing process.
Prerequisite: ENG 101

ENG 211 Academic Speaking Skills **(3-1)3**

The course aims at developing spoken English skills. To this end, students are engaged in classroom discussions, role plays and presentations on a variety of topics..
Prerequisites: ENG 101 and ENG 102

ENG 311 Advanced Communication Skills **(3-1)3**

This is a course designed to develop communication skills in a business context. Emphasis is on accuracy, fluency and effectiveness of students in certain business tasks such as socializing, telephoning, presenting information, holding meetings, etc.
Prerequisites: Eng 101, 102 and 211.

B. ELECTIVE:

ENG 201 English-Turkish Translation **(3-1)3**

Intermediate work in translating texts from English into Turkish in three stages: (a) starting with samples including the basic structures in English at sentence level, (b) moving on to short paragraphs in which these structures are found in more complex form, (c) exposing students to short essays covering a wide variety of subjects as representative as possible of the styles and registers found in contemporary written English.
Prerequisites: ENG 211 and consent of the department.

ENG 202 Turkish-English Translation **(3-1)3**

Intermediate work in translating texts from Turkish into English in three stages: (a) starting with samples including the basic structures in English at sentence level, (b) moving on to short paragraphs in which these structures are found in more complex form, (c) exposing students to short essays covering a wide variety of subjects as representative as possible of the styles and registers found in contemporary written Turkish.
Prerequisites: ENG 211 and consent of the department.

ENG 212 Writing Term Papers **(3-1)3**

A course designed to guide students in library research and the production of academic papers. Students follow basic steps of research: choosing and narrowing a topic, compiling a working bibliography, outlining, note-taking, writing the first draft and writing the final paper with documentation of sources. *Prerequisites: ENG 211 and consent of the department.*

ENG 411 English in The Media
(3-1)3
Intermediate-advanced work on English as it is used in the international media by native writers/speakers, in a variety of different registers such as newscasts (CNN and BBC), video documentaries, popular sit-coms and authentic unabridged texts. Emphasis will be on language and on critical thinking. Students will have some autonomy and flexibility in their choice of learning strategies, themes and registers, and in turn, they will make on-going, active contribution to the course.
Prerequisites: Consent of the department

II. ARABIC COURSES*

ARAB 201 Beginning Arabic I (4-1)4
An introduction to the Arabic alphabet, phonetic and grammatical rules and basic Arabic vocabulary.

ARAB 202 Beginning Arabic II (4-1)4
A continuation of ARAB 201.
Prerequisite: ARAB 201 or proficiency at ARAB 201 level.

ARAB 203 Intermediate Arabic I (4-1)4
Detailed analysis of the language through text study.
Prerequisite: ARAB 202 or proficiency at ARAB 202 level.

ARAB 204 Intermediate Arabic II (4-1)4
A continuation of ARAB 203.
Prerequisite: ARAB 203 or proficiency at ARAB 203 level.

ARAB 205 Advanced Arabic (4-1)4
This course, which is the continuation of Arabic 204, aims to develop students´ reading comprehension skills and to equip students with advanced grammar knowledge by means of analyzing authentic material. Students are also expected to develop their oral skills in Arabic by participating in classroom discussions.
Prerequisite: ARAB 204 or proficiency at ARAB 204 level.

III. CHINESE COURSES

CHIN 201 Basic Chinese I (4-1)4
This course is an introduction to the basics of the Chinese Language. The aim is for students to understand spoken Chinese, express themselves and ask questions in this language. is an important component of the course.

CHIN 202 Basic Chinese II (4-1)4
A continuation of CHIN 201.
Prerequisite: CHIN 201

IV. FRENCH COURSES*

FREN 201 Beginning French (4-1)4
An introduction to basic spoken and written French.

FREN 202 Beginning French II (4-1)4
A continuation of FREN 201.
Prerequisite: FREN 201 or consent of the instructor.

FREN 203 Intermediate French I (4-1)4
Further reinforcement of basic French.
Prerequisite: FREN 202 or proficiency at FREN 202 level.

FREN 204 Intermediate French II (4-1)4
The final stage in the development of a knowledge of basic French.
Prerequisite: FREN 203 or proficiency at FREN 203 level.

FREN 205 Advanced French (4-1)4
Authentic texts of different genres will be used for the improvement of reading, listening and vocabulary skills. Reading related writing will also be practiced.
Prerequisite: FREN 204.

V. GERMAN COURSES*

GERM 201 Basic German I (4-1)4
An introduction to the basic structures of spoken and written German.

GERM 202 Basic German II (4-1)4
A continuation of GERM 202.
Prerequisite: GERM 201 or proficiency at GERM 201 level.

GERM 203 Intermediate German I (4-1)4
Intermediate German for Science and the Social Sciences.
Prerequisite: GERM 202 or proficiency at GERM 202 level.

GERM 204 Intermediate German II (4-1)4
A continuation of GERM 203.
Prerequisite: GERM 203 or proficiency at GERM 203 level.

GERM 205 Advanced German I (4-1)4
Advanced German for Science and the Social Sciences.
Prerequisite: GERM 204 or proficiency at GERM 204 level.

GERM 206 Advanced German II (3-1)3
A continuation of GERM 205.
Prerequisite: GERM 205 or proficiency at GERM 205 level.

VI. GREEK COURSES*

GRE 201 Basic Greek I (4-1)4
This course is an introduction to the basics of the Greek Language. The approach of the course is communicative. The aim is for students to understand spoken Greek, express themselves and ask questions in Greek. The basic structures of the Greek language are studied; bur grammar study is not the primary focus. Listening is an important component of the course. A student who takes this course will be able to engage in simple every day dialogues and basic reading texts.

GRE 202 Basic Greek II (4-1)4
A continuation of GRE 201.
Prerequisite: GRE 201

VII. ITALIAN COURSES*
ITAL 201 Basic Italian I (4-1)4
An introduction to basic spoken and written Italian.

ITAL 202 Basic Italian II (4-1)4
A continuation of ITAL 201.
Prerequisite: ITAL 201.
ITAL 203 Intermediate Italian I (4-1)4
An intermediate level course in spoken and written Italian.
Prerequisite: ITAL 202.

ITAL 204 Intermediate Italian II (4-1)4
A continuation of ITAL 203 at an upper-intermediate level.
Prerequisite: ITAL 203.

ITAL 205 Advanced Italian (4-1)4
A continuation of ITAL 204 at an advanced level.
Prerequisite: ITAL 203.

VIII. JAPANESE COURSES*

JA 201 Basic Japanese I (4-1)4
An introduction to the Japanese Hiragana and Katagana alphabets and to the basic spoken and written language.

JA 202 Basic Japanese II (4-1)4
A continuation of JA 201 and introduction to Kanji.
Prerequisite: JA 201 or proficiency at JA 201 level.

JA 203 Intermediate Japanese I (4-1)4
Further reinforcement of basic Japanese and Kanji.
Prerequisite: JA 202 or proficiency at JA 202 level.

JA 204 Intermediate Japanese II (4-1)4
The final stage in the development of a knowledge of basic Japanese and detailed analysis of the language through text study.
Prerequisite: JA 203 or proficiency at JA 203 level.

IX. RUSSIAN COURSES*

RUS 201 Basic Russian I (4-1)4
An introduction to the Russian Alphabet and the basic grammar of Russian.

RUS 202 Basic Russian II (4-1)4
A continuation of RUS 201 and reading of simple texts in Russian.

RUS 203 Intermediate Russian I (4-1)4
Reading Comprehension and Translation of simple texts from Russian to Turkish and Turkish to Russian.

RUS 204 Intermediate Russian II (4-1)4
A continuation of RUS 203 with emphasis on reading, writing and grammar of Russian. Spoken Russian is also integrated into the course in the form of dialogues, mini oral presentations.

RUS 205 Advanced Russian (4-1)4
An advanced level course which aims at further developing the students' reading and oral skills. Authentic texts of different genres will be studied. Students will be expected to make oral presentations in class.

X. SPANISH COURSES*

SPAN 201 Basic Spanish I (4-1)4
An introduction to basic written and spoken Spanish.

SPAN 202 Basic Spanish II (4-1)4
A continuation of SPAN 201.
Prerequisite: SPAN 201.

SPAN 203 Intermediate Spanish I (4-1)4
An intermediate level course in spoken and written Spanish.
Prerequisite: SPAN 202 or proficiency at SPAN 202 level.

SPAN 204 Intermediate Spanish II (4-1)4
An upper-intermediate level course in written and spoken Spanish.
Prerequisite: SPAN 203 or proficiency at SPAN 203 level.

XI. TURKISH AS A FOREIGN LANGUAGE*

TFL 271 Beginning Turkish I (3-2)4
A course designed for Exchange Students, International Summer School and other Special Program Students. This course aims at providing the students who have little or no knowledge of Turkish with the skills required for basic communication. The students will be exposed to the basic structures of the Turkish language in communicative contexts. Some insight into the Turkish culture and life style will be given.
Prerequisite: Consent of the department.

TFL 272 Beginning Turkish II (3-2)4
A continuation of TFL 271. In addition to the study of structures of the Turkish language, students will be exposed to simple written texts in Turkish.
Prerequisite: Consent of the department.

TFL 273 Advanced Turkish I (3-2)4
A course designed for exchange students, International Summer School students and other special program students. The course aims at providing communicative tasks for students to actually communicate in Turkish. The students will also be exposed to commonly occurring advanced syntactic patterns and vocabulary items of the Turkish language, studying written texts such as newspapers, short stories, etc. And taking part in some oral communication activities such as dialogues, discussions, debates or interviews.

TFL 274 Advanced Turkish II (3-2)4
Continuation of Advanced Turkish I. There is more emphasis on reading texts and writing reports. The topics are determined by students' interests and career goals.

**** Regulations concerning enrollment in Foreign Language Elective courses:***

A. Elective Courses in Foreign Languages are offered to second or above year students who have completed their ENG 101 and ENG 102 requirements.

B. Students will not be permitted to register for courses in their native language. (Students enrolling in foreign language courses will be required to sign a form that the language to be studied is not their native language).

C. Students who have graduated from a high school which conducts education in a foreign language medium will not be able to register for 201, 202, 203 and 204 level courses in that language. They may, however, register for 205 level courses in that language. (Students enrolling in 201, 202, 203, or 204 level courses will be required to sign a form stating that they have not graduated from a high school which conducts education in that language).

D. Students who have taken 201 or 202 level courses in a foreign language can not register for 201 or 202 level courses in another foreign language. These students should continue with 203 and 204 level courses of the same language.

E. A student who has taken a foreign language course cannot in any following semester register for a lower level course in the same language.

F. Consent of the Department is a prerequisite for all of the Foreign Language Elective Courses offered by the Department

FACULTY OF ARCHITECTURE

Dean : CENGİZKAN, Ali: Prof. Dr.; B.Arch., M.Arch., Ph.D., METU.
Associate Dean : ERGUT, Tomris Elvan; Assoc. Prof. Dr.; B.Arch., M.Arch., METU, Ph.D. State University of New York at Binghamton.
Associate Dean : UZUN, Nil; Assoc.Prof. Dr.; B.CRP, MS.RP., METU; Ph.D. Utrecht University.
Assistant to the Dean : GÜZER, C. Abdi; Prof. Dr.; B.Arch., M.Arch., Ph.D. METU.

GENERAL INFORMATION

Middle East Technical University (METU) was established in 1956 as an Institute for Architecture and Community Planning for the Middle East region, through the collaboration of the Turkish government and the UN. The Faculty of Architecture, which was the first Faculty to open, originated from this background with a special law which made it possible for the best universal minds from all over the world to meet with Turkish outlook, expertise and practice in the middle of Anatolia (in Ankara).

The new academic attitude of the Faculty of Architecture mainly consisted of, critical outlook, new conceptual research for the fundamentals of good design and good planning, a good mix of international students from the region, open juries and open discussions in the classes, social consciousness on a global scale and taking social responsibility on a local scale. This is still the major behavior pattern in itself for our work at the Faculty. In the early sixties, in 1963, the Faculty founded the first Department of City and Regional Planning, and the first Department of Architectural Conservation in Turkey, and in 1979 the Department of Industrial Design was established.

The University, in order to save the cultural heritage of the campus, carried out excavations on METU campus site in association with our Faculty. The findings dating from 5000-3000 BC are now exhibited in the first private museum of Turkey, which is in the Faculty complex.

The Faculty started publishing the METU Journal of the Faculty of Architecture in 1975. A refereed journal, METU JFA was the first academic and internationally scholar journal of its kind in Turkey, and it still is, that accepts articles in both Turkish and English (www.arch.metu.edu.tr/jfa.htm). It is now indexed in more than 10 core-indexes, including the Arts and Humanities Citation Index (AHCI), as the only Turkish journal of architecture among some 45.

Faculty Archive of Slides, which produced and catalogued around 100.000 of vernacular, classical and modern buildings, environments and products, in Turkey and abroad since 1956 (http://www.arch.metu.edu.tr/bbem/); Historic Buildings Documentation Archives of about 800 historic monuments (some of which do not exist anymore); Planning Archives starting with some of the originals of the Ankara Plan by Jansen of 1927 and onwards; and a library of thesis work produced since 1962 (all in English) and of books from different periods are forming the Information and Documentation Center of the Faculty. The center is also accepted as one of the three architectural culture centers from Turkey. All services are open to the public.

Our Research efforts are reorganized around a ‘Faculty of Architecture Research, Design and Planning Center’ (MATPUM) with Research Units ranging from theoretical research to professional consultancy services to building science experiments and ‘branding’. The Research Center has a separate building on the research strip of the campus. (http://matpum.metu.edu.tr/).

In order to support our research and education efforts we are transforming our workshops into design research laboratories. They are being organized around the areas of, ‘virtual design’, ‘animation’, ‘environmental simulation’ and ‘solid modeling’.

The Faculty houses most up-to-date workshops and a printing press which not only prints the Journal, but did print a good collection of some 300 books all written by our staff since 1962.

Faculty cooperation with Industry, private sector and NGOs has been always at a particular level where it makes prove that academic research and scholarly practice go hand in hand. Our faculty also acts as public specialists for a significant number of court cases, most of which are very important in terms of public impact. Some of our research activity is about helping the local authorities on environmental issues, on policy making, crisis and hazard management issues and above all in strategic spatial planning.

Our alumni, now around 5500 graduates, are organized within the new Faculty of Architecture Alumni Association (www.omim.org.tr). The Association as an NGO is providing consultancy services for the public and the private sectors.

In 2010 we celebrated the fiftieth year of our first graduates, and looking at the way we are now organized, we can say that our next fifty years look to be more multi-dimensional, multi-modal and multi-disciplinary in terms of the knowledge we are going to process and in terms of the public, private and non-governmental sectors as well as the national and international bodies we are going to work with.

All this means that we are open and looking forward to meeting and working together with those ‘students, teachers and researchers’ of ‘architecture, planning and design’ who would like to share our basic attitudes and who would like to develop new mutual value systems in the related areas of knowledge and practice as well as the regions they are set or meant to influence and would like to ask good questions and try to do the most for good answers and best practice.

DEPARTMENT OF ARCHITECTURE

PROFESSORS

BALAMİR, Aydan: B.Arch., M.Arch., Ph.D., METU.
BAYKAN, Can: B.Arch., M.Arch., METU; Ph.D., Carnegie Mellon University.
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GÜVEN, Suna: B.A., Wellesley College; M.A., Ph.D., Cornell University.
ELIAS-OZKAN, Soofia Tahira: B.Arch., M.S., Ph.D., METU.
ERKILIÇ (BAYAR), Mualla: B.Arch., M.Arch., METU; Ph.D., University of Edinburgh.
MENNAN, Zeynep: B.Arch., M.Arch., Ecole d'Architecture Paris-Villemin; Ph.D., METU.
ÖZKAYA (TURAN), Belgin: B.Arch., M.Arch., METU; Ph.D., Cornell University.
PEKER, Ali Uzay: B.A., Istanbul University; M.A., Boğaziçi University; Ph.D., ITU.
SARGIN, Güven Arif ***(Department Chair)***: B.Arch., M.Arch., METU; Ph.D., University of Wisconsin-Madison.
SAVAŞ, Ayşen: B.Arch., M.Arch., METU; Ph.D., M.I.T.

ASSOCIATE PROFESSORS

ERGUT (ALTAN), T. Elvan (***Associate Dean of the Faculty of Architecture)***: B.Arch., M.Arch., METU; Ph.D., State University of New York at Binghamton.
ERKAL, Namık G.: B.Arch, M.A., Ph.D., METU.
GÜNEL, Mehmet Halis: B.S., M.S.., Ph.D., METU.
ÖZGENEL, Lale ***(Assistant to the President)***: B.Arch., M.A., Ph.D., METU.
SORGUÇ (GÖNENÇ), Arzu: B.S., M.S., Ph.D., METU.
GÜR, F. Berin : B.Arch., M.Arch., Ph.D., METU.
TANYER, Ali Murat ***(Vice Chair)***: B.Arch., M.S., METU; Ph.D., University of Salford.
TAVUKÇUOĞLU, Ayşe ***(Vice Chair)***: B.Arch., M.Arch., Ph. D., METU.

ASSISTANT PROFESSORS

ALTINÖZ (BİLGİN), Güliz A.: B.Arch., M.S. in Restoration, Ph.D., METU.
DİNO, İpek Gürsel: B.Arch., Gazi University; M.Arch., METU; M.Sc., Carnegie Mellon University; Ph.D., Delft University of Technology.
EKİNCİ (ENGİNSOY), Sevil: B.Arch., M.A., METU, Ph.D. Cornell University.
SERİN, Ufuk: B.Arch., M.S., METU; M.A., Ph.D., Pontificio Istituto di Archeologia Cristiana (PIAC), Roma.

INSTRUCTORS

AYTAÇ, Erkin: B. Arch., METU; M.S. in Arch. Conservation, Heriot- Watt University.
BAŞ BÜTÜNER, Funda: B. LAUD, Bilkent University; M.C.R.P., Ph.D., METU
ÇAKMAKLI (ZEYTUN), Ayşem Berrin: B.Arch, M.S. in Building Science; Ph.D. in Building Science, METU.
ERDER, Evin: B.A., Princeton University; M.A., Pennsylvania University, PhD., METU.
GÖKÇE, Fuat: B.Arch., M.S. in Restoration, METU; Ph.D., Ankara University.
ÖĞÜT, Rana Nergis: B.Arch., M.Arch., Ph.D., METU.
ÖZGÖNÜL, Nimet: B.Arch., M.Arch., Ph.D., METU.
PEKERİÇLİ, Mehmet Koray: B.Arch, METU; M.S. in Construction Management, Ph.D., University of Reading, UK.
SUMMERS, Françoise: B.A., B.Arch., Manchester University, UK.
VAN DER MEIJ, Agnes: B.Arch., M.Arch., Delft University of Technology.

ZELEF, Haluk: B.Arch., M.Arch., Ph.D. METU.

VISITING PROFESSORS

ARNOLD, Dana: B.Arch., University of London; M.S., Ph.D., Bartlett University College of London.
MULDERS, Sander: B.Sc.,M.Sc., Delft University of Technology.
PLOMP, Huib: B.Sc.Arch., Delft University of Technology; M.Sc.Arch., Delft University of Technology.
SARIYILDIZ, Sevil: B.Arch., YTU; M.Arch., Ph.D., Delft University of Technology.
STOUFFS, Rudi: B.Sc., M.Sc., Vrije Universiteit Brussel; M.Sc., Ph.D., Carnegie Mellon University.
TUNCER, Bige: B.Arch., METU; M.Sc, Carnegie Mellon University; Ph.D., Delft University of Technology.
YETKEN, Carol J. H.: B.Sc., Ball State University; MLA., University of Virginia.LEED AP, RLA.

SPECIALISTS

DİRİ, Filiz: B.Arch., Gazi University; M.Sc., METU.
ÖZGENEL, Çağlar Fırat: B.S. Physics, M.Sc. Building Science, METU.

DEGREE PROGRAMS: The Department of Architecture (the first department of METU) offers undergraduate and graduate programs in Architecture. The undergraduate program is based on a four-year study leading to the Bachelor's degree with emphasis on architectural design studios. The graduate program, leading to the master's degree is offered in the following areas: Master of Architecture in Design, Master of Science in Building Science, Master of Arts in History of Architecture and Master of Science in Restoration and Preservation of Historical Monuments, International Joint Master of Science in Computational Design and Fabrication Technologies in Architecture (Dual Diploma). Graduate studies leading to the Ph.D. degree are offered in Architectural Design, Building Science, Restoration and History of Architecture.

Two undergraduate minor programs are offered; Minor Program in Conservation for undergraduate students of city-planning, and Minor Program in Architectural Culture for students from all departments of METU.

RESEARCH INTERESTS AND FACILITIES: Architectural theory, history and criticism and philosophy, theory and methods of architectural education and practice, theory and history of urban space, restoration and preservation of historic work and environments, monographic studies on settlements in Turkey, environmental issues in architecture, building and construction systems, project and construction management, computational technologies and IT in architecture are the major areas of graduate research.

In addition to the studios where undergraduate and graduate design courses take place, there are workshops and laboratories, the Photogrammetry Center, the Building Materials Laboratory, the Environmental Simulation Laboratory, the Computer Laboratory, Digital Design Research Studio, , support the academic and research activities in the Department.

The Graduate Program in Restoration combines theoretical education with practical work in its two laboratories in the Faculty of Architecture. Both facilities are directly involved in the education program besides undertaking research projects from governmental bodies and individuals. The Photogrammetry Center (laboratory) which was established in 1967 contributes to teaching methods of measured surveys with the aid of instruments. The Building Materials Laboratory was also established in 1967 and aims at teaching methods of analysis in order to determine the properties as well as the problems of deterioration likely to develop in the fabric of historic buildings. The laboratory is related to course work as well as guiding the students in their thesis projects.

The Department of Architecture Information Center (ARCHIC) was established in 1996, to fulfill the information flow to and from the Department, the Faculty, the students, the alumni, practicing architects and architectural offices, architectural materials producers, the construction industry in Turkey, and other institutions of architectural education.

Other than direct call, detailed and up-to-date information about the Department can be reached at through the web-site: www.archweb.metu.edu.tr

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

ARCH	101	Basic Design	(4-8)8
ARCH	103	Graphic Communication I	(2-2)3
ARCH	111	Introduction to Architectural Concepts	(3-0)3
MATH	125	Basic Mathematics I	(3-2)4
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC
*TURK	201	Turkish	(3-0)3

Second Semester

ARCH	102	Introduction to Architectural Design	(4-8)8
ARCH	104	Graphic Communication II	(2-2)3
ARCH	112	Architectural History I	(3-0)3
MATH	126	Basic Mathematics II	(3-2)4
ENG	102	English for Academic Purposes II	(4-0)4
*TURK	202	Turkish	(3-0)3

ARCH 190 Practice in Building Construction and Surveying NC

SECOND YEAR

Third Semester

ARCH	201	Architectural Design I	(4-8)8
ARCH	203	Digital Media in Architecture I	(2-2)3
ARCH	211	Architectural History II	(3-0)3
ARCH	231	Architectural Engineering I: Statics and Strength of Materials	(3-2)4
ARCH	251	Building Materials Technologies	(2-2)3
ARCH	291	Landscape Design	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
Any 1 of the following set:			
HIST	2201	Principles of Kemal Atatürk I	NC
HIST	2205	History of the Turkish Revolution I	NC
*HIST	400	Principles of Kemal Atatürk I	NC

Fourth Semester

ARCH	202	Architectural Design II	(4-8)8
ARCH	204	Digital Media in Architecture II	(2-2)3
ARCH	212	Architectural History III	(3-0)3
ARCH	232	Architectural Engineering II: Behavior and Analysis of Structures	(3-2)4
ARCH	252	Building Construction Technologies	(2-2)3
ARCH	282	Principles of Built Environment	(3-0)3
Any 1 of the following set:			
HIST	2202	Principles of Kemal Atatürk II	NC
HIST	2206	History of the Turkish Revolution II	NC
*HIST	400	Principles of Kemal Atatürk II	NC

ARCH 290 Summer Practice NC (**)

THIRD YEAR

Fifth Semester

ARCH	301	Architectural Design III	(4-8)8
ARCH	331	Structural Design in Architecture I	(3-2)4
ARCH	351	Building Detail Modelling	(2-4)4
ARCH	381	Environmental and Building Systems	(3-0)3
ARCH	393	Principles of Cultural Heritage Conservation	(3-0)3
Any 1 of the following set:			
TURK	105	Turkish I	(2-0)NC
TURK	201	Elementary Turkish	(4-0)NC
TURK	303	Turkish I	(2-0)NC

Sixth Semester

ARCH	302	Architectural Design IV	(4-8)8
ARCH	312	Principles of City Planning and Urban Design	(3-0)3
ARCH	332	Structural Design in Architecture II	(3-2)4
ARCH	382	Environmental Control Technologies	(3-0)3
Any 1 of the following set:			
TURK	106	Turkish II	(2-0)NC
TURK	201	Elementary Turkish	(4-0)NC
TURK	304	Turkish II	(2-0)NC
Approved elective course			(3-0)3
Approved elective course			(3-0)3

ARCH 390 Summer Practice NC (**)

FOURTH YEAR

Seventh Semester		Eighth Semester	
ARCH 401 Architectural Design V	(4-8)8	ARCH 402 Architectural Design VI	(4-8)8
Approved elective course	(3-0)3	ARCH 452 Professional Practice	(3-0)3
Approved elective course	(3-0)3	Approved elective course	(3-0)3
Approved elective course	(3-0)3	Approved elective course	(3-0)3
Approved elective course	(3-0)3	Approved elective course	(3-0)3
		Approved elective course	(3-0)3

(*) For international students.
(**) The student is expected to apply to the Department with a written statement of acceptance from the place of work including the dates of the 2-month practice, before the due date announced by the Department. For the detailed information, please see the Department's official webpage: *www.archweb.metu.edu.tr*

MINOR PROGRAM IN CONSERVATION

The contemporary theoretical approaches on conservation require a close collaboration between the fields of restoration/conservation and city planning. First phase of this collaboration is the constitution of a shared framework of communication. Minor Program in Conservation for the undergraduate students of city planning aims at giving the basic concepts of conservation as well as their conceptual parameters. This program offers six courses. The courses on the theoretical framework and the legal aspects of conservation are supported by several seminars on varying related topics. The theoretical accumulation of knowledge is tested through a field study in the workshop.

ARCH	395	Theory of Conservation			
	(3-0)3				
ARCH	397	Seminar on Conservation I			(3-0)3
ARCH	398	Seminar on Conservation II			(3-0)3
ARCH	495	Legal and Administrative Aspects of Conservation	(3-0)3		
ARCH	497	Selected Topics in Conservation		(3-0)3	
ARCH	498	Workshop in Conservation			(4-0)4

MINOR PROGRAM IN ARCHITECTURAL CULTURE

Architecture is associated with many fields and types of study and learning. While Architects find themselves compelled to be acquainted with them, it seems relevant to think and expect that those in diverse fields be concerned with the relation of their field of knowledge to architecture, to the qualities of the background to our everyday life. In a world where interdisciplinary work is gaining ever-growing importance, many from different disciplines collaborate with architects on studies and projects related with our built environment. An acquaintance with architecture along with their major studies will give them a sound understanding of architecture, and insight into its possible relations to their major subjects and will be instrumental for effective communication and collaboration in the medium of architecture.

ARCH	111	Introduction to Architectural Concepts	(3-0)3	
ARCH	112	Architectural History I		(3-0)3
ARCH	211	Architectural History II		(3-0)3
ARCH	212	Architectural History III		(3-0)3

3 elective courses approved by the Department of Architecture (selected from four groups of elective courses, each from a different group)

ELECTIVE COURSES

Students are expected to pass 10 courses as elective courses prior to graduation with the B.Arch Degree. One from each of the following four groups of elective courses will have to be taken and successfully completed. The remaining 6 elective courses are expected to be on related subjects (excluding performance based courses such as foreign languages, music, etc.).

Maximum 2 of the elective courses have to be taken from other departments at the University. Elective courses taken from other METU departments, as well as from other universities (in Turkey or abroad) have to be approved by the Department.

5XX/7XX courses can be taken by undergraduate students upon consent by instructor. Except the courses listed below, elective courses taken from Fine Arts and Music, and Foreign Languages Departments are not going to be regarded as a part of the required elective courses package.

THEA 291 Genres in the Arts (3-1)3
THEA 292 Genres in the Arts (3-1)3
THEA 151 Introduction to Video Production (3-1)3
THEA 251 Introduction to Video Production (3-1)3
THEA 351 Introduction to Video Production (3-1)3
THEA 451 Introduction to Video Production (3-1)3
THEA 201 History of Theatre (3-1)3
THEA 202 History of Theatre (3-1)3

Building Technology

ARCH	325	(Depending on the syllabus) Architecture in Situ	(3-0)3
ARCH	333	Mathematics in Architecture	(3-0)3
ARCH	344	Environment and Man: Cause and Effect	(3-0)3
ARCH	361	Integration of Building Systems in Architectural Design for Environmental Control	(3-0)3
ARCH	371	Information Architecture	(3-0)3
ARCH	438	Design of Steel Structures	(3-0)3
ARCH	439	History of Modern Structural Engineering	(3-0)3
ARCH	443	Environmental Aesthetics I	(3-0)3
ARCH	444	Environmental Aesthetics II	(3-0)3
ARCH	450	Generative Design in Architecture	(3-0)3
ARCH	453	Construction Design Practice	(3-2)4
ARCH	454	Problems of Traditional Building Materials	(3-0)3
ARCH	456	New Building Technologies	(3-0)3
ARCH	457	Introduction to Deterioration and Conservation	(3-0)3
ARCH	458	Understanding Tectonics	(2-2)3
ARCH	460	Appropriate Technology	(2-2)3
ARCH	461	Computer Literacy in Architecture	(3-2)4
ARCH	462	Computer Aided Drafting and Design	(3-2)4
ARCH	467	Design Methods	(3-0)3
ARCH	470	Digital Design Studio	(3-6)6
ARCH	473	Architect's Market Structure I	(3-0)3
ARCH	474	Architect's Market Structure II	(3-0)3
ARCH	475	Digital Design Studio II	(3-6)6
ARCH	479	Acoustical Design of Halls for Musical Performance	(3-0)3
ARCH	481	Design with Climate	(2-2)3
ARCH	482	Conservation of Archaeological Sites	(3-0)3
ARCH	483	Energy Considerations in Architecture I	(3-0)3
ARCH	484	Energy Considerations in Architecture II	(3-0)3
ARCH	489	Lighting in Architecture	(3-0)3

With consent of the instructor: (under the Graduate Programs)

BS	531	Studies in Structures	(3-0)3
BS	532	Geometrical and Morphological Analysis of Spatial Structures	(3-0)3
BS	533	Building Design: Form and Structure	(3-0)3
BS	534	Analytical Modeling and Computer Analysis of Structures	(3-0)3
BS	536	Studies on Tall Buildings: Design Considerations	(3-0)3
BS	550	Building Arts and Timber	(3-0)3
BS	552	Performance Assessment of Buildings	(3-0)3

BS	574	Composite Materials and Their Applications in Buildings	(3-0)3
BS	575	Acoustics in Architecture I	(3-0)3
BS	575	Acoustics in Architecture II	(3-0)3
REST	531	Structural Analysis of Historical Structures	(3-0)3
REST	533	Historic Structural Systems	(3-0)3

History

ARCH	322	Developments in Modern Art	(3-0)3
ARCH	323	Developments in Modern Art	(3-0)3
ARCH	324	Thinking (Reading/Writing) on Architecture	(3-0)3
ARCH	325	(Depending on the syllabus) Architecture in Situ	(3-0)3
ARCH	407	City in Late Antiquity and Byzantium: Topography and Architecture	(3-0)3
ARCH	409	Perspectives in the Conservation and Valorization of Cultural Heritage	(3-0)3
ARCH	410	A Survey on Architectural Culture: From the Neolithic to the Modern Period	(3-0)3
ARCH	413	Survey of Early Christian and Byzantine Architecture	(3-0)3
ARCH	419	Pre-Classical Architecture of Ancient Anatolia	(3-0)3
ARCH	420	Architecture and Politics in 20th Century Italy	(3-0)3
ARCH	421	Architects and Architectural Practice in History	(3-0)3
ARCH	422	Classical Antiquity in Asia Minor	(3-0)3
ARCH	423	Domestic Architecture in Antiquity	(3-0)3
ARCH	425	The Cultural Context of Art and Architecture	(3-0)3
ARCH	426	House and Daily Life in History	(3-0)3
ARCH	427	Studies in Greek Architecture	(3-0)3
ARCH	428	Twentieth Century Architecture in Turkey	(3-0)3
ARCH	430	Seminar in Contemporary Architecture	(3-0)3
ARCH	436	Studies in Roman Architecture	(3-0)3
ARCH	440	Masterworks of Medieval Architecture in East and West	(3-0)3
ARCH	443	Environmental Aesthetics I	(3-0)3
ARCH	444	Environmental Aesthetics II	(3-0)3
ARCH	448	Issues and Problems in 'Modernism'	(3-0)3
ARCH	449	Nineteenth Century Architecture	(3-0)3

With consent of the instructor: (under the Graduate Programs)

AH	501	Studying Architectural History	(3-0)3
AH	513	Aesthetics and Criticism I	(3-0)3
AH	514	Aesthetics and Criticism II	(3-0)3
AH	520	Topics on Urban Form, Patterns and Architecture	(3-0)3
AH	521	Themes on Ancient Domestic Architecture	(3-0)3
AH	522	Byzantine Architecture: The Art and Architecture of Byzantine Cappadocia	(3-0)3
AH	526	History and Theory of Art and Architectural Styles	(3-0)3
AH	533	Ottoman Architecture in the Nineteenth Century	(3-0)3
AH	535	Approaches in Greek Architecture	(3-0)3
AH	536	Approaches in Roman Architecture	(3-0)3
AH	539	Cosmological Thought and Architecture in the Middle East	(3-0)3
AH	541	Assimilation of Western Modes in Eighteenth Century Ottoman Architecture	(3-0)3
AH	543	Anatolian Seljuk Architecture (11-14th Centuries)	(3-0)3
AH	544	Architectural History Research Studio: The Modern Capital City, Ankara	(2-2)3
AH	546	Theories of History I	(3-0)3
AH	547	Theories of History II	(3-0)3
AH	548	Aesthetics and the Psyche	(3-0)3
AH	601	Critical Review in Architectural History	(3-0)3

AH	612	Imperial Architecture of the Ancient Near East	(3-0)3
AH	654	Framing the Past, Ruins and the Architectural History	(3-0)3
AH	655	Spaces and Practices of Displaying the Past	(3-0)3
AH	666	Medieval Buildings and Texts	(3-0)3
AH	668	Seminar in Classical Ottoman Architecture	(3-0)3
AH	670	Architectural Books of the Italian Renaissance	(3-0)3
AH	671	Historiography of Renaissance Architecture: Shifting Geographical Boundaries	(3-0)3
AH	672	Historiography of Renaissance Architecture: Florence in the 19th Century	(3-0)3
AH	673	Architectural History of Reading and Writing	(3-0)3
REST	521	Sources and Methods of Research in Conservation	(3-0)3
REST	522	History of Architecture in the Middle East	(3-0)3

Theory and Criticism

ARCH	324	Thinking (Reading/Writing) on Architecture	(3-0)3
ARCH	325	(Depending on the syllabus) Architecture in Situ	(3-0)3
ARCH	415	Fundamentals of Site Planning	(3-0)3
ARCH	416	Architects and Patrons	(3-0)3
ARCH	417	The Limits of Architectural Criticism	(3-0)3
ARCH	418	Case Studies in Architectural Criticism	(3-0)3
ARCH	425	The Cultural Context of Art and Architecture	(3-0)3
ARCH	439	History of Modern Structural Engineering	(3-0)3
ARCH	441	Reading Architectural Works I	(3-0)3
ARCH	442	Reading Architectural Works II	(3-0)3
ARCH	447	Ethics and Morality in Architecture	(3-0)3
ARCH	451	Buildings During Use: Post-Occupancy Evaluation	(3-0)3
ARCH	463	Introduction to the Theory of Shape Grammars	(3-0)3
ARCH	467	Design Methods	(3-0)3
ARCH	482	Conservation of Archaeological Sites	(3-0)3
ARCH	491	Landscape Research I	(3-0)3
ARCH	492	Landscape Research II	(3-0)3

With consent of the instructor: (under the Graduate Programs)

ARCH	505	Advanced Architectural Design Studio I	(3-6)6
ARCH	508	Research Analysis and Design in Multilayered Context	(2-4)4
ARCH	511	Social and Cultural Themes in Urban Architecture	(3-0)3
ARCH	512	Advanced Studies on Urban Architecture	(3-0)3
ARCH	526	Politics and Space	(3-0)3
ARCH	527	Advanced Topics in Digital Constructivism	(3-0)3
ARCH	543	Assessment of Interiors I	(3-0)3
ARCH	544	Assessment of Interiors II	(3-0)3
ARCH	547	Architecture and the Social Context of Modernity I	(3-0)3
ARCH	548	Architecture and the Social Context of Modernity II	(3-0)3
ARCH	586	Descriptive and Systematic Approaches to Design	(3-0)3
ARCH	583	Philosophical Issues in Computation and Design	(2-2)3
ARCH	585	Computational Design Research Lab	(2-4)4
ARCH	591	Theory and History of Landscape Architecture I	(3-0)3
ARCH	592	Theory and History of Landscape Architecture II	(3-0)3
ARCH	613	Critical Theories on Urban Architecture	(3-0)3
ARCH	614	Cartography of Architectural Theory	(3-0)3
AH	501	Studying Architectural History	(3-0)3
AH	513	Aesthetics and Criticism I	(3-0)3
AH	514	Aesthetics and Criticism II	(3-0)3
AH	546	Theories of History I	(3-0)3
AH	547	Theories of History II	(3-0)3
AH	548	Aesthetics and the Psyche	(3-0)3

AH	601	Critical Review in Architectural History	(3-0)3
REST	511	Theory of Restoration and Conservation I	(3-0)3
REST	512	Theory of Restoration and Conservation II	(3-0)3

Design and Presentation

ARCH	303	Freehand Architectural Drawing	(3-2)4
ARCH	325	(Depending on the syllabus) Architecture in Situ	(3-0)3
ARCH	365	Fine Arts Techniques Workshop (Photography)	(3-2)4
ARCH	366	Fine Arts Techniques Workshop	(3-2)4
ARCH	403	Advanced Architectural Surveying	(2-8)6
ARCH	429	Pattern and Geometry in Design	(3-0)3
ARCH	441	Reading Architectural Works I	(3-0)3
ARCH	442	Reading Architectural Works II	(3-0)3
ARCH	445	Fundamentals of Design in Works of Art	(2-2)3
ARCH	450	Generative Design in Architecture	(2-2)3
ARCH	453	Construction Design Practice	(3-2)4
ARCH	462	Computer Aided Drafting and Design	(3-2)4
ARCH	463	Introduction to the Theory of Shape Grammars	(3-0)3
ARCH	465	Fine Arts Techniques Workshop I	(2-2)3
ARCH	466	Fine Arts Techniques Workshop II	(3-2)4
ARCH	470	Digital Design Studio I	(3-6)6
ARCH	472	Thinking Lines II: Constructions	(2-4)4
ARCH	475	Digital Design Studio II	(3-6)6
ARCH	477	Architectural Modeling	(3-0)3
ARCH	491	Landscape Research I	(3-0)3
ARCH	492	Landscape Research II	(3-0)3
ARCH	494	Creativity in Expressive Communication	(3-0)3

With consent of the instructor: (under the Graduate Programs)

ARCH	517	Principles of Universal Design	(3-0)3
ARCH	524	Architecture and Different Modes of Representation	(3-0)3
ARCH	524	Architecture and Different Modes of Presentation: Ortographic Set, Perspective, Axonometry, Model and Photography	(3-2)4
ARCH	543	Assessment of Interiors I	(3-0)3
ARCH	544	Assessment of Interiors II	(3-0)3
ARCH	585	Computational Design Research Lab	(2-4)4
ARCH	591	Theory and History of Landscape Architecture I	(3-0)3
ARCH	592	Theory and History of Landscape Architecture II	(3-0)3
BS	565	Computer Programming and Introduction to Architectural Applications	(2-2)3
BS	566	Computer Graphics for Architectural Drafting Purposes	(2-2)3

DESCRIPTION OF COMPULSORY COURSES

ARCH 101 Basic Design (4-8)8
Introduction to the basic concepts and principles of design. Development of visual values for design organization, form and space using a variety of elements and materials. The formal and tectonic characteristics of design. Experimental techniques of design thinking and making.

ARCH 102 Introduction to Architectural Design (4-8)8
Introduction to architectural design based on the concepts explored in ARCH101. The exploration of architectural notions and physical elements that define architectural space. Analysis and coordination of internal and external factors defining an architectural problem such as the site, program, scale, tectonics, etc. The design of small scale architectural spaces.
Prerequisite: ARCH 101

ARCH 103 Graphic Communication I (2-2)3
Furnishing the student with basic skills of graphic expression. Exercises in various presentation and

rendering techniques, orthographic, paralline, pictorial drawing and free-hand sketching.

ARCH 104 Graphic Communication II (2-2)3

Analytical study and presentation of natural and man-made environments. Analysis of part/whole, figure/ground, form/structure, mass/space, form/function relations. Emphasis given to analytical drawings of architectural forms chosen among historical and contemporary examples.
Prerequisite: ARCH 103.

ARCH 111 Introduction to Architectural Concepts (3-0)3

The course aims to introduce the student to the scope and vocabulary of architecture. Analysis of form values; space, structure and meaning; order and character of places. Environmental and cultural influences on architectural form. Design activity at different scales, in relation to conceptual and material aspects.

ARCH 112 Architectural History I (3-0)3

Major monuments and architectural development in Prehistoric (Anatolian, Egyptian, Mesopotamian, Minoan, Mycenean), Classical (Greek and Roman), Early Christian, Byzantine, Romanesque and Gothic periods.

ARCH 190 Practice in Building Construction and Surveying NC

Introduction to building materials and their simple use and application techniques (one month). Introduction to use of surveying equipment, topographic readings, measurement techniques and their applications (one month).

ARCH 201-202 Architectural Design I-II (4-8)8

Studies for the identification of the elements of architectural design and the development of a sensitivity and awareness required for valid interpretations.
Prerequisite for ARCH 201: ARCH 102.
Prerequisite for ARCH 202: ARCH 201.

ARCH 203 Digital Media in Architecture I (2-2)3

Representation and communication of architectural design using the digital media, the basic principles, tools and methods of graphic design, two dimensional drafting and three dimensional modeling using digital tools, the concepts of surface modeling and building information modelling
Prerequisite: ARCH 104.

ARCH 204 Digital Media in Architecture II (2-2)3

Knowledge and skills on building information modeling, generative design methods, parametric modeling and digital fabrication, digital skills that relate to representation, information, generation and fabrication in design
Prerequisite: ARCH 203.

ARCH 211 Architectural History II (3-0)3

This course explores architectural history between the 7th and 18th centuries in the lands Muslims ruled; and between the 15th and 18th centuries in Western Europe, corresponding to the Renaissance and Baroque periods. It concentrates on the functional, structural, cultural and geographical factors that led to the emergence and development of specific architectural products in these times and geographies.

ARCH 212 Architectural History III (3-0)3

Architecture from the 18th to the 19th century in relation to technological, cultural and urban changes; early 20th Century architecture of the avant-garde movements; modernism, post-modernism and contemporary debates in architecture in the mid- and the late 20th century.

ARCH 231 Architectural Engineering I: Statics and Strength of Materials (3-0)0

Introduction to principles of mechanics. Equivalent force systems, free body diagrams. Analysis of simple plane structures. Internal force in beams and trusses, sheer force, bending moment and axial force diagrams. Centroids and moment of inertia of sections. Introduction to stress and strain concepts. Equilibrium, compatibility and constitutive relations. Bending and shear stresses. Deflection of trusses and beams. Torsion.

ARCH 232 Architectural Engineering II: Behavior and Analysis of Structures (3-0)3

A survey of the elements influencing the behavior of structures. Use of appropriate approximate methods and structural models in the approximate analysis of columns, continuous beams, trusses, frames, arches, curved beams, plates and shells. Introduction to computer analysis of building structures.
Prerequisite: ARCH 231.

ARCH 251 Building Materials Technologies (2-2)3

Building materials and components for construction design. Building materials, products & components; assemblies & sub-assemblies. What materials are:

origins of building materials, defects and deterioration. What we do with materials: joining of materials, finishes & surface treatments. Where materials go: related, coordinated and integrated system design bringing together the structural system, the enclosure system, the cladding system, the conduit/ flow system, the environmental comfort system, the amenities system. What we expect from materials: performance factor (maintenance, compatibility, durability), selection criteria, performance specifications in terms of measurable parameters.

ARCH 252 Building Construction Technologies (2-2)3

The building materials and components forming the construction system of a structure. The fundamentals of construction design: the structural, constructional, environmental, performance and maintenance requirements for timber, steel, reinforced concrete and composite construction systems. Basic construction design considerations, application procedures and architectural detailing for the building components named as: construction under foot (foundations and floors), construction all around (walls, windows and doors), and construction overhead (roofs and ceilings).
Prerequisite: ARCH 251.

ARCH 282 Environmental Design I (3-0)3

Thermal Performance: Heat transfer, thermal insulation regulations and application in Turkey, thermal properties of building materials and their effects on thermal performance of buildings, humidity and condensation prediction, thermal comfort and its parameters, wind movement in and around buildings; Climate: Climate and climatic elements in different climatic regions as environmental factors influencing architectural design.

ARCH 290 Summer Practice (two months) NC

Building construction procedures and techniques and active participation in construction work. The student can engage in archaeological site work with the approval of the Department.
Prerequisite: ARCH 190.

ARCH 291 Landscape Design (3-0)3

The course aims to introduce landscape design process to second year architecture students by discussing major landscape design elements, concepts and principles. Arch 291 Landscape Design is a project oriented course that provides students with every stages of landscape design; site visit, observation and recording; analysis and synthesis; landscape design brief, initial ideas and conceptual diagrams; 1:500 and 1:200 scale landscape plans, sections and elevations; details; verbal and graphic presentation of a final landscape design project.

ARCH 301-302 Architectural Design III-IV (4-8)8

Analysis and design of buildings in relation to their urban context and structural form. Term projects include housing settlements, new buildings in historical environments and large span structures, with emphases on programmatic complexity, spatial variety and architectonic expression.
Prerequisite for ARCH 301: ARCH 202.
Prerequisite for ARCH 302: ARCH 301.

ARCH 312 Principles of City Planning and Urban Design (3-0)3

The course is conducted parallel with lectures and studio work. Lectures introduce students with theories on the city, analysis of its components, activities and functions, movement channels, corresponding physical form, physical structure and growth patterns, followed by a general introduction to city planning, different scales of planning, land-use plan, structural and strategic plan approaches. Particular emphasis is put on urban design theories. Students are given an urban design problem – mostly a problematic area of the city subjected to development; on which they are asked to make analyses and develop an urban design scheme.

ARCH 331 Structural Design in Arhitecture I (4-0)4

Mechanical behavior of concrete and reinforcing steel. Behavior of reinforced concrete members in uniaxial compression and flexure. Reinforced concrete slab systems. Preliminary design of reinforced concrete members. General concepts in steel design. .
Prerequisite: ARCH 232.

ARCH 332 Structural Design in Architecture II (4-0)4

General review of structures: Concepts of equilibrium and stability, Structural analysis and behavior of trusses, beams, frames, arches, and cables. Approximate method of analysis of indeterminate beams and frames. Structural systems: Framed, braced /shear-walled, flat slab/plate. Earthquake safe architectural design concept: structural behavior and building code requirements. Design example.
Prerequisite: ARCH 331.

ARCH 351 Building Detail Modelling (2-4)4
Integrating the substance and systems of a building so they work together (Production Drawings): what to show; how, where, when, why and to whom. Standards, conventions, notations, practices, procedures, and phase of the virtual depiction needed to "Raise High the Roof Beam[s]…". *Partial quotation from the title of the book, 'Raise High the Roof Beam, Carpenters', by J.D. Salinger.*
Prerequisite: ARCH 252.

ARCH 381 Environmental and Building Systems (3-0)3
Solar: Solar systems, sunpatch diagrams, shadowing effects, passive solar heating and cooling buildings;
Lighting: Daylighting and artificial lighting, color in architecture;
Acoustics: Architectural acoustics, behavior of sound in rooms, noise through buildings;
Fire: Fire prevention in buildings: passive approaches in design.
Prerequisite: ARCH 282

ARCH 382 Environmental Control Technologies (3-0)3
Sanitary services: water supply, building layout and equipment, pressure requirements and zoning, active firefighting, waste water disposal, building piping, vertical transportation, equipment, active heating and cooling systems, water heating.
Prerequisite: ARCH 381.

ARCH 390 Summer Practice (two months) NC
Experience in an architectural office environment observing and participating in project development, relations of projects and implementation, and various office procedures. Student can be engaged in an archaeological excavation team upon approval of the Department.
Prerequisite: ARCH 290.

ARCH 393 Principles of Cultural Heritage Conservation (3-0)3
The course aims to provide the students of architecture with the basic knowledge and understanding of the cultural heritage and its conservation

ARCH 401-402 Architectural Design V-VI (4-8)8
Advanced architectural design and planning of buildings involving considerations of structural and functional complexity. Demonstration of a high level of creativity is expected and critical skills are necessary in situating and negotiating significantly complex architectural and urban programs at all scales in national and/or international contexts.
Prerequisite for ARCH 401: ARCH 302.
Prerequisite for ARCH 402: ARCH 401.

ARCH 452 Professional Practice (3-0)3
Office organization, financial aspects and the legal framework of the professional with emphasis on relation with project preparation and construction practice. Management aspects of the architectural practice will be dwelt on through information on professional and administrative bodies; economic and financial policies, project and construction management, as well as collaborations with other professions; Building Information Modelling (BIM) and other contemporary information and communication concepts affecting the profession.
Prerequisite: ARCH 351.

DESCRIPTION OF ELECTIVE COURSES

ARCH 303 Freehand Architectural Drawing (3-2)4
Development of skills in free–hand sketching and rendering techniques through life-drawings in studio and outdoors. Studies are supervised individually through tutorial briefs and criticism.

ARCH 322-323 Developments in Modern Art I-II (3-0)3
This course aims at familiarizing students with the art of the 20th Century through a survey of art movements, approaches and artists of the 20th Century who have helped from the contemporary understanding of art. The subject matter will not comprise of only western artists, but Turkish and other important international artists and movements will be conducted through lectures with visual material, discussions and student presentations.

ARCH 324 Thinking (Reading/Writing) on Architecture (3-0)3
The course intends to improve students' skills in the practice of thinking in terms of reading and writing by emphasizing the significance of this practice in the process of architectural production.
In a movement from simpler to complex reading and writing, it aims to acquaint students with basic and advanced strategies in the analysis, synthesis and critique of architectural texts (texts, acting as the medium through which these strategies are developed, are selected to overlap within a contextual framework and renewed each year). In this sense, the course attempts to play a preparatory

role for advanced courses on history, theory and criticism that demand these strategies intensively in the practice of thinking on architecture.

ARCH 325-326 Architecture in Situ (3-0)3
A course largely based on direct experience of built works of architecture and architectural sites in Turkey or abroad, facilitated by field studies or design workshops to be conducted by staff. Due to time to be spent far from school premises, programs for the course are offered in the Summer School, or travel periods are organized in summer or winter vacations. Expenses for travels are met by students themselves, with partial support for those held in Turkey.

ARCH 333 Mathematics in Architecture (3-0)3
It is aimed to make explicit the relation between architecture and mathematics, thus the role of mathematics is emphasized, with the new age of informatics and so called 'algorithmic thinking' then computation in design' questioned in the architectural design. The concepts of 'sets' and then 'functions-relations' are used in throughout the course in order to establish a base for further discussions on mathematical modeling, parametric modeling and computation modeling etc in relation with algorithmic thinking and design computation.
Following this, first issues related to form geometry and structural stability/materials are re-experienced by forcing students to perceive the 'design problem' as a whole from the very beginning and instead of designing the final product, they are expected to design the process. Isometries, similarities, linear and non linear-systems, fractals etc. are some of the mathematical tools used in this inquiry.
Finally, thinking and designing in n-dimensional space, mapping from one domain to another is studied in relation with mathematics and information technologies.

ARCH 344 Environment and Man: Cause and Effect (3-0)3
"How Environment and Man relate. Basic phenomena of their domains. Conditions of their co-existence: interrelationships and interactions. Concepts and manifestations of "shelter". The continuum of time and space. Needs, activities, and responses. Activity locations and boundaries. Attributes of Man: Anthropometrics and ergonometrics. Space and the built environment: Definitions and attributes. Environmental information for Man's continued survival.

ARCH 361 Integration of Building Systems in Architectural Design for Environmental Control (3-0)3
This course aims to develop an awareness on environmental issues and their close relation with architectural design. Building systems in architectural design in terms of environmental control and technology; environmental issues; the responsibility of architects for preserving and improving environment; basic building systems (active and passive); environmental control as an integral part of architectural design, environmental control policies, and legislations are studied. Integration of these systems and principles in architectural design process starting from the very beginning and their potentials for innovative design solutions are discussed. State-of-art technologies for environmentally friendly systems/solutions and their applications in architectural design are investigated through several examples encountered in built-environment.

ARCH 365-366 Fine Arts Techniques Workshop (3-2)4
To familiarize the student with potentialities of the adjustable camera. Terminology concerning the topic. Accessories and their function. How to look consciously to see. Seeking for a message in the picture. How to adjust the instrument to get the required result. Darkroom practice. Color and black and white photography.

ARCH 371 Information Architecture (3-0)3
This course will be a study on the methods of organization of information, building informational structures, which will enable the audience to interpret this information, on their journey from data to wisdom. Making the complex clear, Information Architecture is the 21st century professional occupation addressing the needs of the age focused upon human understanding.

ARCH 395 Theory of Conservation (3-0)3
Basic concepts of theory of conservation. Historical background, contemporary international regulations, charters, declarations. Terminology in conservation.

ARCH 397 Seminar in Conservation I (3-0)3
Basic concepts of architectural scale. Types of cultural property. Characteristics of traditional residential architecture in Anatolia.

ARCH 398 Seminar in Conservation II (3-0)3
Definition of different fields of specializations those take part in conservation studies. Varying topics such as urban archaeology, documentation,

architectural identity of settlements, tourism/conservation relations.

ARCH 403 Advanced Architectural Surveying (2-8)6

Aims to give a comprehensive understanding of the methodology followed in the preparation of conservation, reutilization project for traditional dwellings. Focuses on providing knowledge on the methods of making a thorough measured and descriptive survey of a building by means of various techniques; analysis and evaluation of the building according to the different aspects; conservation and reused proposal at the end.

Practical exercises are carried out on the site.

ARCH 405 Design in Restoration (4-8)8

The course concentrates on the traditional dwellings in Turkey. The main focus is on the timber frame dwellings. The course aims to teach the methods and techniques of documentation including graphical, verbal and visual documentation on a specific case. The analysis of a traditional dwelling is followed by research and preparation of restitution projects. The discussion on the problems of traditional residential architecture within the framework of restoration / preservation leads to the preparation of restoration projects.

All phases are supplemented by written reports. *(Preparatory course for M.S. in Restoration and Preservation)*

ARCH 407 City in Late Antiquity and Byzantium: Topography and Architecture (3-0)3

This course intends to introduce students to the field of Late Antique and Byzantine architecture and topography through a survey of major Early Christian and Byzantine cities, i.e. Rome, Ravenna, Milan, Istanbul, and Thessaloniki. The course will present the basic architectural and topographical components introduced by the new political, cultural, and religious system, and explore several different factors in determining the distribution and positioning of these components into the urban topography and their relationship with the existing (Classical) buildings and functions.

ARCH 409 Perspectives in the Conservation and Valorization of Cultural Heritage (3-0) 3

Introduction to the field of conservation and its relationship with the visual arts and architecture, as well as natural and cultural sites and their associated values; history of conservation, its origins and development; the conservation of objects, paintings and architecture. Existing theories and perspectives on conservation, current definitions of cultural heritage, tools and methodological approaches to the conservation and valorization of cultural heritage.

ARCH 410 A Survey on Architectural Culture: From the Neolithic to the Modern Period (3-0)3

This course aims to introduce the general history of architecture through a brief survey, by underlying: urban patterns and social role of architecture; form and meaning; structure and building technology; materials and ornament. The course outline is mainly chronological from the Neolithic to the Modern period. The focus is the architecture of the Middle East and the Mediterranean till the Modern period; the Modern period will be surveyed globally.

ARCH 413 Survey of Early Christian and Byzantine Architecture (3-0)3

Byzantine architecture throughout the east Mediterranean, the Balkans, Greece, Anatolia, and the Near East between 323 A.D. and 1453. A survey designed to familiarize students with the major monuments and themes in the history of Byzantine architecture using a contextual approach. Students to describe and analyze Byzantine buildings critically in writing and class discussions with special focus on the Byzantine churches, which are the buildings to have survived the most, while fortifications, civic infrastructures, monasteries, palaces, castles and houses will also be discussed.

ARCH 415 Fundamentals of Site Planning (3-0)3

Studies the techniques of site planning in four parts. Starts with an analysis of the main physical site elements, continues with the analysis, relation and location of activities on a site. Alternative choices for vehicular and pedestrian circulation systems are studied in the third section. The architectural design elements of site design, criteria for the evaluation of good site design, and practical know-how on site design constitute the fourth section.

ARCH 416 Architects and Patrons (3-0)3

Aims at developing awareness in the determinative role of the relationship occurring between the architect and the patron in the careers of architects. A concise survey of some distinct cases throughout history to understand how this relationship evolved. Focusing on the forms of patronage in relation to architecture as profession, autonomy and authorship of the architect, construction of self and identity within the social process of an architectural project.

ARCH 417 The Limits of Architectural Criticism (3-0)3
Mapping cultural/positional differences between and across different forms of architectural criticism. A critical survey of significant architectural critics, magazines and representations.

ARCH 418 Case Studies in Architectural Criticism (3-0)3
A critical survey of selected themes, concepts, buildings and architects concerning contemporary architecture. Students are encouraged to take an active role and engage in architectural criticism/ activities.

ARCH 419 Pre-Classical Architecture of Ancient Anatolia (3-0)3
An undergraduate survey focusing on the history of architecture of Anatolia from the Neolithic Period to the end of Iron Ages in chronological order: Architecture of the Neolithic Period, Early Bronze Age Troy, Assyrian Trade Colony Period, Hittite Empire, and the Kingdoms of Lycia, Phrygia and Urartu. It is to provide students with a general knowledge of different architectural traditions on Pre-Classical Anatolia; to acquire a basic understanding of Anatolian Pre-Classical architectural traditions as well as to have a basis for further studies in history of architecture.

ARCH 420 Architecture and Politics in 20th Century Italy (3-0)3
Italian Architecture displays an unbalanced position within architectural history scholarship. The tremendous interest directed to the architecture produced on this land in Antiquity or between 14th and 18th centuries dissolves when more recent times are at issue. In reality both the architectural production itself and the architectural discourses flourished in Italy in the 20th Century show great variety and immense intellectual depth not easily matched elsewhere. In this course we try to acquaint ourselves with this rich architectural culture that has affected the 20th Century Western architectural scene in many ways. With this aim Italian architectural production of this century is scrutinized vis-à-vis different problematic such as tradition/innovation, realism/surrealism, and by situating architecture within Italy's socio-political conjuncture(s).

ARCH 421 Architects and Architectural Practice in History (3-0)3
Status of architects, and other professionals involved in building, both in the west and in the east, from antiquity to the end of the nineteenth-century. Verbal and visual sources and other documentary evidence on the education of architects in different times and places. Tools used in architectural practice, drawings and models, other tools for modification and particular signs for identity. Position and status of architects in the society, working conditions, corroboration with the patrons.

ARCH 422 Classical Antiquity in Asia Minor (3-0)3
Architectural developments in Anatolia during the classical age will be covered with a contextual approach. Indigenous traditions in construction and building types will also be considered to stress the Anatolian contribution and the resulting synthesis in the material evidence of Greek and Roman civilizations, with particular attention to Western Asia Minor.
Prerequisite: ARCH 112.

ARCH 423 Domestic Architecture in Antiquity (3-0)3
Development of domestic architecture in the ancient Greek and Roman periods are covered in a contextual approach. Architectural organization of houses are presented in relation to ancient daily life and social practices.

ARCH 425 The Cultural Context of Art and Architecture (3-0)3
This is an audio-visual course which analyses the socio-economic, political and cultural background of important works of art and architecture and their interrelation with other aesthetic achievements during a given period, so as to induce in the student an analytic understanding of a particular artistic and aesthetic milieu as an indivisible entity. The course will be conducted through lectures aided by video films, slides, audio cassettes and discs.

ARCH 426 House and Daily Life in History (3-0)3
The course covers the developments in the domestic architecture and daily life before the 20th century. Changes, continuities and transformations in the meaning, use and form of the houses and domestic spaces as well as those in the conception of private sphere and privacy are covered in thematic sessions.

ARCH 427 Studies in Greek Architecture (3-0)3
The course deals with various approaches and viewpoints in the study of Greek architecture through selected readings. Class discussions are based on specific topics and themes such as the evolution of the Greek temple. Active oral participation in the course is mandatory.

ARCH 428 Twentieth Century Architecture in Turkey (3-0)3

The course surveys and evaluates major developments in architecture during the twentieth century in Turkey. The objective is to examine the stylistic, technological, typological, urban and professional transformations in contemporary architectural production with reference to the frames of nationalism, internationalism, modernization and globalization.

ARCH 429 Pattern and Geometry in Design (3-0)3

Review and learning basic geometric forms and their relationships. Study of geometric patterns, their criteria and analysis of existing examples with specific emphasis on historic Anatolian examples. Exercises in creating new geometric patterns by using the rules developed in the existing patterns.

ARCH 430 Seminar in Contemporary Architecture (3-0)3

The course addresses the current developments and debates in contemporary architecture through thematic lectures. It highlights the diversity and covers a multitude of critical discourses, experimental practices and case studies that challenged architecture after the WW2. Selected themes provide an insight into the key concepts, actors, institutions, products and projections that formed the architectural agenda in particularly the last three decades.

ARCH 436 Studies in Roman Architecture (3-0)3

A critical survey of the major developments in the history of Roman architecture in Rome and the provinces. Adaptation and evolution with regard to the Roman architectural revolution. *Prerequisite: ARCH 435*.

ARCH 438 Design of Steel Structures (3-0)3

Principles of basic design concepts. Definition of loads (dead, live, wind, snow and earthquake loads). Material characteristics of steel. Behavior of individual elements, tension members, compression members, beams and columns. Types and behavior of connections, connection design and details. Use of steel in architectural design. Behavior and analysis of large span steel structures.

ARCH 439 History of Modern Structural Engineering (3-0)3

A historical survey of the development of modern structural engineering with active participation of the students. Discussion of the merits and sources of modern structural products concerning industrialization and invention of modern structural materials. Study of objective aesthetic values of great builders such as Telford, Eiffel, Roebling, Nervi, Saarinen, Maillart, and Freyssinet. Interrelation between structural design criteria and architectural design principles.

ARCH 440 Masterworks of Medieval Architecture in East and West (3-0)3

This course investigates masterworks of Islamic and Christian architecture in medieval age. Selected monumental buildings are analyzed in terms of their structural, formal and stylistic features. The course is constructive in creating an overall view about the cultural and historical contexts wherein monumental buildings were produced, and in providing basic knowledge on design methods in medieval age. Students will be acquainted with the main creative impulses in different epochs and realms of medieval architecture.

ARCH 441-442 Reading Architectural Works I-II (3-0)3

Addressed to question a common ground for reading works of art and architecture referring to certain philosophical arguments-perceiving architecture as art, as a cultural product, not only a built product but also a product of thought and ideas. Theory of Regionalism will help to clarify the historical and intellectual reasoning in the gradual formation of today's attitudes in reading and understanding of architectural works.

ARCH 443 Environmental Aesthetics I (3-0)3

A theoretical course conducted in discussions on assigned readings and research. Aims to introduce students to environmental concerns and issues of aesthetics related to the environment and to social and urban experiences. Apart from the discussions, students are asked to submit papers related to the environment, short stories, drawings and visual documentation.

ARCH 444 Environmental Aesthetics II (3-0)3

A studio course in applied environmental art, based on the theoretical background of ARCH 443. The course aims to sensitize students towards environmental values through direct contact and projects which investigate meaning and form, and potential of objects and new materials.

ARCH 445 Fundamentals of Design in Works of Art (2-2)3

A course on comparative analysis of different forms of expression (literature, performance arts, cinema,

music, etc.) on the basis of basic design principles. Discussion of compositional characteristics in works of art. Exploration of the similarities and differences between processes of creation. Understanding of space through selected media.
Prerequisites: ARCH 101-102 or ID 101-102 or CP 101-102.

ARCH 447 Ethics and Morality in Architecture (3-0)3
The course aims to develop a sense of professional morality and critical-ethical reasoning, by transferring a multi-dimensional knowledge about various approaches in ethics, through selected texts by leading philosophers on ethics, as well as on epistemology and ontology. Examples from professional and personal life experiences will be cases to work on.

ARCH 448 Issues and Problems in "Modernism" (3-0)3
In this course the complex relations between the Western architectural production of early twentieth century and its material and intellectual contexts is explored. We start by delving into the concepts of "aesthetic modernism" and "social modernity." After setting the scene through an analysis of social, economic and intellectual background of what come to be known as "Architectural Modernism", each week the course focuses on specific (architectural) productions and problems with the aim of acquainting the students with different "modernisms" as well as cases that deviate from the "Modernist" norms.

ARCH 449 Nineteenth Century Architecture (3-0)3
A survey on 19th Century in the "West" and the Ottoman Empire within a cross-cultural framework. Western architectural discourses, the state of architecture and of engineering, i.e. historicism vs. progress, the notions of "Orientalism" on the one hand and "Westernization" on the other, and the great organizational, topological, stylistic and technological transformations in Ottoman architecture of the last century, form the main topics of the course.

ARCH 450 Generative Design inArchitecture (3-0)3
This course presents concepts of generative design in architecture across various scales and disciplines from arts to computer science. The students are to develop a creative and analytical understanding of generative models by implementing various methods and tools in their own design projects. Computational and algorithmic thinking will be the central element through which the relevant topics will be explored and applied.

ARCH 451 Buildings During Use: Post-Occupancy Evaluation (3-0)3
Introduces building evaluation during different stages of use. Focuses on Post Occupancy Evaluation as a feedback mechanism. Defines the background and concepts reaching to a framework of POE. Initiates basic evaluation techniques and tools.

ARCH 453 Construction Design Practice (3-2)4
Organizing the basic construction systems consisting of structure, enclosure and cladding systems. The joints and interfaces where/how these systems come together. Fundamental concerns of construction design: thermal, acoustic, moisture, movement & fire control requirements; precipitation discharge & proofing. The production of proper point & system details considering material specifications & performances. Putting all together from the ground up: typical component assemblies (foundations, floors & walls); considering site practices & procedures

ARCH 454 Problems of Traditional Building Materials (3-0)3
Introduces the properties, the major deterioration and conservation problems of common traditional building materials such as stone, brick, mortar, plaster, etc. Case studies concerning the monuments to make the student acquainted with the research on the diagnosis of the problems and organization of the proper conservation work in relation to the current state of knowledge in the field of Material Science in conservation.

ARCH 456 New Building Technologies (3-0)3
Presentation of special construction techniques and equipment in building activities. This lecture course aims to present an over and view of large scale construction activities from feasibility studies to construction, erection, monitoring of special structures.

ARCH 457 Introduction to Deterioration and Conservation (3-0)3
Introduction to historic structures and materials. Introduction to the characteristics of traditional materials, such as stone, brick, mudbrick, timber, mortar, plaster, and their deterioration. Types of decay and their possible causes in historic structures or sites. Diagnostic and monitoring studies on the problems of historical structures, such as dampness, soluble salts, air pollution, biodeterioration.

Introduction to conservation by means of some case studies.

ARCH 458 Understanding Tectonics (3-0)3
An advanced tutorial study on outstanding examples of architecture. Analysis of selected works. Aims at an understanding of construction techniques, materials and detailing, as well as the cultural and spiritual intentions of the architect.
Prerequisite: ARCH 352.

ARCH 460 Appropriate Technology (2-2)3
The course objectives are to introduce students to a world-wide range of architectural concepts, focusing on appropriate and affordable solutions, in terms of choice of materials and technologies, to the extensive needs of the underdeveloped, developing and developed world. The relevance of appropriate technology in certain current global issues, such as sustainability and ecological concerns, will be considered.

ARCH 461 Computer Literacy in Architecture (3-2)4
An introduction to computer basics. Both theory and practice of operating systems, word-processors, spread-sheets and data-base programs are covered to provide an understanding of state-of-art of the computer technology.

ARCH 462 Computer Aided Drafting and Design (3-2)4
The purpose of the course is to introduce computer aided graphics applications. Two dimensional and three dimensional representation techniques are presented. Drawing, rendering, animation programs are covered. Students are expected to fully represent a project in computer environment.
Prerequisite: ARCH 461 or consent of instructor.

ARCH 463 Introduction to the Theory of Shape Grammars (3-0)3
A lecture course that focuses on the theory of shape grammars (Stiny and Gips, 1975); seeks to provide a critical perspective to quantitative and symbolic computations, and encourage design students to apply visual and spatial thinking in computation; aims to give basic knowledge of shapes and visual computation.

ARCH 465 Fine Arts Techniques Workshop I (2-2)3
A basic course of drawing and/or pointing to develop students' ability to see, understand and express in visual objects in space.

ARCH 466 Fine Arts Techniques Workshop II (3-2)4
A basic course of drawing and/or pointing to develop students' ability to see, understand and express in visual objects in space.

ARCH 467 Design Methods (3-0)3
The course focuses on definitions of design and different methods to define and solve design problems. An overview of quantitative methods, such as decision theory and optimization; qualitative methods, such as decision trees and pattern languages are discussed. Methods that help in finding creative solutions, such as brainstorming and synectics are covered.

ARCH 470 Digital Design Studio I (2-4)4
A design research studio. Architectural representation medium will be questioned as an architectural thinking environment. A workshop on abstraction and folding techniques in model making. Relation between model making and digital thinking. Emphasizing the different paradigms of digital design. Introducing an high-end software. Designing thematic and conceptual environments to reveal the enriching relation between the digital and tectonic worlds.

ARCH 472 Thinking Lines II: Constructions (2-4)4
This course is the studio work of ARCH 471-Thinking Lines I. It aims at questioning the relation between architectural representation and architecture by a series of weekly projects both in paper and digital medium. Through the following questions students will be asked to rethink the instrumental character of lines and to develop a further consciousness for architecture: Are lines just tools or more than that? How distant and close are lines and architecture? Are we as architects familiar enough with the nature of the environment that we think through? By coming closer to lines can we come closer to architecture? Can we release the further possibilities of space and architecture by developing a consciousness to what stands closer to us?

ARCH 473-474 Architect's Market Structure I-II (3-0)3
This course aims to prepare the senior students to the market conditions that they will experience after graduation: Defines the role of the architect through economic, social and cultural parameters of the market structure; investigates the rules and regulations affecting the architect's services in both the private and the government sectors.

ARCH 475 Digital Design Studio II (3-6)6
An advanced design research studio. An innovative consciousness will be developed for advanced themes and topics of digital environment. Themes and topics will differ in each semester. Architectural thinking and space in relation to digital environment will be further elaborated and discussed through a design project.

ARCH 477 Architectural Modeling (3-0)3
Models have always constituted an important means of architectural representation. The goal of this course is to endorse a new awareness among architectural students in this particular mode of representation under three themes: Architectural Model as a Mode of Representation, techniques of Model Making, and Conceptual Models.

ARCH 479 Acoustical Design of Halls for Musical Performance (3-0)3
It is aimed to explore the interdisciplinary science of designing concert halls and understanding the concert experience. A collective view of concert hall design as a fusion of the arts and sciences-physical acoustics, architectural design and engineering, auditory psychology, and musical performance is introduced.
Interwoven themes of music, architecture, audience and acoustics are investigated.

ARCH 481 Design with Climate (3-0)3
The course addresses the issue of climatic considerations and their significance in the design process of the built environment emphasizing the necessity of different architecture for different climates. Definition of climatic problems, effect of topography and surrounding elements on microclimate; different climatic regions, examples of vernacular architecture are the main topics. A design project considering site selection/ topography/landscape/orientation and microclimate/ microspace in urban and rural context is the output.

ARCH 482 Conservation of Archaeological Sites (3-0)3
The course aims evaluation and discussion of architectural conservation, planning and management on archaeological sites within international theoretical approaches and national laws. Concentrates to historical evolution of archaeological activities; the methods and techniques of excavation and survey, analyse and assess archaeological sites in terms of the conservation problems, interventions and conservation methods.

ARCH 483-484 Energy Considerations in Architecture I-II (3-0)3
Energy structures, centralized and decentralized energy systems. Future energy systems. Thermal comfort, heating forms and space use, consumer's control of heating. Heat flow through buildings, review of related regulations. Heat load coefficient, shape and thermal performance of buildings. Management of heating systems, energy accounting. Energy conservation projects, solar heating systems.
Prerequisite for ARCH 484: ARCH 483

ARCH 489 Lighting in Architecture (3-0)3
Lighting requirements, recommended illumination and luminance levels, illumination distribution on interior surfaces, illuminance and luminance measurements. Artificial lighting design: Lamps and luminaires, direct lighting, recessed lighting, diffused lighting. Daylighting design: Design skies, design-based exterior illuminance levels, daylight factor method of interior illuminance level calculation, window design, worked examples.

ARCH 491-492 Landscape Research I-II (3-0)3
The courses aim to develop a general appreciation and knowledge on landscape issues by introducing various concepts, contexts and states of landscape architecture and design. "Landscape Research I & II" intend to reveal landscape as a natural, cultural and aesthetic phenomenon; not only as a technical issue. The courses cover a series of lectures and a research period that includes students' works on a specific landscape topic.

ARCH 494 Creativity in Expressive Communication (3-0)3
This course aims to improve communication skills of students. It is expected that, through this course, students will gain awareness of the other facets of communication such as body language, mimicry, posture. During the course, by practical exercises, students will learn to tackle possible communicative problems of professional life.

ARCH 495 Legal and Administrative Aspects of Conservation (3-0)3
The legal and administrative aspects of preservation of cultural heritage. Comparison of various laws and regulations related with preservation, development and environment. The characteristics of governmental (central and local) and non-governmental bodies dealing with preservation.

ARCH 497 Selected Topics in Conservation (3-0)3
Recent development of conservation and Implementation Plans in Turkey. Introduction and

discussion of various concept and problems of conservation and implementation on selected specific examples of conservation plans and projects in Turkey and Foreign countries.

ARCH 498 Workshop in Conservation (2-4)4
To introduce historic sites, their characteristics and problems to the students. Includes analysis and evaluation of the problems of conservation in different scales in a historic area.

MINOR PROGRAM IN CONSERVATION

ARCH 395 Theory of Conservation (3-0)3
Basic concepts of theory of conservation. Historical background, contemporary international regulations, charters, declarations. Terminology in conservation.

ARCH 397 Seminar in Conservation I (3-0)3
Basic concepts of architectural scale. Types of cultural property. Characteristics of traditional residential architecture in Anatolia.

ARCH 398 Seminar in Conservation II (3-0)3
Definition of different fields of specializations those take part in conservation studies. Varying topics such as urban archaeology, documentation, architectural identity of settlements, tourism/ conservation relations.

ARCH 495 Legal and Administrative Aspects of Conservation (3-0)3
The legal and administrative aspects of preservation of cultural heritage. Comparison of various laws and regulations related with preservation, development and environment. The characteristics of governmental (central and local) and non-governmental bodies dealing with preservation.

ARCH 497 Selected Topics in Conservation (3-0)3
Recent development of conservation and Implementation Plans in Turkey. Introduction and discussion of various concept and problems of conservation and implementation on selected specific examples of conservation plans and projects in Turkey and Foreign countries.

ARCH 498 Workshop in Conservation (2-4)4
To introduce historic sites, their characteristics and problems to the students. Includes analysis and evaluation of the problems of conservation in different scales in a historic area.

MINOR PROGRAM IN ARCHITECTURAL CULTURE

ARCH 111 Introduction to Architectural Concepts (3-0)3
The purpose of the course is to introduce the student to the scope and vocabulary of architecture. Study of the design activity at different scales and levels of space; order and character of places. Analysis of form, structure, use and meaning; physical and cultural influences on architectural form.

ARCH 112 Architectural History I (3-0)3
Major monuments and architectural development in Prehistoric (Anatolian, Egyptian, Mesopotamian, Minoan, Mycenean), Classical (Greek and Roman), Early Christian, Byzantine, Romanesque and Gothic periods.

ARCH 211 Architectural History II (3-0)3
This course explores architectural history between the 7th and 18th centuries in the lands Muslims ruled; and between the 15th and 18th centuries in Western Europe, corresponding to the Renaissance and Baroque periods. It concentrates on the functional, structural, cultural and geographical factors that led to the emergence and development of specific architectural products in these times and geographies.

ARCH 212 Architectural History III (3-0)3
Architecture from the 18th to the 19th century in relation to technological, cultural and urban changes; early 20th Century architecture of the avant-garde movements; modernism, post-modernism and contemporary debates in architecture in the mid- and the late 20th century.

3 elective courses approved by the Department of Architecture (selected from four groups of elective courses, each from a different group.

GRADUATE PROGRAMS AT THE DEPARTMENT OF ARCHITECTURE

The graduate programs leading to the degrees of M.Arch., M.S. in Restoration, M.S. in Building Science, M.S. Program in Computational Design and Fabrication Technologies in Architecture and M.A. in History of Architecture take a minimum of four semesters. The programs are structured to enable specialization in the options offered by the Department. The candidates for M.Arch. should have an undergraduate degree in architecture. Prior to the submission of the thesis, students are required to complete 24 credit hours (a minimum 7 courses with credit) for M.Arch. in Architecture, 21 credit hours (minimum 7 courses with credit) for M.S. in Building Science; 21 credit hours (minimum 7 courses with credit) for the M.A. in History of Architecture and 40 credit hours (minimum 10 courses with credit) for the M.S. in Restoration degrees. Courses being registered by the student should be approved by the Department.

Post-graduate studies leading to Ph.D. degrees are conducted according to the Academic Regulations of the University which prescribe relevant requirements and provisions for said degrees (See: Academic Regulations).

Master of Architecture Program

The M.Arch. program endows the graduate student with the knowledge of the social, political, economic, geographic and professional contexts of architecture and an awareness of the social and environmental consequences of design decisions. Graduate candidates are expected to acquire an adequate knowledge of the history and theories of architecture and related arts, technologies and human sciences, a critical awareness of current paradigms, issues and themes of present day architectural debates and the ability to use them in individual research. The graduate program in Architecture is involved with processes concerning the creation, representation, application and dissemination of knowledge and offers various graduate theory and research courses, as well as graduate design research studios. Elective courses cover a wide range of research interests and orientations supported by the diversity and the versatility of the staff profile, with extensive teaching experience both in studio and theory courses.

The program's resources have recently been mobilized and restructured under different research tracks in order to foster the existing strengths of the program and to nurture and encourage the development of emerging research agendas and structures brought forth by new priorities and challenges in architectural research. Built upon a clear diagnosis and awareness of global educational and research priorities and emergent fields, these non-compulsory research tracks offer graduate students the possibility to pursue their individual research agendas along different research orientations offered by the Department. The program is structured around an integrated curriculum which links and networks both the different tracks of the M.Arch. program and the four graduate programs of the Department to encourage the involvement of the graduate student with heterogeneous research, learning and design communities. Flexibility within and across the programs is hence encouraged to contribute to the improvement of quality and effectiveness in education, leading to adaptive curricula, which prove especially significant within the context of the currently operating reform in architectural education to align with the goals of the Bologna Process and the European Higher Education Area.

Existing and Evolving Research Tracks

Architecture, Theory and Design
- Architecture, Society And Culture
- Architectural Design Research and Research by Design, Architectural Design Strategies

Urban Architecture

Architecture and Environment
- Sustainable Architecture: Green Design, Community Design and Universal Design in Architecture
- Landscape Architecture
- Landscape Research

Computational Design

Qualifications and Competences of the Graduates

Graduate candidates are expected to develop skills in the design and planning of creative research projects and in the application of their problem-solving skills in new and unfamiliar environments and in multi-disciplinary contexts related with the built environment. Candidates should display outstanding communication skills in both written, oral and graphic forms and the ability to work with autonomy, while also to collaborate, network and build relationships both at individual and institutional levels, with colleagues, peers and various scholar communities from different professional backgrounds. A good level of English language, as well as time management and organizational skills are considered essential to the successful completion of the program.

Master of Science Program in Building Science

This is an interdisciplinary program open to all candidates holding a Bachelor's Degree in architecture, restoration, engineering or industrial design. The aim of the program is to establish an interface between the systematic findings of 'science' and the creative aspirations of architecture by instilling a grasp of how the former looks at the same world in which the latter performs. A highly worthwhile endeavor in view of the fact that architecture is essentially a net 'borrower' of knowledge from the annals of science: Some from the physical sciences (*e.g.*, mechanics, optics, thermodynamics, acoustics, electricity, geology, geography, meteorology, hydrology, astronomy, *et al.*); some from the social, behavioral and administrative sciences (*e.g.*, psychology, sociology, anthropology, history, economics, management, *et al.*) and others yet from the life-sciences (*e.g.*, plant and animal ecology, environment management, hygiene, pollution control and containment, sewage treatment, *et al.*). However, a great deal of controversy arises when 'science', delving into ever-broadening domains that increasingly encroach on those of architecture, ever more frequently makes disturbing and high-handed proclamations about what architecture should and should not do, with practically no idea about the technical, temporal and/or financial complications which these would entail if carried out as demanded. Needed, therefore, is a kind of 'half-and-half' professional: One with a background to a lesser or greater extent involved with the built environment, who is at the same time well-versed in the outlooks, approaches, motivations and methodologies of the scientist; one who, by way of being conversant in both languages, can carry the concerns of one to the other so they converge on some common ground. Put in a nutshell, this, then, is the job cut out for our graduates...

In more specific terms the program looks into the many-faceted aspects of concerns like building management efficiency, construction systematics, computer aided design and manufacturing technologies in architecture, computer-based library for construction detailing, function-systematics, function-specific spaces, energy in building design, integrated mechanical systems, building system design for sustainability, structures, lighting, environmental and room acoustics, thermal performance of buildings, computer modeling and simulations, project and construction management, *etc.*

Master of Science Program in Restoration

The M.S. Program in Restoration is aimed at training graduate students with specialized skills for the conservation and preservation of historic monuments and sites. These include all the theoretical and practical background and the techniques necessary to conserve, restore and manage historic buildings, parts or the whole of historic towns and areas, and archaeological sites. The increase in scientific and cultural interest and the economic emphasis due to tourism have led to greater attention to this field. The curriculum aims at providing a multidisciplinary educational environment in accordance with the multidisciplinary nature of conservation. The students are introduced with the necessary approaches, methodologies, and tools orientated toward the conservation of cultural properties at various scales within the framework of conservation theory and principles, and educated to gain the skills for defining and solving related problems. They also get familiar with the materials and techniques of restoration by laboratory experience. Admission is open to all candidates holding a Bachelor's Degree.

Master of Art Program in History of Architecture

The M.A. Program in History of Architecture provides training in different periods and geographical areas of architectural culture and built environment, aiming to equip its graduates with the requisite knowledge, research skills, and initiative to engage in innovative scholarship at both international and national

levels. Research interests and disciplinary backgrounds of the faculty cover various fields of history and theory of art and architecture. The program is affiliated with the Department of Architecture and is offered within the Institute of Social Sciences.

There is no disciplinary limitation for the applicants, but applications from the graduates of architecture and related fields in design, fine arts, humanities and social sciences are especially invited. Applicants from all fields are required to demonstrate their interest in and familiarity with architectural history through transcripts, a portfolio and a letter of intent, as well as satisfactory performance in entrance examinations. Proficiency in English is required of all applicants. Accepted students may be asked to attend a preparatory program.

Master of Science Program in Computational Design and Fabrication Technologies in Architecture

Developments in information and communication technology have an impact throughout the entire life cycle of a building, not only from a process and technical point of view but also from a creative design and materialization point of view. The rise of spatial modeling and form creation techniques enables architects to deal with forms that previously could barely be drawn or built, and that require non-standard engineering and construction methods for their materialization. Therefore, the exploration and adoption of new techniques and methods for design and manufacturing, including parametric design approaches, performance-based design approaches and digital manufacturing techniques, are necessary.

Parametric design enables the exploration of alternative designs within a single representation using parameters and associative relationships to control geometric and constructive aspects of the design. In performance-based design, performance goals with respect to various aspects, such as comfort and structure, are explicitly developed and updated during the design, and assessed and guarded throughout the design process. Digital manufacturing enables innovative design exploration through physical prototyping during the design process, and mass-customization of non-standard architecture towards industrialization in a cost-effective manner.

The Master of Science Program on Computational Design and Fabrication Technologies in Architecture focuses on Computational Design and Fabrication Technologies in Architecture with the goal of teaching cutting-edge design technologies and new design tools as well as new design paradigms in architecture. Students are expected to be fully adequate in research and have a background to follow up new design technologies and to enrich research and design in the field of architecture as explained in the vision above.

Ph.D. Programs

Ph.D. Program in Architecture

To be eligible for admission to the Ph.D. program, candidates are required to have successfully completed a Masters degree in Architecture (M.Arch.) from METU or an equivalent institution. The Ph.D. program in Architecture lasts a minimum of eight semesters. Degree requirements consist of formal coursework of a total minimum credits of 27 (2 required courses and 5 elective courses approved by the Department of Architecture), a proficiency exam, a substantial Ph.D. dissertation and its defense. Prior to the submission of the dissertation proposal, candidates must have selected a thesis supervisor who aligns with their research interests.

The Ph.D. program in Architecture aims at enhancing scholarship in the fields of theory, design, knowledge and representation. It endows the doctoral student with the knowledge and skills and the development of appropriate ways of thinking and production required to cope with the growing complexity of contemporary research projects. Original and significant scholar contribution to the field is expected, as well as versatility in dealing with research projects of an interdisciplinary or technocentric nature. The formal coursework presents and investigates different epistemological, methodological or representational frameworks and scientific approaches used in the discipline and in other human or physical sciences and deals with the problems of integration, representation and communication of knowledge. Elective courses develop awareness of current issues and topics in architectural debates and of the complex socio-cultural, economic and technological issues shaping contemporary architectural discourse and practice. A critical understanding and

reinterpretation of the most recent theoretical debates and paradigms in architecture and in related fields and disciplines, as well as an effective consciousness of the social, historical and epistemological contexts of research is considered as a substantial part of doctoral research. The program endows the doctoral candidate with an awareness of the moral and ethical issues in scientific inquiry, competence in the synthesis and integration of knowledge in real world situations and the development of an ethos to this end.

Considering that the majority of doctoral candidates are interested in future academic careers, career planning is also on the agenda. The program provides for training both in research and teaching, attracting future academics nationwide to experience the research culture and scholarship developed there.

Existing and Evolving Research Tracks

Architecture, Theory and Design
Architecture, Society and Culture
Architectural Design Research and Research by Design, Architectural Design Strategies
Urban Architecture
Architecture and Environment
Sustainable Architecture: Green Design, Community Design and Universal Design in Architecture
Landscape Architecture
Landscape Research
Computational Design

Qualifications and Competences of the Graduates

The doctoral candidate is expected to work with a high degree of autonomy, displaying high standards of scholarship and effective and creative self-curation abilities. Candidates should display outstanding skills in the definition, planning and development of their research projects, which in turn should prove relevant and significant contributions to the field of knowledge within current architectural debates. Competence in the understanding and organization of interdisciplinary and multi-disciplinary knowledge and its use and interpretation within the disciplinary field of design and architecture, as well as skills in complexity management are expected. Candidates assume professional and ethical responsibilities in research and its applications, and develop their work within the academic codes of conduct.

Ph.D. Program in Building Science

This is an interdisciplinary program open to all candidates holding at least one graduate degree in architecture, restoration, engineering or industrial design. There is a strong emphasis on the application of scientific method, from the inception, design, conduct and evaluation of a germane investigation to the universally-acknowledged format of its report; i.e., the thesis proper.

In more specific terms the program looks into the many-faceted aspects of concerns like building management efficiency, construction systematics, computer aided design and manufacturing technologies in architecture, computer-based library for construction detailing, function- systematics, function-specific spaces, energy in building design, integrated mechanical systems, building system design for sustainability, structures, lighting, environmental and room acoustics, thermal performance of buildings, computer modeling and simulations, etc.

Existing and Evolving Research Tracks

More or less by definition, the particular issues with which the program aspires to deal range over a very wide spectrum. The basic limiting factor is the number and background of subscribing staff available at any given time. Depending on depth of focus, these are necessarily considered with specific reference to one or more of the following building typologies, in so far as they admit of such:

–educational facilities/buildings (elementary, secondary and collegiate);
–healthcare facilities/buildings;
–public facilities/buildings (auditoria, sports arenas, convention/assembly/exhibition halls, museums, etc.);
–white- or blue-collar workplaces (office or industrial buildings);
–commercial facilities (malls, multi-use developments, etc.); and

–multi-unit residential buildings (condominiums, housing estates, public housing developments, etc.).

To cite a few of these in somewhat broad topical terms, the programmes look into the many-faceted aspects of concerns like:

–building management efficiency;
–construction systematics;
–building and construction safety;
–human factors concerns in building design;
–computer aided design and manufacturing technologies in architecture;
–assessment, concerns and/or provision of control over climatic factors;
–performance assessment and/or concerns regarding materials, in terms of origin, derivation and working methods, deterioration potential defects, compatibility and durability, etc.;
–assessment of and/or concerns regarding building technologies and structure;
–design requirements of function-specific spaces (building programming)
–thermal performance and energy concerns in building design;
–integrated mechanical systems and building system design for sustainability;
–environmental and room acoustics;
–computer modeling and simulations;
–sustainability and green building design and delivery;
–project and construction management;
–information and communication technologies for building life cycle; *ad infinitum*.

Ph.D. Program in Restoration

The Graduate Program in Restoration at METU was established in 1964, as the first program of its kind in Turkey, with the aim of training experts working in the field of conservation of cultural heritage; developing institutional and practical conservation processes based on scientific principles; and increasing public consciousness in this field. Since its foundation, the Graduate Program in Restoration at METU has retained its leading position in its field with its core staff who have been contributed to its being awarded as a "Center of Excellence" by TUBITAK in 1988, while in time, it has grown stronger with the new staff joining the program. The Graduate Program in Restoration at METU, with its current academic staff, research units and technical infrastructure, offers a program based on contemporary and international norms and in accordance with national, regional and international necessities and improvements in the field of conservation.

The PhD Program in Restoration is for the person who wants to make a significant scholarly contribution to the field of conservation of built environment. The candidates are expected to enhance scholarship in the field of conservation of built environment by producing new knowledge through original research. The program also provides a gateway to future academic careers. To be eligible for admission to the PhD program, candidates are required to have successfully completed a Masters program in METU or an equivalent institution. The PhD program in Restoration lasts a minimum of eight semesters. Requirements for the degree include formal coursework of total minimum credits of 24 / x ECTS credits (1 required course and 6 approved electives), a proficiency exam, a dissertation and a final defense. The students must select a thesis supervisor at the beginning of the third semester the latest, who aligns with their research interests. After completing the coursework and passing the proficiency exam, a thesis monitoring committee is set up for each student. The student presents a progress report to the committee once in every six months. The students who receive their PhD degree from this program will have:

-knowledge and systematic understanding of the field of conservation of built environment and its multidisciplinary nature;
-mastery of the skills and methods of research associated with the field of conservation;
-the capability of critical analysis, evaluation and synthesis of new and complex ideas in the field of conservation;
-the ability to conceive, design, implement and adapt a substantial process of research in the field of conservation of built environment with scholarly integrity;
-made a scholarly contribution to the field of conservation through original research that produces new knowledge.

Existing and Evolving Research Tracks

Due to the complex and multidisciplinary nature of the field of conservation, there are various subareas for research and contribution in PhD studies in the Graduate Program in Restoration at METU. Accordingly, some of the major research areas can be grouped as follows:

-Theory and History of Conservation: National and international aspects.

-Architectural Conservation: Singular or group of cultural properties including traditional residential architecture with emphasis on structural and material problems (physical, mechanical and chemical properties and mechanics of deterioration), documentation techniques, refunctioning and adaptation possibilities for contemporary requirements and restoration problems.

-Urban Conservation: Conservation, rehabilitation and management issues in historic urban sites. Research, survey, analysis, evaluation and decision-making processes in conservation of historic urban/ rural sites by considering the natural, historical, architectural, visual, socio-economical, legal, administrative, financial and managerial aspects.

-Conservation of Archaeological Sites: Conservation, restoration, interpretation, presentation and management issues in/of archaeological sites.

-Research on Historic Building Materials: Properties and weathering processes of historic materials, diagnostic studies, conservation and repair treatments.

-Cultural Heritage Recording and Information Management: Theoretical and technical aspects of documentation, recording and information management for conservation of cultural heritage

-Legal, Administrative and Economical Aspects of Preservation and Restoration of Cultural Properties.

-Architectural / Urban Design in Historic Environments.

Ph.D. Program in History of Architecture

The Ph.D. Program in History of Architecture provides training in different periods and geographical areas of architectural culture and built environment, aiming to equip its graduates with the requisite knowledge, research skills, and initiative to engage in innovative scholarship at both international and national levels. Research interests and disciplinary backgrounds of the faculty cover various fields of history and theory of art and architecture. The program is affiliated with the Department of Architecture and is offered within the Institute of Social Sciences There is no disciplinary limitation for the applicants, but applications from the graduates of architecture and related fields in design, fine arts, humanities and social sciences are especially invited. Applicants from all fields are required to demonstrate their interest in and familiarity with architectural history through transcripts, a portfolio and a letter of intent, as well as satisfactory performance in entrance examinations. Proficiency in English is required of all applicants. Accepted students may be asked to attend a preparatory program.

M.ARCH. PROGRAM

ARCH	500	M.Arch Thesis in Architecture	NC	ARCH	513	Introduction to Architectural Research	(3-0)3
ARCH	504	Seminar in Thesis Research	(0-2)NC	ARCH	8XX	Special Studies	(4-2)NC

Approved elective coursesTotal minimum credit: 24
Number of courses with credit (min): 7

M.S. PROGRAM IN BUILDING SCIENCE

BS	500	M.S. Thesis in Building Science	NC	BS	504	Research Methods in Building Science	(2-2)3
BS	501	Seminar in Building Science	(0-2)NC	BS	8XX	Special Studies	(4-2)NC
BS	503	Building Science Workshop	(2-2)3				

Approved elective courses
Total minimum credit: 21
Number of courses with credit (min): 7

M.S. PROGRAM IN RESTORATION

REST	511	Theory of Restoration and Conservation I	(3-0)3
REST	516	Heritage Recording and Information Management	(3-0)3
REST	518	Technical and Statutory Processes in Conservation of Historic Environments	(3-0)3
REST	521	Sources and Methods of Research in Conservation	(3-0)3
REST	533	Historic Structural Systems	(3-0)3
REST	555	Diagnosis and Treatment of Material Decay in Historic Structures	(3-0)3
REST	611	Seminar in Conservation and Restoration	(0-2)NC
REST	590	Summer Practice in Restoration	(NC)

2 Restricted electives*
Approved elective courses:

REST	500	Thesis in Conservation	(NC)

*For the Students with an Undergraduate Degree:
- *in Architecture:*

REST	506	Design in Architectural Conservation	(4-8)8
REST	507	Planning and Design in Urban Conservation	(4-8)8

- *in City and Regional Planning:*

REST	507	Planning and Design in Urban Conservation	(4-8)8
REST	563	Legal and Administrative Aspects of Conservation in Turkey	(3-0)3

- *in Social Sciences:*

REST	522	History of Architecture in the Middle East	(3-0)3
REST	508	Workshop in Conservation I	(3-6)6

-in Natural and Applied Sciences else than Architecture and City and Regional Planning:

REST	558	Laboratory Experiments in Conservation Science I	(1-4)3
REST	509	Workshop in Conservation II	(3-6)6

Total minimum credit: 38
Number of courses with credit (min): 9

M.A. PROGRAM IN HISTORY OF ARCHITECTURE

AH	501	Studying Architectural History	(3-0)3
		Approved Elective Courses	
AH	8XX	Special Studies	(4-2)NC
AH	504	Prothesis Seminar	(0-2)NC
AH	599	M.A. Thesis in History of Architecture	NC

Total minimum credit: 21
Number of courses with credit (min):7

M.S. PROGRAM IN COMPUTATIONAL DESIGN AND FABRICATION TECHNOLOGIES IN ARCHITECTURE

ARCD	501	Computational Design Studio	(6-3)6
ARCD	511	Research in Computational Design	(3-0)4
ARCD	500	MSc Thesis in Computational Design and Fabrication Technologies	NC
ARCD	590	Seminar in Thesis Research	NC

Total minimum credit: 24
Number of courses with credit (min):7

Ph.D. PROGRAM IN ARCHITECTURE

If admitted by M.S. degree:

ARCH	600	Ph.D. Thesis in Architecture	NC
ARCH	615	Architectural Research I	(6-0)6

Approved elective courses

ARCH	616	Architectural Research II	(6-0)6
ARCH	9XX	Advanced Studies	(4-0)NC

Total minimum credit: 27
Number of courses with credit (min): 7

If admitted by B.S. degree:

Total minimum credit: 51
Number of courses with credit (min): 14

ARCH	504	Seminar in Thesis Research	(0-2)NC
ARCH	513	Introduction to Architectural Research	(3-0)3
ARCH	600	Ph.D. Thesis in Architecture	NC
ARCH	615	Architectural Research I	(6-0)6
ARCH	616	Architectural Research II	(6-0)6

12 elective courses

Ph.D. PROGRAM IN BUILDING SCIENCE

If admitted by M.S. degree:

ARCH	615	Architectural Research I	(6-0)6

Approved elective courses

BS	9XX	Advanced Studies	(4-0)NC
BS	600	Ph.D. Thesis in Building Science	NC

Total minimum credit: 24
Number of courses with credit (min): 7

If admitted by B.S. degree:

BS	501	Seminar in Thesis Research	(0-2)NC
BS	503	Building Science Workshop	(2-2)3
BS	504	Research Methods in Building Science	(2-2)3
BS	600	Ph.D. Thesis in Building Science	NC
ARCH	615	Architectural Research I	(6-0)6

12 elective courses

Total minimum credit: 48
Number of courses with credit (min): 14

Ph.D. PROGRAM IN RESTORATION

If admitted by M.S. degree:

ARCH	615	Architectural Research I	(6-0)6

Approved electives

REST	9XX	Advanced Studies	(4-0)NC
REST	600	Ph.D. Thesis in Restoration and Conservation	NC

Total minimum credit: 24
Number of courses with credit (min): 7

If admitted by B.S. degree:

REST	511	Theory of Restoration and Conservation I	(3-0)3
REST	516	Heritage Recording and Information Management	(3-0)3
REST	518	Technical and Statutory Processes In Conservation of Historic Environments	(3-0)3
REST	521	Sources and Methods of Research In Conservation	(3-0)3
REST	533	Historic Structural Systems	(3-0)3
REST	555	Diagnosis and Treatment of Material Decay in Historic Structures	(3-0)3
REST	611	Seminar in Conservation and Restoration	(0-2)NC
ARCH	615	Architectural Research I	(6-0)6
REST	590	Summer Practice in Restoration	(NC)
REST	600	Ph. D. Thesis in Restoration and Conservation	(NC)
REST	9XX	Advanced Studies	(4-0)NC

2 Restricted electives*

Approved elective courses
- *in Architecture:*

REST	506	Design in Architectural Conservation	(4-8)8
REST	507	Planning and Design in Urban Conservation	(4-8)8

- *in City and Regional Planning:*

REST	507	Planning and Design in Urban Conservation	(4-8)8
REST	563	Legal and Administrative Aspects of Conservation in Turkey	(3-0)3

*For the Students with an Undergraduate Degree:
- *in Social Sciences:*

REST	522	History of Architecture in the Middle East	(3-0)3
REST	508	Workshop in Conservation I	(3-6)6

- *in Natural and Applied Sciences else than Architecture and City and Regional Planning:*

REST	558	Laboratory Experiments in Conservation Science I	(1-4)3
REST	509	Workshop in Conservation II	(3-6)6

Total minimum credit: 62
Number of courses with credit (min): 16

Ph.D. PROGRAM IN HISTORY OF ARCHITECTURE

AH	600	Ph.D. Thesis in Architectural History	NC
AH	601	Critical Review in Architectural History	(3-0)3
AH	602	Surveying Architectural History	(3-0)3
AH	9XX	Advanced Studies	(4-0)NC

Approved elective courses

Total minimum credit: 24
Number of courses with credit (min): 8

ELECTIVE COURSES FOR GRADUATE PROGRAMS

ARCH	505	Advanced Architectural Design Studio	(3-6)6
ARCH	508	Research Analysis and Design in Multilayered Context	(2-4)4
ARCH	511	Social and Cultural Themes in Urban Architecture	(3-0)3
ARCH	512	Advanced Studies on Urban Architecture	(3-0)3
ARCH	517	Principles of Universal Design	(3-0)3
ARCH	524	Architecture and Different Modes of Representation	(3-0)3
ARCH	526	Politics and Space	(3-0)3
ARCH	527	Advanced Topics in Digital Constructivism	(3-0)3
ARCH	543	Assessment of Interiors I	(3-0)3
ARCH	544	Assessment of Interiors II	(3-0)3
ARCH	545	Interpretation of Architectural Texts I	(3-0)3
ARCH	546	Interpretation of Architectural Texts II	(3-0)3
ARCH	547	Architecture and the Social Context of Aesthetic Modernity I	(3-0)3
ARCH	548	Architecture and the Social Context of Aesthetic Modernity II	(3-0)3
ARCH	571	Directed Studies	(1-0)NC
ARCH	585	Computational Design Research Lab	(2-4)4
ARCH	591	Theory and History of Landscape Architecture I	(3-0)3
ARCH	592	Theory and History of Landscape Architecture II	(3-0)3
ARCH	609	Advanced Themes in Architecture and Urban Design I	(3-6)6
ARCH	610	Advanced Themes in Architecture and Urban Design II	(3-6)6
ARCH	613	Critical Theories On Urban Architecture	(3-0)3
ARCH	614	Cartography of Architectural Theory	(3-0)3
ARCH	626	Issues in Architectural Research	(3-0)3
ARCH	627	Principles and Theories of Architectural Education	(3-0)3
ARCH	628	Practice and Methods of Architectural Education	(3-0)3
ARCH	671	Directed Studies	(1-0)1
ARCH	7XX	SpecialTopicsBS	

BS	509	Introduction to Construction Management	(3-0)3
BS	531	Studies in Structures	(3-0)3
BS	532	Geometrical and Morphological Analysis of Spatial Structures	(3-0)3
BS	533	Building Design: Form and Structure	(3-0)3
BS	534	Analytical Modeling and Computer Analysis of Structures	(3-0)3
BS	535	Earthquake Resistant Building Design in Architecture	(3-0)3
BS	536	Studies on Tall Buildings: Design Considerations	(3-0)3
BS	550	Building Arts and Timber	(2-2)3
BS	551	Advanced Professional Practice	(3-0)3
BS	552	Performance Assessment of Buildings	(2-2)3
BS	557	The Art and Technology of Timber Construction	(2-2)3
BS	558	Advanced Construction Management	(3-0)3
BS	561	Data and Information Modeling for Construction Informatics	(3-0)3
BS	562	Construction Informatics	(3-0)3
BS	565	Computer Programming and Introduction to Architectural Applications	(2-2)3
BS	566	Computer Graphics for Architectural Drafting Purposes	(2-2)3
BS	571	Directed Studies	(1-0)NC
BS	573	Composite Materials and Applications in Buildings	(2-2)3
BS	575	Acoustics in Architecture I	(3-0)3
BS	576	Acoustics in Architecture II	(3-0)3
BS	581	Energy Analysis of Buildings	(3-0)3
BS	583	Principles of Green Building Design and Delivery	(3-0)3
BS	587	Fire Control in Architecture	(3-0)3
BS	671	Directed Studies	(1-0)1
BS	7XX	Special Topics	

REST	512	Theory of Restoration and Conservation II	(3-0) 3
REST	523	History of Restoration and Preservation of Buildings in Turkey	(3-0)3
REST	531	Structural Analysis of Historical Buildings	(3-0)3
REST	546	Family / Dwelling Interrelations in the Traditional Residential Architecture in Turkey	(3-0)3
REST	553	Materials of Construction and Ornament in Anatolian Architecture I	(3-0)3
REST	554	Materials of Construction and Ornament in Anatolian Architecture II	(3-0)3
REST	556	The Laboratory and Conservation of Structures and Materials	(2-2)3
REST	558	Laboratory Experiments in Conservation Science I	(1-4)3
REST	559	Laboratory Experiments in Conservation Science II	(1-4)3
REST	561	Architectural Photogrammetry	(3-0)3
REST	571	Directed Studies	(1-0)NC
REST	645	Issues in Conservation I	(3-0)3
REST	646	Issues in Conservation II	(3-0)3
REST	647	Research in Historic Environment I	(3-0)3
REST	648	Research in Historic Environment II	(3-0)3
REST	655	Issues in Restoration I	(3-0)3
REST	656	Issues in Restoration II	(3-0)3
REST	657	Research in Vernacular Architecture I	(3-0)3
REST	658	Research in Vernacular Architecture II	(3-0)3
REST	671	Directed Studies (1-0)1	
REST	675	History of Traditional Materials and Techniques I	(3-0)3
REST	676	History of Traditional Materials and Techniques II	(3-0)3
REST	685	Conservation of Materials I	(3-0)3
REST	686	Conservation of Materials II	(3-0)3
REST	7XX	Special Topics	

AH	513	Aesthetics and Criticism I	(3-0)3
AH	514	Aesthetics and Criticism II	(3-0)3
AH	520	Topics on Urban Form, Patterns and Architecture	(3-0)3
AH	521	Themes on Ancient Domestic Architecture	(3-0)3
AH	522	Byzantine Architecture: The Art and Architecture of Byzantine Cappadocia	(3-0)3
AH	526	History and Theory of Art and Architectural Styles	(3-0)3

AH	533	Ottoman Architecture in the Nineteenth Century Architecture	(3-0)3	AH	547	Theories of History II	(3-0)3
AH	534	Seminar in Contemporary Architecture	(3-0)3	AH	612	Imperial Architecture of the Ancient Near East	(3-0)3
AH	535	Approaches in Greek Architecture	(3-0)3	AH	654	Framing the Past, Ruins and Architectural History	(3-0)3
AH	536	Approaches in Roman Architecture	(3-0)3	AH	655	Spaces and Practices of Displaying the Past	(3-0)3
AH	539	Cosmological Thought and Architecture in the Middle East	(3-0)3	AH	668	Seminar in Classical Ottoman Architecture	(3-0)3
AH	541	Ottoman Architecture in the Eighteenth Century	(3-0)3	AH	670	Architectural Books of the Italian Renaissance	(3-03)
AH	543	Anatolian Seljuk Architecture (11-14th Centuries)	(3-0)3	AH	671	Historiography of Renaissance Architecture: Shifting Geographical Boundaries	(3-0)3
AH	544	Architectural History Research Studio: The Modern Capital City, Ankara	(2-2)3	AH	671	Historiography of Renaissance Architecture: Florence in the 19th Century	
AH	546	Theories of History I	(3-0)3	AH	673	Architectural History of Reading and Writing	(3-0)3
				AH	7XX	Special Topics	

DESCRIPTION OF GRADUATE COURSES

ARCH 500 M.Arch Thesis in Architecture NC

ARCH 504 Seminar in Thesis Research (0-2)NC

Research that is necessary in forming a conceptual and/or programmatic basis toward the thesis work. Study is conducted with compulsory attendance requirements, in the form of seminars in the options offered by the Department.

ARCH 505 Advanced Architectural Design Studio I (3-6)6

An architectural design studio milieu for advanced studies on cultural, social, and the environmental contexts of design processes as well as the architectonic qualities of "space".

ARCH 508 Research Analysis and Design in Multilayered Context (2-4)4

Methods, theories and approaches for comprehension, analysis, evaluation, representation and design in / of multi-layered contexts; survey of stratification formed by the matrix of relations though historical continuity in heterogeneous levels of geographical space, ranging from settlements to buildings; constitution of the plano-volumetric image of multi-layered settlements in reference to spatio-temporal data obtained from diverse disciplines as a means to define specific case studies; representative, interpretative and transformative design explorations in selected areas.

ARCH 511 Social and Cultural Themes in Urban Architecture (3-0)3

The course aims at exploring urban questions from the perspective of different disciplines –urban sociology, urban geography, cultural studies, political philosophy as well as architecture. Production processes of urban spaces and spatial practices are studied in relation with social, cultural and political aspects.

ARCH 512 Advanced Studies on Urban Architecture (3-0)3

Following ARCH 511, the graduate research studio focuses on the analysis of particular urban environments in the light of a chosen theoretical framework. Processes of production and use, spatial and social practices, public and representational qualities of urban spaces are scrutinized by students through working papers.
Prerequisite: Consent of Department.

ARCH 513 Introduction to Architectural Research (3-0)3

This method course considers architecture as a discipline as well as a cultural enterprise. It starts with on assumption that architecture can be studied not only by pragmatic and formal considerations, but also by historical and theoretical interpretations.

ARCH 517 Principles of Universal Design (3-0)3

Introduction to the principles of universal design; a survey of the ethical, moral and legal issues involved, and of the related international legal instruments, including Convention for the Protection of Human Rights and Fundamental Freedoms, Charter of Fundamental Rights of the European Union, the revised European Social Charter, and recommendations, declarations, resolutions of international bodies in chronological order; history of universal design; current research and scholarship that aim at contributing to the elimination of social, physical and attitudinal barriers in the built environment, and making the built environment “universally accessible” for “people of all ages, sizes and abilities;” universal design in products; review of existing policies and practices concerning “access and mobility requirements.”

ARCH 524 Architecture and Different Modes of Representation: Ortographic Set, Perspective, Axonometry, Model and Photography (3-2)4

This course is about different modes and techniques of representation in architecture; directed to master students. Focusing on conventional representation techniques, its objective is to study the transformations in the definition of the works of architects from "toll of communication" to "aesthetic objects". Instead of suggesting a continuity in this transformation process however, this course is organized to show the possible coexistence of these characteristics.

ARCH 526 Politics and Space (3-0)3

This course explores the forms and the proponents of politics and its uncanny relationship to design fields. Investigating the changing perceptions of idea-political positions it cultivates critical standpoints in understanding how such views first struggle over design and then become instrumental on architectural discourses and discursive practices.

ARCH 527 Advanced Topics in Digital Constructivism (3-0)3
Theoretical and epistemological mapping of digital research in architecture. Impact of research in computational and cognitive sciences on form-making processes and studies on morphogenesis. Introduction to theories of complexity and formal hermeneutics. Discussion of formal, semantic and constructivist implications and outcomes.

ARCH 543 Assessment of Interiors I (3-0)3
A study of Architectural Psychology and a critical survey of the literature related to the assessment of space. Students are encouraged to take an active role and engage in research activities that have both theoretical and practical relevance to our understanding and evaluation of space. The relevant statistical techniques and psychological concepts will be introduced where necessary.

ARCH 544 Assessment of Interiors II (3-0)3
ARCH 544 is the continuation of ARCH 543 dealing with evaluative and cognitive aspects of buildings. Each student is required to design, execute, analyze and report a research project in his/her prospective thesis subject.
Prerequisite: ARCH 543.

ARCH 545 Interpretation of Architectural Texts I (3-0)3
Elucidation of an epistemological/conceptual framework for interpreting architectural texts. Unfolding of architectural knowledge from its mythical origins to the present, through the neoplatonic, empiricist and critical rationalist traditions.

ARCH 546 Interpretation of Architectural Texts II (3-0)3
Relationship between myth, poetry and architecture in the light of critical rationalism. Setting forward through Giambattista Vico's theory of poetry and Ernst Cassirer's work on myth, the course emphasizes moral, political as well as theoretical implications of diverse stances concerning this relationship.

ARCH 547 Architecture and the Social Context of Aesthetic Modernity I (3-0)3
A theory of modernity. Critical social theory. Aesthetic modernity. The theory of the avant-grade. The status of architecture as an art in bourgeois society. Modernism and mass culture. Autonomy in architecture.

ARCH 548 Architecture and the Social Context of Aesthetic Modernity II (3-0)3
A discussion of the relations between architecture, culture industry and post modernism. Introduction of a critique of post structuralism and phenomenology. Conservative attitudes in contemporary architecture.

ARCH 571 Directed Studies (1-0)NC
Individual tutoring on specific topics that are related to unique and special interests of Master's students.

ARCH 583 Philosophical Issues in Computation and Design (2-2)3
A seminar coarse on basic thought structures that underline computational design thinking within the discipline of architecture; the history and fundamentals of digital computing; the relation between digital computing and visual reasoning; hierarchical point data and phrase structures; complexities of discrete bits; computational approaches to design thinking and overview of the Design Methods movement; the comparison of linear-symbolic and visual descriptions; creative processes and visual reasoning in design and computation.

ARCH 585 Computational Design Research Lab (2-4)4
Critical interaction of conceptual and applied/computational aspects of design research for the production of genuine architectural modes of thinking and expression. Exploration of new design situations and strategies with a theoretical/historical agenda. Evolutionary design systems. Formal sequences. Algorithmic design. Analog/digital modes of morphogenetic design. Projects and topics of research vary each term.

ARCH 586 Descriptive and Systematic Approaches to Design (3-0)3
A graduate elective that tries to shed light on the design process though readings and exercises; dwells on how design is approached from design cognition framework with descriptive methods, how design goals can be precisely stated with systematic methods and how design intentions can be explored via enumeration by computational methods.

ARCH 591 Theory and History of Landscape Architecture I (3-0)3
A study of the significant historical periods of landscape design from its ancient origins to the Modern Era. A look at how the landscapes of settlements, buildings and public spaces express the values of the society and their time.

ARCH 592 Theory and History of Landscape Architecture II (3-0)3
City as a physical setting for urban social life, from the post-industrial to the contemporary times, from an architectonic viewpoint, in terms of city texture, public and private open spaces and areas.

ARCH 600 Ph.D. Thesis in Architecture NC

ARCH 609 Advanced Themes in Architecture and Urban Design I (3-6)6
Interpretation of contemporary architectural and urban design situations in light of basic hermeneutic notions (understanding, interpretation, application, effective historical consciousness, fusion of horizons etc.). Design explorations well-knitted in historical and theoretical awareness.

ARCH 610 Advanced Themes in Architecture and Urban Design II (3-6)6
An experimental design course focusing on the implications of current debates in aesthetics for contemporary architectural and urban design situations. Postpositivism in aesthetics and in architectural theory. Theories of the beautiful and the sublime. Contemporary modes of aesthetic experience. Morality and aesthetics in architecture and urban design.

ARCH 613 Critical Theories On Urban Architecture (3-0)3
Critical theories on urban space in terms of Marxist political economy. The changing characters of mode of production and their spatial implications, geographies to urban environments; the attitudes in modes of distribution, re-distribution, and consumption; the roles of urban spaces as political setting of spatial re-configurations; the future of urban spaces in relation to such themes as authority, discipline, and/or resistance.

ARCH 614 Cartography of Architectural Theory (3-0)3
Provision of a theoretical map of the influential traditions of architectural theory. Foundations of these traditions in light of epistemological models and metaphors. Special emphasis on contemporary architectural production and the critical shift in theory with relation to currents in contemporary thinking. Introduction and discussion of anti-foundationalist / post-positivist positions and their possible premises.

ARCH 615 Architectural Research I (6-0)6
The nature of architectural research; problems and prospects of research in architecture: current research directions; responsible research; integrity in research; the codes of good practice in research and scholarship; research paradigms; issues of disciplinarity, multidisciplinarity, interdisciplinarity and transdisciplinarity; research from the perspectives of the related branches of philosophy, history and other humanities disciplines, sciences and social sciences; the state of the art research on selected areas of study, and research in architecture and urbanism with an emphasis on theoretical and conceptual frameworks, strategies and tactics adopted.

ARCH 616 Architectural Research II (6-0)6
Recontextualizing architectural research and scholarship in relation to various branches of knowledge and research fields, and to architectural education and practice; critical review of selected research papers and dissertations in terms of research topics, philosophical / theoretical foundations, methodologies and techniques employed and the scientific, cultural, social and historical contexts within which they were carried on.

ARCH 626 Selected Topics in Architectural Research (3-0)3
The relative approaches of the social and the natural sciences. Social constructionist theories of science and various criticisms of traditional Western epistemology. Alternatives offered in social epistemology to the question of whether knowledge and science can exist independently of social construction and the ways by which they inform research. Continuation and/or dissolution of basic dichotomies, epistemological consequences and alternatives. Premises and limits of interdisciplinary research.

ARCH 627 Principles and Theories of Architectural Education (3-0)3
History, sociology and philosophy of, and research on, architectural education; Basic concepts of a theory of architectural education; Context, objectives, contexts and methods of architectural education; Relationships between the theories of architecture, design, knowledge, professional practice and education; Interdisciplinary, intercultural and international aspects of the curriculum.

ARCH 628 Practice and Methods of Architectural Education (3-0)3
Institutional, professional, pedagogic and epistemological structures of teaching and learning architecture; Modes, methods and mediums of education; Comparative analyses of courses, curricula and programs; Educational planning;

Management of the curriculum and the educational space and time; Methods of curriculum design, project design and course design; Practical relationships between research, design and teaching.

ARCH 671 Directed Studies (1-0)1
Individual tutoring by Staff other then the thesis advisor on unique and specialized topics or problems related with the student's thesis studies.

ARCH 7XX Special Topics
Provisional courses not listed in the catalogue lasting 1-2 semesters.

ARCH 8XX Special Studies (4-2)NC
Study under the guidance of a faculty member, as M.Arch thesis advisor.

ARCH 9XX Advanced Studies (4-0)NC
Study under the guidance of a faculty member, as Ph.D. thesis advisor.

BS 500 M.S. Thesis in Building Science NC

BS 501 Seminar in Thesis Research (0-2)NC
Presentation of preliminary investigations necessary to form a conceptual and/or programmatic basis towards the final research report, the thesis.. Semester work conducted as bi-weekly rehearsals leading to fully-structured textual submissions. Attendance mandatory..

BS 503 Building Science Workshop (2-2)3
Research: What it is and what it is not. Research ethics: overt and covert plagiarism. Finding/choosing a research topic and the mechanics of conducting it. Reference sources: compilation for various types of bibliography. Citations and quotations. Paraphrasing and summaries. Working outlines. Research papers/reports, theses and dissertations. Use of writing manuals: Style, grammar and punctuation. Internet and computer software. Thesis abstracts. The final report.

BS 504 Research Methods in Building Science (2-2)3
The problem: where it lies; what be its 'parts'; how best to describe it. Information: sources, modes, types and cost(s). Objectives: formulation and realization. Data: measures of location and dispersion; reliability and consistency; interpretation and inference. Data: frequency and other distributions. Probability: dependent and independent events; the random experiment, observation and variable. The design of experiments: population and sample; parameters and statistics; systematic sampling and sampling distributions; the sample variance and confidence intervals. The Hypothesis: formulation, tests, errors and level of significance. Quantitative and qualitative methods.

BS 509 Introduction to Construction Management (3-0)3
Weekly seminar submissions on topics selected from among the following: office and site organization; site layout; subcontract management; management of legal and liability affairs; site security; management information systems; financial management;, purchasing and materials management; stock control; cost control; prefabrication plant management; repair shop management; quality control; project scheduling and management; resource management, *etc*.

BS 531 Studies in Structures (3-0)3
Studies on architectural structures. A survey of structural systems used in architectural design and implementation in the past and present; review of significant and landmark structural solutions contributing to architectural achievements. Discussion of the merits and origins of past and present structures from mechanical, aesthetic, functional constructional and material points of view on a case basis. A summary on the aesthetic aspects of structural design and evaluation of structural solutions for art products; discussion of works by master architects and engineers. Conducted through discussions where active student participation is motivated.

BS 532 Geometrical and Morphological Analysis of Spatial Structures (3-0)3
Classification of large scale structural forms and their development through the ages. Descriptive aspects regarding the study of form and shape. Morphological analysis of basic forms in architecture. Concepts and models bridging geometric morphology and architecture. Hierarchies of dimensional spaces. Planar and spatial orders. Interactions between the geometric morphological characteristics of selected structures and their physical-structural characteristics: spatial truss structures, membrane and shell structures, folded plate structures, *etc*.

BS 533 Building Design: Form and Structure (3-0)3
Structural systems; framed, wall, and combined structures; floor slabs (one and two-way, with beams, joist slabs, flat slabs, flat plates, waffle

slabs). Architectural design concepts for seismic safety.. Building code requirements for reinforced concrete structures. Design examples.
Prerequisite: ARCH 332 or consent of the instructor.

BS 534 Analytical Modeling and Computer Analysis of Structures (3-0)3
Basic principles for analytical modeling of structural systems. Hierarchy of models. Techniques for understanding behavior of structural elements. Material behavior, element behavior. Use of elements in frames, walls, plates, shells and 3-D solid modeling. Linear analysis of statically determinate and indeterminate structures; calculation of elastic displacements. Introduction to seismic analysis of building structures: basic concepts and, methods of solution. Checking the model and evaluating the results.

BS 535 Earthquake-resistant Building Design in Architecture (3-0)3
Definition, causes and characteristics of seismic activity. Modeling the earthquake for architectural and engineering purposes. Concepts involved in the Turkish Seismic Code. Illustrations from past earthquakes. Reasons for structural collapse. The merits of using shear walls. Repair and rehabilitation of earthquake-damaged structures. Strengthening existing structures against seismic displacements.

BS 536 Studies on Tall Buildings: Design Considerations (2-2)3
Definition, emergence and historical background of tall buildings. Planning and design considerations. Lateral loads; wind and earthquake effects; aerodynamic modifications against wind. Steel, reinforced concrete and composite tall buildings. Structural systems used in architectural design of tall buildings; frame systems, braced frame and shear walled frame systems, outrigger systems, framed-tube systems, braced-tube systems and bundled tube systems. Buildings with twisted facades. The course is conducted through lectures, case studies and discussions and aims the student to realize that the design of tall buildings starts with the architect and requires high level of interdisciplinary approach.

BS 550 Building Arts and Timber (2-2)3
A tutorial course where the architectonic features of building components, types, techniques and design details of timber construction and properties of timber are studied. through selected term projects.

BS 551 Advanced Professional Practice (3-0)3
Seminars, visits to buildings, construction sites and architectural offices. Analyses of different jobs handled by architects. Case studies.

BS 552 Performance Assessment of Buildings (2-2)3
Fundamental concerns, issues and factors of construction design. The building as 'system'. System components. Component interfaces, interactions and interdependencies; conflicts, confluences and compromises. Performance and assessment criteria. Analog indicators for on-site assessment. Language, terminology & style(s) of reporting. Report organization and presentation. Case-study.

BS 557 The Art And Technology of Timber Construction (2-2)3
Introduction to timber building technologies and material properties; advantages and disadvantages of traditional timber-framing methods of Anatolia and contemporary applications in the western world. Types of framing used in floor, wall and roof construction. Performance of timber buildings with respect to thermal insulation, moisture control; structural and seismic safety, resistance to fire, fungi and insect attack.

BS 558 Advanced Construction Management (3-0)3
Various project planning techniques: CPM, PERT, PDM. Resource allocation and scheduling; budgeting for construction; planning and control of material flow; decision-making techniques.

BS 561 Data and Information Modelling for Construction Informatics (2-2)3
Introduction to Data and Information Modelling; Introduction to Information Systems, Systems Analysis and Information Systems Development Life Cycle, Object - Oriented Technology; Entity - Relationship Diagrams; Introduction to Databases; Process Modelling, Data Flow Diagrams and Integrated Definition Technique; Unified Modelling Language; Data Exchange Standards; Building Information Models and Industry Foundation Classes, Current Product Modelling Issues and Future Directions.

BS 562 Construction Informatics (3-0)3
Construction informatics: Definition and scope, vision of construction informatics, integrated and collaborative computing, visualisation and virtual reality in construction, three, four and multi-dimensional modelling, CAD standards, web-based

collaborative environments and extranets, e-business and e-commerce in construction, auto identification technologies in construction, wireless technologies in construction, digital design-construction and manufacturing, facilities information systems

BS 565 Computer Programming and Introduction to Architectural Applications (2-2)3
Introduction to computers, programming techniques, algorithms, flowcharts, programming languages; preparation, running and testing of programs; introduction to Computer Aided Design (CAD) and Computer Aided Architectural Design (CAAD).

BS 566 Computer Graphics for Architectural Drafting Purposes (2-2)3
Advanced programming. Use of computers in design. Interactive programming. Line-drawing algorithms. Computer graphics and drafting applications, linked list and tree structures.

BS 571 Directed Studies (1-0)NC
Individual tutoring by staff other than the thesis advisor on specific topics related to unique and special interests of graduate students.

BS 574 Composite Materials and Their Applications in Buildings (3-0)3
Theoretical aspects of composite materials, classification, production methods. Particle and fiber-reinforced and structural composites, the influence of the combination of different materials on the properties of the product. Material selection according to design. Construction and building materials applications.

BS 575 Acoustics in Architecture I (3-0)3
Physical phenomena. Sound measurement. Measurement of absorption coefficients. Standing wave tube. Reverberation room method. Statistical room acoustics. Geometrical room acoustics. Method of images. Ray tracing. Reflection pattern and impulse response by computer simulation. Acoustical design criteria. Diffusers. Helmholtz resonators. Acoustics of small spaces. Room resonances and room modes. Case studies.

BS 576 Acoustics in Architecture II (3-0)3
Noise measurement. Hearing damage. Risk criteria. Noise criteria. Sound transmission. Frequency selective transmission. Measurement of transmission loss. Rating airborne noise isolation. Principles of noise control. Acoustical design of enclosures and barriers. Computer simulation of noise levels. Structure borne noise isolation. Impact noise isolation. Case studies.

BS 581 Energy Analysis of Buildings (3-0)3
Determining the energy situation of a building from: weather data; response factors; thermal load analysis; necessary equipment and systems analysis; owning and operating cost analysis. Special emphasis on thermal load analysis and calculation of the thermal load of a building both for heating and cooling purposes.

BS 583 Principles of Green Building Design and Delivery (3-0)3
The need for green buildings, green building assessment tools, green building design and delivery process, site selection strategies, water efficiency strategies, building energy system strategies, active and passive energy systems, materials selection strategies, indoor environmental quality strategies, operations & management of green buildings, economic analysis of green buildings, future of high-performance green buildings

BS 587 Fire Control in Architecture (3-0)3
Information on existing fire legislation and other requirements such as insurance. Understanding the behavior of fire; structural fire protection, structural stability and avenues of escape in case of fire. Precautions and measurements to be considered during architectural design and site planning stages. Comparison of different construction materials from a fire prevention point of view.

BS 600 Ph.D. Thesis in Building Science NC

BS 671 Directed Studies (1-0)1
Individual tutoring by staff other than the thesis advisor on unique and/or specialized topics or on problems related to the research work of post-graduate students.

BS 7XX Special Topics
Provisional courses not listed in the catalogue, lasting 1-2 semesters.

BS 8XX Special Studies (4-2)NC
Study under the guidance of a faculty member as graduate thesis advisor.

BS 9XX Advanced Studies (4-0)NC
Study under the guidance of a faculty member as post-graduate thesis advisor.

REST 500 M.S.Thesis in Restoration NC

REST 506 Design in Architectural Conservation (4-8)8

Preparation of a conservation and restoration project for individual historic building(s). Survey of a historic building by means of various techniques and instruments; analysis and evaluation the historic building according to different aspects; preparation of restitution project; and design of a conservation and restoration project.

Prerequisite: Consent of Department

REST 507 Planning and Design in Urban Conservation (4-8)8

Provide the students a systematic and contemporary approach to urban conservation that can be used in defining the general characteristics and conservation problems of historic sites considering the current legal, administrative, financial and managerial means. Research, survey, analysis, evaluation and preparation of conservation master plan proposals for a historic site by use of Geographic Information Systems. Detailed study of the natural, architectural, visual and certain socio-economic characteristics as well as historical development of the historic site.

Prerequisite: Consent of Department

REST 508 Workshop in Conservation I (3-6)6

Study of historical, physical, natural, social, cultural, legal, administrative, managerial aspects of a part of or whole historic site in order to achieve a comprehensive understanding of its values, problems and potentials as a part of the multidisciplinary conservation process. Documentation, inventorization, evaluation, preparation of site conservation and management proposals. Awareness of the roles of different disciplinary backgrounds in contributing to the multidisciplinary conservation processes for historic sites.

Prerequisite: Consent of Department

REST 509 Workshop in Conservation II (3-6)6

Study of historical, architectural, structural and material characteristics of individual historic building(s) together with its physical context in order to achieve a comprehensive understanding of its values, problems, potentials as a part of an interdisciplinary conservation process. Documentation, assessment, preparation of conservation proposals focusing on the students' own expertise and their presentation in a visual and written format.

Prerequisite: Consent of Department

REST 511 Theory of Restoration and Conservation I (3-0)3

The historical background of restoration and conservation in different countries; important international charters; evaluation of the contemporary scopes to reach a comprehensive theoretical approach relevant for Turkey. Discussion of parameters by using practices in different countries.

REST 512 Theory of Restoration and Conservation II (3-0)3

The historical background of restoration and conservation in different countries are discussed and compared to evaluate the contemporary scopes. The evaluation and discussed on the theoretical approaches towards restoration and conservation aim to reach a comprehensive theoretical approach relevant for Turkey. The practices in different countries, including Turkey are also questioned within this framework

Prerequisite: REST 511.

REST 516 Heritage Recording and Information Management (3-0)3

Introducing the theoretical and technical advances in cultural heritage recording and information management; teaching different techniques, tools and methods; implementing different tools and techniques on different examples.

REST 518 Technical and Statutory Processes in Conservation of Historic Environments (3-0)3

Discussions on subjects such as: the methods and techniques of survey in historic areas, of project making and implementation, the issues on legal and administrative aspects of preservation in different countries and their evaluation with special emphasis on Turkey, case studies on existing examples throughout seminars.

Prerequisite: Consent of Department

REST 521 Sources and Methods of Research in Conservation (3-0)3

Introduction to the documentary sources and research methods employed for the study of the cultural heritage, designated for analytical research, prior to an intervention project related to conservation.

REST 522 History of Architecture in the Eastern Mediterranean (3-0)3

This course intends to introduce students to the history of architecture and built environment in Anatolia in its Eastern Mediterranean context and attempts to increase awareness on cultural heritage of all periods from the Neolithic through to the end

of Ottoman periods (and later). This course will present, on the one hand, a brief historical outline and general characteristics of urban centers through selected examples and their topographical transformation throughout history; while, on the other, it will focus on particular building types and their architectural characteristics.
Prerequisite: Consent of Department

REST 523 History of Restoration and Preservation of Buildings in Turkey (3-0)3
The organization of restoration and preservation activities between 13th-20th Centuries in Turkey. The regulations, materials, and the institutions that carry the implementation. A general introduction to archival sources.

REST 531 Structural Analysis of Historical Structures (3-0)3
A general review of structural systems used in historical structures. Behavior of basic structural forms and elements, their materials properties and failure theories. Structural loads and other environmental effects. Analytical model of historical structures and structural analysis by conventional and by Finite Element Method.

REST 533 Historic Structural Systems (3-0)3
General introduction to various structural systems used in historic buildings, as well as techniques and materials employed in their construction, and their relevance to specific architectural styles. Although the different systems are traced through the material with specific emphasis on Anatolia, the course includes structural systems and building methods used in interacting regions, especially around the Aegean and Mediterranean Basins.

REST 553 Materials of Construction and Ornament in Anatolian Architecture I (3-0)3
A historic and stylistic evaluation of the materials used in Anatolian architecture during the Seljuk, Beylik and Ottoman periods. The traditional building materials. Use of stone, brick and timber in chronological order.

REST 554 Materials of Construction and Ornament in Anatolian Architecture II (3-0)3
The traditional materials used for architectural ornament in Seljuk, Beylik and Ottoman architecture. Research papers to be prepared based on case-studies. Class presentations.

REST 555 Diagnosis and Treatment of Material Decay in Historic Structures (3-0)3
The properties of traditional building materials, their durability, weathering behaviour and compatibility characteristics. Diagnosis of decay factors by the analytical data produced through in-situ non-destructive investigations and laboratory analyses. Evaluation of data for the measures in the building and materials scale.

REST 556 The Laboratory and Conservation of Structures and Materials (2-2)3
Assessment of the state of preservation and durability of historic building materials, selection and preparation of repair materials, methods for controlling decay factors, and development of repair and maintenance programs for historic structures. Current conservation approaches and techniques with a critical view of their compatibility and performance in the field. Case studies concerning the conservation of historic materials and structures and their discussion in the context of material science in conservation.

REST 558 Laboratory Experiments in Conservation Science I (1-4)3
The use of laboratory facilities, in situ tests and measurements which will lead to an understanding of properties and behavior of traditional building materials. Diagnosis of active decay factors in the context of a conservation research project.

REST 559 Laboratory Experiments in Conservation Science II (1-4)3
Laboratory studies on the selection criteria and testing of suitable conservation treatments, development of appropriate repair methods and materials, monitoring of conservation operations in historic structures.

REST 561 Architectural Photogrammetry (3-0)3
Basic principles of terrestrial photogrammetry with emphasis on architectural photogrammetry. The students gain practical experience in fieldwork as well as laboratory work on architectural photogrammetry.

REST 563 Legal, Administrative and Technical Aspects of Restoration in Turkey (3-0)3
Laws, state of local organizations concerned with the conservation of historical monuments and sites in Turkey. Policies adopted, different approaches used for the restoration and rehabilitation of historical monuments and sites.

Prerequisite: Consent of Department

REST 571 Directed Studies (1-0)NC
Individual tutoring on specific topics that are related to unique and special interests of Master's students.

REST 590 Summer Practice in Restoration (two months) NC
The student is assigned to a site where conservation or investigation is in progress. Here, under the tutelage of the site director, he/she assists in the work and prepares a report on what is done. This practice may be coordinated with projects run by the Department.

REST 600 Ph.D. Thesis in Restoration NC

REST 611 Seminar in Conservation and Restoration (0-2)NC
The seminar covers general problems of conservation and restoration. The students prepare and present papers of different projects including the review of examples of recent practices as well as certain problems related to their thesis.

REST 645 Issues in Conservation I (3-0)3
Recent developments in conservation. General trends in conservation. National and international developments.

REST 646 Issues in Conservation II (3-0)3
Specific examples. Individual research papers to be prepared on specific problems related to selected buildings.

REST 647-648 Research in Historic Environment I-II (3-0)3
Research in historic environment with emphasis on urban pattern, building typology, changes in the built form in historic areas, or issues of conservation, such as relationship of old and new; residential use in historic urban sites.

REST 655 Issues in Restoration I (3-0)3
This course is designed for doctoral students in order to introduce them to contemporary issues on Architectural Restoration and Preservation. Special topics are selected for analysis and evaluation and the students are expected to present research projects of their own.

REST 656 Issues in Restoration II (3-0)3
This course is designed for doctoral students to establish the right background by studying special issues of restoration and conservation more related to their thesis topics. The students are required to present a research and conduct related discussions in the form of seminars.

REST 657 Research in Vernacular Architecture I (3-0)3
Identity of Vernacular Architecture in Turkey. The social factors shaping characteristics such as family structure, level of production, income, religion, and physical factors such as geography, climate, geology to be discussed through case studies.

REST 658 Research in Vernacular Architecture II (3-0)3
The course concentrates on the identity of Vernacular Architecture in Turkey. The social factors shaping characteristics such as family structure, level of production, income, religion, and physical factors such as geology are discussed through case studies.

REST 671 Directed Studies (1-0)1
Individual tutoring by Staff other than the thesis advisor on unique and specialized topics or problems related with the student's thesis studies.

REST 675 History of Traditional Materials and Techniques I (3-0)3
For doctoral students interested in the study of specific problems related to traditional building materials used in the monumental buildings of the medieval period in Anatolia.

REST 676 History of Traditional Materials and Techniques II (3-0)3
A continuation of ARCH 675, based on the case study approach with case studies related to the specific research topics of the students.

REST 685 Conservation of Materials I (3-0)3
Newly developed techniques related to specific problems of material deterioration and remedies for them.

REST 686 Conservation of Materials II (3-0)3
Advances in conservation of some specific historic materials by the evaluation and discussion of recent research papers on several topics.

REST 7XX Special Topics
Provisional courses not listed in the catalogue lasting 1-2 semesters.

REST 8XX Special Studies (4-2) NC
Study under the guidance of a faculty member as M.S. thesis advisor.

REST 9XX Advanced Studies (4-0) NC

Study under the guidance of a faculty member as Ph.D. thesis advisor.

AH 500 Master's Thesis in History of Architecture NC

The thesis in History of Architecture aims to lead the student toward professional research with original results. The student is expected to demonstrate skills of critical appraisal and research techniques. Topics may be chosen from a wide chronological spectrum and may involve historical or theoretical issues pertaining to architecture in Turkey and the world at large.

AH 501 Studying Architectural History (3-0)3

The objective is to provide some overview and real understanding of the nature, power and the limitations of research in social sciences and humanities and to familiarize students with research techniques and teach them how to select appropriate techniques for a given set of data.

AH 504 Prothesis Seminar (2-2)NC

Independent work leading to the selection and clarification of thesis topic. Presentation of the research in departmental seminars, with a written draft of the thesis proposal at the end of the semester.

AH 513-514 Aesthetics and Criticism I-II (3-0)3

This course is offered as two consecutive programs: the first based on class discussions of classical texts on philosophy of art and aesthetics from Plato to Heidegger. The second semester focuses on modern concepts of art and aesthetics reviewed through readings of 20th century philosophers and critics. It aims to acquaint the participants with changing and multi-dimensional aspects of art theory and practice. The class is conducted through discussions and active student participation is expected.

AH 520 Topics on Urban Form, Patterns and Architecture (3-0)3

This course is a critical history survey on the conditions (anthropological, geographical, political) generating architecture/s of the city frontier. It aims to cover multiple meanings of the city frontier under the three main headings: city and defence (fortifications bastions, garrisons, nuclear shelters, etc), city and trade (customs, ports, tollhouses, entrepots. etc.), city and speed (terminals, gates, stations, way stations, etc). As the architecture of the city frontier is essentially generic, on the basis of the developments in military, transportation and communication technologies and common territorial strategies, the course covers a cross-periodical survey. The architectural history of the city frontier is studied as part of the history of human territoriality, in other words, as a factor of different territorialization processes through different periods. Each semester a specific city or region will be focused on and the successive *strata* of its urban defences will be researched by the students through text and *situ*.

AH 521 Themes on Ancient Domestic Architecture (3-0)3

This seminar course is a critical survey of domestic architecture and daily life in ancient Greek and Roman periods in an interdisciplinary framework through thematic readings. Weekly readings and discussions focus on themes and concepts like house, home, space, privacy, luxury, leisure, gender, art and consumption to highlight how private space was designed, decorated, populated and used in antiquity.

AH 522 Byzantine Architecture: The Art And Architecture of Byzantine Cappadocia (3-0)3

The special topic on Byzantine Cappadocia investigates the art and architecture of the region's many churches, both masonry and rock-cut, and the area's unusual landscape. Emphasis will be given to the developments of a variety of plan types and interior church decorations. We will cover issues of style, iconography, and patronage and the problems of dating. Other topics include the region's geology and geomorphology as well as the human impact on the landscape; the date and purpose of the region's underground cities; the form and function of ceremonial and utilitarian spaces in Cappadocia's settlements; and the metropolitan and cross-cultural influences on the region.

AH 526 History and Theory of Art and Architectural Styles (3-0)3

Through comparative and analytical study of styles and form/content relations, approaches within greater cultural frames are investigated. The course aims to familiarize advanced students of architecture with properties and dynamics of styles and to help them develop a methodology of formal analysis.

AH 533 Ottoman Architecture in the Nineteenth Century Developments (3-0)3

The seminar is a critical survey on nineteenth century Ottoman architecture, aiming to cover its multiple dimensions within a cross-cultural framework that emerged with contemporary encounters between the West and the East. The objective of the seminar is to study the break with

the classical Ottoman architecture, and to interpret and critically evaluate consequential cases of organizational, stylistic, technological, typological and urban transformations in the field of architectural production during "the longest century of the empire" that extended from the late eighteenth century into the early twentieth century.

AH 534 Seminar in Contemporary Architecture (3-0)3
The seminar intends to critically evaluate the idea of Modernity and Post-Modernity looking at the cultural and architectural products of the 20th Century discussing themes of modernism, populism, technological discourse, urban theories, neo-Rationalism, neo-Modernism, Regionalism and Deconstruction. The course is structured on theoretical lectures, students' participation.

AH 535 Approaches in Greek Architecture (3-0)3
Selected themes concerning architectural developments in Greek architecture during the archaic, classical and Hellenistic periods with emphasis on Greece and Asia Minor.

AH 536 Approaches in Roman Architecture (3-0)3
A critical survey of the major developments in the history of Roman architecture in Rome and the provinces. Adaptation and evolution with regard to the Roman architectural revolution. May be taken independently of AH 535.

AH 539 Cosmological Thought and Architecture in the Middle East (3-0)3
This course unearths concepts which inspired medieval buildings in the Middle East. The course equips students with knowledge on human-environment relationship and its architectural end-products. Readings through cosmology, philosophy and symbolism render students familiar with the conceptual sources that nourished architectural design in the Middle Ages

AH 541 Ottoman Architecture in the Eighteenth Century (3-0)3
This course investigates Seljuk architecture in Anatolia (11-14th c.) in terms of its form, style, building typology, meanings, regional characteristics, social and political background and landscape. Urban and architectural inheritance of the Pre-Seljuk Anatolia is also surveyed to display local precedents. Neighboring architectural traditions are also given in a similar fashion. The course specifically focuses upon encounters, transformations and contributions of Seljuk architecture in Anatolia

AH 543 Anatolian Seljuk Architecture (11-14thCenturies) (3-0)3
This course investigates Seljuk architecture in Anatolia (11-14th c.) in terms of its stylistic and semantic aspects. It surveys building types, regional features, landscape and symbolic meanings. This course will be constructive in promoting graduate research on history architecture in Anatolia and in creating an overall view on architecture culture in medieval Anatolia. Students will be acquainted with building types and their antecedents, landscape and sites, regional features and symbolic meanings of Seljuk architecture.

AH 544 Architectural History Research Studio: The Modern Capital City, Ankara (2-2)3
Archival study on primary sources and bibliographical study on secondary sources as part of the process of writing architectural history. The main theme changes each semester, but Ankara remains as the general study area to read and discuss the theoretical frameworks of architectural modernism, and of city formation, and to search for and analyze the documents in various archives and libraries, in order to write a critical and interpretive account of the architectural history of the city.

AH 546 Theories of History I (3-0)3
This course explores the implications of the writings of Louis Althusser for history-writing. As Peter Schöttler has stated there are conspicuous parallels between the way Althusser conceptualizes the task of history and the way Annales School historians are engaged in their "craft" - both sides are committed to the concept of history of problems (histoire-problème) and think of history "in the form of a structural process of evolution of complex societies." After elucidating the basic terms of this potential dialogue we combine these with an analysis of spatial phenomena as it is undertaken in the writings of Fredric Jameson and Henri Lefebvre.

AH 547 Theories of History II (3-0)3
The last couple of decades witnessed a proliferation of methodologies for the analysis of visual and spatial phenomena. The Common point of these new strategies-coming from fields as diverse as psychoanalysis, philosophy and feminism among others – is concentration on singular cases and denigration of any systematic approach aiming to develop general explicative frameworks. In this seminar we will try to develop ways of analyzing visual and spatial practices through close-readings of different texts including canonical works of art

and architectural history and recent products of interdisciplinary approaches.

AH 548 Aesthetics and the Psyche (3-0)3
Creativity, memory, and the aesthetic have long been discussed by different disciplines from sundry perspectives. in this seminar, we will engage in the daunting task of probing these elusive terms which intermittently pervade architectural discourse. We will try to come to grips with them by locating aesthetic and architectural production at the interstice between the social and the psychic—the two realms between which, in Kaja Silverman's words, "[there is a complex] interaction involving a series of *relays'." What does "to create" amount to? What are the ways in which "the aesthetic" works? Where to draw the lines between memory, myth and nostalgia? These are some of the questions we will tackle vis-â-vis different architectural and visual products.

AH 601 Critical Review in Architectural History (3-0)3
This course is designed for PhD students specializing in architectural history. It aims at providing them with the knowledge of the general patterns in architectural historiography. In addition to more conventional approaches, recent theoretical debates and current issues in architectural historiography are surveyed in order to equip students with the requisite knowledge and research tools in an advanced level that help them develop their own research and interpretation strategies.

AH 602 Surveying Architectural History (3-0)3
Complimentary to "AH 601: Critical Review in Architectural History," and preparatory for the Ph.D. qualification exam, this course is directed towards overviewing architectural history and historiography by focusing on the topic of "survey" as a critical enterprise. It aims to equip students with the tools of studying the topic comprehensively to develop their own research and interpretation strategies.

AH 612 Imperial Architecture of the Ancient Near East (3-0)3
This course is a graduate seminar focusing on the architecture of the ancient Near Eastern empires. The principal aim is to provide students with a variety of examples of specialized studies on architectural problems related to the study of imperial polities of the Near East. The course will provide an overview of architectural traditions of the Hittite, Neo-Assyrian, Urartian and Persian Empires. The students will be encouraged to think about how architecture plays an integral role in the structuring and governance of imperial systems both in the level of individual buildings as well as integration of building complexes into the larger rubric of urban mechanisms. They will be exposed to questions related to the transmission and sharing of architectural styles, incorporation of art into architecture, and creation of meaning in imperial ceremonial structures. The multi-disciplinary aspects of the course will further familiarize students with how economics, politics, social and religious concerns played a role in the making of architectural traditions in the Ancient Near East.

AH 654 Framing the Past, Ruins and Architectural History (3-0)3
Treats different forms of verbal, visual and spatial evidence concerning ruins especially in Italy and the Near East. Critically assesses the role of changing perceptions in bridging the past and present through selected monuments and archaeological sites.

AH 655 Spaces and Practices of Displaying the Past (3-0)3
The course focuses on the emergence and establishment of travel, collecting and display as spatial practices from the late eighteenth to the twentieth century. These practices were pivotal for the formation of spaces that frame and exhibit the past, effective in the emergence of the modern museum.
Studying the contextual and conceptual dimensions of the topic throughout the semester, students will prepare term projects on suggested cases that will discuss the multiple problematics of displaying the past, from museums to larger sites of travel and display to spaces of geographically and historically comparative and interconnected practices.

AH 668 Seminar in Classical Ottoman Architecture (3-0)3
This course is designed primarily for graduate students specializing in Ottoman architecture who already have some knowledge in the field. It aims at providing them with an overview of – and a critical approach to - scholarship and historiography, and with the skills to pursue a contextual examination of classical Ottoman architecture (ca. 1450-1600). Selected works of architecture are evaluated in their social, political, cultural, and institutional contexts, and in the comparative framework of architecture in order Islamic empires and in Europe. The specific topics of discussion change each semester. Particular attention is paid to relevant primary sources.

AH 670 Architectural Books of the Italian Renaissance (3-0)3

This course focuses on the major architectural books of the Italian Renaissance which, both individually and collectively, denote a distinctive place in the history of architectural books. It explores their contents, literary and material forms, and reception practices to discuss their roles in the transformation of architectural theory and practice, and of architectural profession and patronage between the 15th and the 17th centuries in Italy.

AH 671 Historiography of Renaissance Architecture: Shifting Geographical Boundaries (3-0)3

Study of architectural and artistic encounters across geographies between the 15th and 16th centuries through traveling forms, images, ideas, texts, and people that calls into question "Europe"-centered maps of Renaissance art and architecture.

AH 672 Historiography of Renaissance Architecture: Florence in the 19th Century (3-0)3

Study of the emergence and development of the historiography of Renaissance architecture and of the invention and transformation of Florence as the centre of Renaissance in the nineteenth century through the works of historians, writers, artists and architects as travelers, expatriates and locals.

AH 673 Architectural History of Reading and Writing (3-0)3

This course focuses on the intersections between architectural history and literary theory/criticism, history of reading and history of the book. Relying on an interdisciplinary approach, it explores various facets of these intersections with the aim of studying the close-but often overlooked relationship between architectural history and the practices of reading and writing.

AH 7XX Special Topics

Provisional courses not listed in the catalogue lasting 1-2 semesters.

AH 8XX Special Studies (4-2)NC

Study under the guidance of a faculty member as M.A. thesis advisor.

AH 9XX Advanced Studies (4-0)NC

Study under the guidance of a faculty member, as Ph.D. thesis advisor.

DEPARTMENT OF CITY AND REGIONAL PLANNING

PROFESSORS

ERAYDIN, Ayda: B.C.P., M.C.P., METU; Ph.D., ITU.
ERCİYAS, D. Burcu: B.A., Bilkent University; M.A., Ph.D., University of Cincinnati.
ERSOY, Melih ***(Department person)***: B.C.P., METU; M.C.P., Columbia University; Ph.D., METU.
IŞIK, Oğuz: B.C.P., M.C.P., METU; Ph.D., University College London.
PINARCIOĞLU, M. Melih: M.S. in Management, M.R.P., METU; Ph.D., University College London.

ASSOCIATE PROFESSORS

AKKAR ERCAN, Müge: B.C.P., M.S.C. UPL., METU; Ph.D., University of Newcastle.
ATAÖV, Anlı: B.C.P., METU; M.C.R.P., Ph.D, Ohio State University..
BABALIK SUTCLIFFE, Ela: B.C.P., M.S.C. UPL., METU; Ph. D., University College London.
BALABAN, Osman: B.C.P., M.S.C. UPL., Ph.D., METU.
BARLAS, Adnan: B.C.P., M.C.P., METU; Ph.D., University of Pennsylvania.
GEDİKLİ, Bahar: B.C.P., M.S.C. UPL., Ph.D., METU.
KAYASÜ, Serap: B.C.P., METU; M.A., University of Waterloo, Canada; Ph.D., METU.
KESKİNOK, H. Çağatay: B.C.P., M.S., Ph.D., METU.
YETİŞKUL ŞENBİL, Emine ***(Vice Chair)***: B.C.P., M.C.P., METU; Ph.D., Kyoto University.
UZUN, Nil ***(Associate Dean of the Faculty of Architecture)***: B.C.P., M.R.P., METU; Ph. D., Utrecht University.

ASSISTANT PROFESSOR

BALABAN (ŞENOL), Meltem: B.C.P., M.C.P., Ph.D., METU; Ph.D., University of Tokyo.

GENERAL INFORMATION: Established in 1961, the Department of City and Regional Planning is one of the oldest and largest schools of planning in Turkey. With 2044 graduates and 410 undergraduate and graduate students today, the Department of City and Regional Planning has played a key role not only in planning education but also in urban research.

Department's undergraduate and graduate curricula have been designed with the understanding that the challenges facing urban planners have multiplied especially in the last two decades and the scope of tasks that planners are expected to undertake has considerably widened. As far as planning education is considered, this means that planners need to be equipped not only with conventional skills but also with the skills required to cope with the new challenges. Planners must now be capable of formulating questions in the light of the inputs of a variety of disciplines and synthesizing these inputs without falling into the dilemma between comprehensiveness and partiality. The aim of the undergraduate program is to train planners who can perceive holistic relationships, develop alternative views (utopian/realist) on how to transform these relationships and produce creative designs for the future and who possess the ability of investigating in depth without falling into partiality. Planners need, therefore, to be equipped with a variety of skills ranging from quantitative analysis techniques to social and economic analyses required to understand how the urban system works.

In addition to the undergraduate program in City Planning, the Department offers graduate degrees. There are three Masters programs carried out by the Department: City Planning, Regional Planning and Urban Design. The Department also offers a PhD degree in City and Regional Planning. In addition to the graduate programs run by the Department, there are interdisciplinary graduate programs carried out jointly with other departments in METU: Masters and PhD programs in Urban Policy Planning and Local Governments, Masters and PhD programs in Geodetic and Geographic Information Technologies, Masters and PhD programs in Settlement Archeology and Earth System Science and Master Program in Earthquake Studies. While the graduate programs in City Planning, Regional Planning, Urban Design, Geodetic and Geographic Information

Technologies, Earthquake Studies and Earth System Science are conducted according to the "Academic Regulations" of the Graduate School of Natural and Applied Sciences, those of the Settlement Archeology and Urban Policy Planning and Local Governments are conducted according to the "Academic Regulations" of the Graduate School of Social Sciences.

RESEARCH INTERESTS AND FACILITIES: The research interests of the members of the Department cover a wide spectrum including urban and regional geography, regional planning and policy, urban and regional governance, institutional transformation, planning history, strategic planning, risk analysis and planning for disaster, housing research and policy, urban history, urban design, urban regeneration, urban conservation, urban archaeology, sustainable development, urban transport, energy conservation, environmental issues, rural transformation, geographical information systems and remote sensing, municipal finance, etc.

The Geographical Information Systems and Remote Sensing Laboratory of the Department is equipped with a Silicon Graphics O2 workstation, backup units and Auto-CAD Map, GenaMap and ER-Mapper software. The Department is connected to the Unix based mainframe computers of the University via local network. There are also sufficient numbers of personal computers within the Faculty of Architecture allocated to the use of undergraduate and graduate students. The Department has also various software packages required for undergraduate and graduate education.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

CRP	101	Planning Studio I	(4-8)8
CRP	111	The City and Planning	(3-0)3
CRP	105	Origins of Urbanism and the Process of Urbanization	(3-0)3
MATH	125	Basic Mathematics I	(3-2)4
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Techniques and Applications	NC

Second Semester

CRP	102	Planning Studio II	(4-8)8
CRP	106	Urban Sociology	(3-0)3
CRP	146	Computer Programming	(2-2)3
MATH	126	Basic Mathematics II	(3-2)4
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

CRP	201	Planning Studio III	(4-8)8
CRP	211	The City in History I	(3-0)3
CRP	231	Economics for Planners I	(3-0)3
CRP	290	Summer Practice: Mapping-Topography and Computer Presentation (4 weeks)	NC
STAT	201	Introduction to Probability and Statistics I	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

CRP	202	Planning Studio IV	(4-8)8
CRP	212	The City in History II	(3-0)3
CRP	234	Economics for Planners II	(3-0)3
CRP	242	Urban Geography	(3-0)3
STAT	202	Introduction to Probability and Statistics II	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

CRP	301	Planning Studio V	(4-8)8
CRP	351	Urban Transport Planning	(3-0)3
CRP	371	Planning Techniques	(3-0)3
CRP	382	Legal and Administrative Aspects of Planning	(3-0)3
CRP	390	Summer Practice: GIS Applications	NC
TURK	303	Turkish I	NC
Elective*			(3-0)3

Sixth Semester

CRP	302	Planning Studio VI	(4-8)8
CRP	341	Urban Economics	(3-0)3
CRP	372	Planning Theory	(3-0)3
CRP	392	Urban Conservation Planning	(3-0) 3
TURK	304	Turkish II	NC
ENVE	330	Principles of Environmental Engineering	(3-0)3
Elective*			(3-0)3

FOURTH YEAR

Seventh Semester

CRP	401	Planning Studio VII	(4-8)8
CRP	409	Urban Politics	(3-0)3
CRP	470	Principles of Housing	(3-0)3
CRP	490	Summer Practice: Municipal, Public or Private Planning Office (4 weeks)	NC
Elective*			(3-0)3
Elective*			(3-0)3

Eighth Semester

CRP	402	Planning Studio VIII	(4-8)8
CRP	404	Contemporary Issues in City and Regional Planning	(3-0)3
Elective*			(3-0)3
Elective*			(3-0)3

** The elective courses of the Undergraduate Program are organized in four modules: Urban Policy Module; Urban and Regional Economic Development Module; Urban Design Module; Environment, Infrastructure and Transport Planning Module. Starting with the third year, students must select one of these modules, and choose the majority of their elective courses from that module. Of the 6 elective courses that each student must take, at least 3 should be taken from the same module.*

ELECTIVE COURSES

CRP	332	Planning Economics	(3-0)3
CRP	333	Introduction to Urban Design	(3-0)3
CRP	334	Movements and Issues in Urban Space Design	(3-0)3
CRP	335	Review Topics in Economics	(3-0)3
CRP	407	Principles and Approaches of Ecology in Planning	(3-0)3
CRP	410	History of Housing	(3-0)3
CRP	412	Innovative Thinking and Problem Solving	(3-0)3
CRP	414	Urban and Regional Project Management	(3-0)3
CRP	415	Social Aspects of Planning	(3-0)3
CRP	418	The Theory of Economic and Spatial Development	(3-0)3
CRP	419	Visions and Strategies for Socio-Spatial Development	(3-0)3
CRP	421	Population Dynamics and Planning	(3-0)3
CRP	423	Computer Application of Statistical Techniques to City and Regional Planning	(3-0)3
CRP	425	Application of Demographic Techniques to Turkish Data	(3-0)3
CRP	433	Economics of Development and the Economy of Turkey	(3-0)3
CRP	437	Urban History Workshop	(3-0)3
CRP	438	Introduction to Geographic Information Systems in Planning Practice	(3-0)3
CRP	444	Application Development in Geographic Information Systems	(3-0)3
CRP	450	New Spaces of Growth and Production	(3-0)3
CRP	451	Models in Urban Planning I	(3-0)3
CRP	452	Models in Urban Planning II	(3-0)3
CRP	453	Participatory Design and Planning	(3-0)3
CRP	454	Urban Transport Systems: Planning and Design	(3-0)3
CRP	455	Aesthetics and Human	

		Experience in Urban Design	(3-0)3
CRP	466	Labor Market Dynamics in Global Restructuring and Spatial Transformation	(3-0)3
CRP	476	Housing Research	(3-0)3
CRP	478	Urban Residential Transformation and Change in Turkish Cities	(3-0)3
CRP	483	Policy Design and Evaluation	(3-0)3
CRP	485	Evolving Gender Issues in Contemporary Urban Planning	(3-0)3
CRP	479	Implementational Aspects of Urban Planning with reference to Legal and Administrative Issues	(3-0)3
CRP	486	Urban Regeneration: Strategies, Policies, Organization and Design	(3-0)3
CRP	488	Institutional Aspects of Urban and Regional Planning	(3-0)3
CRP	495	Urban Political Analysis	(3-0)3
CRP	499	Seminar in Selected Urban Political Issues	(3-0

MINOR PROGRAM IN CITY PLANNING

City Planning is closely interrelated with a wide range of disciplines and fields of knowledge extending from engineering, sciences (civil, environmental engineering, etc.) to sociology, history, architecture, law, economics, and political sciences. The minor program in City Planning aims to familiarize students from neighboring disciplines with the idea of planning and to equip them with a degree of sensitivity towards urban related issues.

The program is in principle open to students from any planning-related department and consists of two must courses and four electives to be chosen from among the following courses. Students who are willing to attend the program should contact Department's Minor Program Coordinator in order to decide the courses they should attend.

Compulsory course

CRP	111	Introduction to City and Planning	(3-0)3
CRP	105	Origins of Urbanization and the Process of Urbanism	(3-0)3
CRP	242	Urban Geography	(3-0)3
CRP	372	Planning Theory	(3-0)3

Four of the following courses

CRP	211	The City in History I	(3-0)3
CRP	212	The City in History II	(3-0)3
CRP	333	Introduction to Urban Design	(3-0)3
CRP	341	Urban Economics	(3-0)3
CRP	351	Urban Transport Planning	(3-0)3
CRP	382	Legal and Administrative Aspects of Planning	(3-0)3
CRP	392	Urban Conservation Planning	(3-0)3
CRP	407	Principles and Approaches of Ecology in Planning	(3-0)3
CRP	409	Urban Politics	(3-0)3
CRP	418	The Theory of Economic and Spatial Development	(3-0)3
CRP	470	Principles of Housing	(3-0)3
CRP	404	Contemporary Issues in City and Regional Planning	(3-0)3
CRP	495	Urban Political Analysis	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

CRP 101-102 Planning Studio I-II (4-8)8
The aim of CRP101 studio is to help students to develop the notion of abstract thinking, attain an ability of representation, develop design skills and appropriate design language in order to develop basic design skills and visual culture. Exercises offered in the studio try to enable students to get acquainted with various concepts concerning order, balance, positive-negative values, three-dimensional representation etc. In CRP102, the students are asked to use the abilities gained in abstract basic design thinking to real situations, that is, space-mass relations, topography, location analysis, movement patterns, hierarchical organization and they are expected to develop methods of problem definition, formulation, analysis and design.
Prerequisite for CRP102: CRP101

CRP 105 Origins of Urbanism and the Process of Urbanization (3-0)3
This is a course on urbanization in the past and at present. It is an introduction to basic processes of man-environment relations. Key social institutions and social relations (authority, economic, culture and identity) are analyzed. Emergence of urban life and the process of urbanization in the Western world and the Developing countries and related problems (employment, housing, migration, environment, and poverty) are stressed.

CRP 106 Urban Sociology (3-0)3
This course deals with the city in modern times, in 20^{th} and 21^{st} centuries. The metropolitan and post-metropolitan phenomenon is one of the main issues. Social differentiation, economic restructuration, social and spatial change, social networks (local and global), social polarization are other issues that are analyzed in the course. Main approaches in urban sociology are also introduced.

CRP 111 Introduction to City and Planning (3-0)3
Types of settlements. Emergence, growth and decline of cities. Urbanization. Urban economy. Urban hierarchy and settlement patterns. Urban land values. Speculation. Urban land use. Urban morphology. Urban ecology. Typology of urban problems. Urban politics and urban administration. Planning and management. Urban design and planning processes. Issues of urban development planning. Issues of urban conservation and rehabilitation planning. Issues of urban infrastructure and transportation planning. Natural environment and the city.

CRP 116 Development of Western Thought and Technology (3-0)3
An introductory course on the development of Western thought, technology and corresponding approaches to environment, providing students with insight about certain basic concepts in their historical and cultural perspectives. Emergence of philosophy, the beginning of modern age, the Renaissance, the Enlightenment, industrial revolution; knowledge and science; culture and ecology; ecology and ecosystems.

CRP 146 Computer Programming (2-2)3
Introduction to computers, hardware and software, operating systems, software applications, word processing, spreadsheets, data-base management, programming techniques, algorithms, flowcharting, introduction to and basic concepts of geographical information systems.

CRP 201-202 Planning Studio III-IV (4-8)8
The aim of this planning studio is to give theoretical and practical skills of comprehensive planning. Hence the town in focus is studied in its regional context, its problems are depicted, its parts are defined. Finally in handling the whole, land use and transportation compatibility is searched and as far as parts are concerned design skills in shaping the urban environment are developed.
Prerequisite for CRP 201: CRP102
Prerequisite for CRP 202: CRP201

CRP 211 The City in History I (3-0)3
General introduction to theoretical and methodological problems in historical analysis of cities and urbanization; the supply of changing spatial and physical pattern of cities in relation to changing socio-economic structure of Greek, Roman, Byzantine, Seljuk and Ottoman periods in Anatolia in comparison with early Medieval Renaissance and Baroque periods in Europe.

CRP 212 The City in History II (3-0)3
The Industrial Revolution and the structural analysis of the early Industrial City; different concepts and movements in city planning after the Industrial revolution and the development of city planning as a profession in the industrial society; the transformation of the Ottoman City in the 19th century; 20th century city: case studies from Europe, American and Middle East.

CRP 231 Economics for Planners I (3-0)3
The scope of economic theory; the price system; theory of consumer behavior; theory of production and cost; the distribution of income.

CRP 234 Economics for Planners II (3-0)3
Measurement of macroeconomic variables; national income accounting; theory of income determination; business cycles; fiscal policy;money, banking and monetary policy; international trade and finance; economic growth and development.

CRP 242 Urban Geography (3-0)3
Discusses settlement systems and hierarchies, models of urban form, land use types and density variations in urban space, different statistical methods for the description and analysis of spatial distributes and gives a critical summary of planners' value judgments towards land use planning in urban areas.

CRP 290 Summer Practice: Mapping, Topography, Computer Presentation NC
Analysis and measurement of topographical elements, mapping cartographic data through the use of computer techniques.

CRP 301-302 Planning Studio V-VI (4-8)8
In the third year studio the cartographic and quantitative data compiled in the CRP290 Summer Practice as well as the local data and observations obtained through a short excursion to the study area will be evaluated together. The third year planning studio will be conducted in two phases. The first is a detailed urban study devised to comprehend urban structures and to identify major planning issues. The aim of this first phase is to define major planning goals to be pursued in the second phase. The second phase constitutes an exercise to simulate the process of structure planning.
Prerequisite for CRP301: CRP202
Prerequisite for CRP302: CRP301

CRP 311 Evolution of Turkish Cities (3-0)3
Discusses the classical Ottoman structure and its spatial reflections, the characteristics of the Ottoman city, the spatial consequences of the developments in 19th century, spatial policies adopted after the Independence War, Ankara as a planning experiment, institutionalization of planning in Turkey and the developments of the post-war period.

CRP 332 Planning Economics (3-0)3
Evaluation of projects in the planning process. Cost-benefit analysis as a project evaluation technique. Alternative evaluation methods in urban and regional planning. Welfare consequence and distribution problems in urban and regional plan and projects. Review of certain studies of plan evaluation.

CRP 333 Introduction to Urban Design (3-0)3
Aims at familiarizing students with the form and functions of the spatial/physical components of the built environment, introducing the nature, concepts, concerns and dimensions of urban design, and making students acquainted with the literature of urban design.

CRP 334 Movements and Issues in Urban Space Design (3-0)3
Deals with the understanding and analysis of urban elements such as the street, the square, and buildings and their interrelations with the urban system. Special emphasis given to buildings in terms of their types, forms and functions.

CRP 335 Review Topics in Economics (3-0)3
Review of essential economic concepts and methods by a study of contemporary social and urban problems. Adoption of an integrated framework to analyze urban issues like housing, transportation, education, health, crime etc. Efficiency and equity criteria. Spatial market system and spatial market failure to handle the regional problem. Income distribution. 'Market vs. state' arguments.

CRP 341 Urban Economics (3-0)3
Economic theory and purposes of urban planning; functions of urban planning in market economies. Formation and distribution of value in the physical environment; approaches in the explanation of rent relations; measurement of value in urban land and property. Behavioral patterns in property markets; investment, development, renewal and rehabilitation decisions. Planning decisions to monitor values and behavior in property markets; implications of development rights, tenure forms, rent control and "other channels of control".

CRP 351 Urban Transport Planning (3-0)3
Designed to cover a whole range of issues related to urban transportation. Main themes are context and definition of urban transportation planning, characteristics of urban travel, transportation planning and decision making, demand and supply analyses. Transport economics and transport for a sustainable future are examined. Issues regarding the urban land/use, location choice of urban activities and transportation also analyzed.

CRP 362 Urban Infrastructure (3-0)3
An introduction to urban environmental issues and network type service systems. The planning procedure, design criteria and performance characteristics of the Bank of Province's urban water supply practice, implementations of urban physical planning, different types of land suitable analysis techniques through 'multicriteria' qualitative techniques.

CRP 371 Planning Techniques (3-0)3
Quantitative and qualitative techniques of urban analysis, geographical analysis, population projections and analysis.

CRP 372 Planning Theory (3-0)3
Development of planning idea and thought, evolution of different planning paradigms, differentiation between planning and design, planning processes.

CRP 382 Legal and Administrative Aspects of Planning (3-0)3
A broad theoretical approach on the subject of the administrative and the organizational approach to the process of planning. A review of legal concepts in Turkish legislative, judiciary and administrative systems. Study of the urban planning process in relation to central and local governments. Analysis of planning and development laws, by-laws and regulations and their usage.

CRP 390 Summer Practice: Data Collection for Studio and Computer Presentation (3-0)3
Students gather and analyze the data required for the third and fourth year studio work. Data analyzed and archived in computers for the use in forthcoming studio work.

CRP 392 Urban Conservation Planning (3-0)3
Scope of urban conservation planning, basic concepts of historic urban conservation, treatment approaches to the management of cultural heritage, designating conservation areas, integrated and sustainable urban conservation policies, methods and techniques of urban conservation, conservation, area appraisals, city centre conservation area, residential conservation areas.

CRP 401-402 Planning Studio VII-VIII (4-8)8
Analytical and planning studies of a metropolitan city or region are conducted in the fourth year planning studio that concentrates on thematic or place-bound problematic of the city in focus. After analytical studies, diverse groups work on different problems (centre, housing, image and many other components) of the city under scrutiny to gain further skills in the use of planning and implementation tools, economic analyses, social problems, urban engineering or urban design.
Prerequisite for CRP401: CRP302
Prerequisite for CRP402: CRP401

CRP 404 Contemporary Issues in City and Regional Planning (3-0)3
The main objective of this course is to introduce the fourth year students to contemporary issues and current debates in the discipline of city and regional planning with particular emphasis on Turkish planning domain. The contemporary issues and current debates regarding to urban and regional policies, spatial planning system, institutional structure, urban administration and local governments, project management, environmental issues, urban transformation, housing, transportation, infrastructure, sustainable development, cultural heritage management, disaster mitigation and urban risk management are discussed within the context of Turkish planning experiences.

CRP 407 Principles and Approaches of Ecology in Planning (3-0)3
Principles and approaches of ecology that should be paid attention in planning practices, and also in collaborating with the members of other disciplines. Basic concepts of ecology, landscape ecology; biodiversity and conservation assessment for planning; protected area management planning; institutions and legislation related to the conservation and use of environment; conventions related to the conservation and use of environment; using biological information on site and regional scales planning; urban ecology; and sustainable urban development.

CRP 409 Urban Politics (3-0)3
The main objective of this course is to introduce the students to a theory informed political analysis of urban question. In the first part of the course, issues such as local state, interest groups, urban planning, world cities and urban inequalities are discussed with reference to a) theoretical considerations, b) experiences of various countries and c) the Turkish case. In the second part, students take up certain issues approved by the instructor and make presentations in the class

CRP 410 History of Housing (3-0)3
Research projects are formulated on relevant subjects and presented to the class and completed in the light of class discussion.

CRP 412 Innovative Thinking and Problem Solving (3-0)3
Develops new ways of defining urban, architectural and industrial design problems and explores methods of generating new and innovative solutions.

CRP 414 Urban and Regional Project Management (3-0)3
Project Cycle Management; Logical Framework Analysis; social Impact Assessment; Project Design; Negotiation and Stakeholder Analysis; Monitoring and Assessment; Financial Estimation and Evaluation.

CRP 415 Social Aspects of Planning (3-0)3
Seminar Topics: Behavior, urban environment and planning; territoriality, micro, meso, macro space behavior; environmental values, needs as related to contextual environment; interpersonal interaction; environmental stress factors; aesthetics, quantity

and quality of life; planning/designing for people and/or with people.

CRP 418 The Theory of Economic and Spatial Development (3-0)3
The concept of development, different theories of economic development, economic development and planning, regional development theories, regional development theories and practice in the European Union, in different European countries and Turkey.

CRP 419 Visions and Strategies for Socio-Spatial Development (3-0)3
Strategic planning and future visioning; scenario writing approach; social marketing and negotiation processes; strategies in geopolitics; strategies for stakeholder society and spatial development strategies.

CRP 421 Population Dynamics and Planning (3-0)3
Introductory course to familiarize the students with the field of demography. Provide the students with the basic principles, methods and techniques of demography which are especially relevant for the planners. Both the conceptual and technical issues. Comparative examples from developing and developed countries. Mainly age and sex structure, vital rates and aggregate population projection.
Prerequisite: Consent of Instructor

CRP 423 Computer Application of Statistical Techniques to City and Regional Planning (3-0)3
Application of statistical methods and techniques (which are taught in STAT 201 and 202) to city and regional planning problems. Package program of SPSS/PC+. Mainly, descriptive univariate statistics, discriminate analysis. Several homework.
Prerequisite: Consent of Instructor

CRP 425 Application of Demographic Techniques to Turkish Data (3-0)3
Application of the demographic methods and techniques to the real world Turkish data. Specific province as a case study. Package programs of SPSS/PC+ and FIVSIN. Interactive use of computer. Discuss the changes in the output when the input data are changed. Mainly, aggregate and disaggregate (cohort-survival) population projection. Several homework.
Prerequisite: Consent of Instructor

CRP 433 Economics of Development and the Economy of Turkey (3-0)3
Different theories and schools of thought in development economics. The evolution of the economic structure and the planning experience of Turkey during the Republican period in the light of these general theories.

CRP 437 Urban History Workshop (3-0)3
Methodological issues in urban history; various theories and models of the city; comparative case studies from changing structures and networks in different regions of the world; socio-morphological transformations in the 19th and 20th century European, Middle Eastern Far Eastern and American cities.

CRP 438 Introduction to Geographic Information Systems in Planning Practice (3-0)3
Understanding of information systems, basic concepts, introduction to Geographic Information Systems (GIS), data conversion, available technology, hardware, software, peripherals, GIS as a tool for planners, use of GIS in planning. Basic project design steps for data conversion, raster to vector conversion and GIS, database design, automation of data, query and analysis of spatial data. Sample projects, computer applications.

CRP 444 Application Development in Geographic Information Systems (3-0)3
Developing site and user-specific GIS applications. An overview of basic GIS tools and scripting for developing graphical user interfaces. The design of application development and case studies where students are expected to develop their own applications.

CRP 450 New Spaces of Growth and Production (3-0)3
Recent issues on geography of production, new spaces of growth, and changing spatial organization of the world system. General discussion on dynamics of the changes in spatial organization of production. The theoretical explanations on the emergence of new nodes of growth. Industrial districts, learning regions, border regions, nodes urban areas as nodes of networks, technology based developing areas.

CRP 451 Models in Urban Planning I (3-0)3
Introduces modeling as the logical outcome of the systems approach and emphasizes its increasing role in the planning field since 1960s. The course aims

to give a basic background for the model building process. Specific topics include; systems theory, mapping theory, theory-model relationships, types of urban models, the spatial interaction (gravity) model.

CRP 452 Models in Urban Planning II (3-0)3

By using the entropy maximization method, generalizes the classical gravity model and thus introduces the family of spatial interaction models. Reviews the Lowry-Garin model and other derivatives. Considers also some selected urban models. Emphasizes the calibration methods, gives worked examples and encourages the computer applications. Discusses how they can be used as location models in urban policy making. Compares first and second generation of urban models, evaluates the present trends.

CRP 453 Participatory Design and Planning (3-0)3

Citizen participation in planning, participatory design and planning methodology, community empowerment, participatory processes in urban management and urban regeneration, strategic planning and participation, participatory research with children living and working on the streets, non-governmental organizations in planning.

CRP 454 Urban Transport Systems: Planning and Design (3-0)3

Planning and design of transport networks, modes, systems, stations. Network and urban form considerations. Route and capacity planning for public transport systems. Planning for pedestrian circulation, city centre pedestrianization. New Urbanism movement and planning for pedestrian-oriented and transit-oriented neighbourhoods. Principles of traffic calming. Design considerations for planning car parks, road junctions, stations, and interchange facilities.

CRP 455 Aesthetics and Human Experience in Urban Design (3-0)3

An overview of environmental psychology. Issues of environmental perception and cognition, elements and structure of mental maps, orientation and way finding, environmental aesthetics, diversity and environment, use of psychological information to evaluate environments, programming for design for human use, implementation tools of environmental attributes salient to human use. Self-managing in –depth group discussions on environment and human experience reflecting on case studies.

CRP 466 Labor Market Dynamics in Global Restructuring and Spatial Transformation (3-0)3

Presents the current issues and debates on the interrelations between labor market and urban planning. Provides an overview of various approaches within the field of labor market analyses in the context of global restructuring along with an emphasis on their relevance for urban social transformation.

CRP 470 Principles of Housing (3-0)3

Definition of housing as a specific commodity; the concepts of housing need and housing demand; forms of housing provision, characteristics of house building industry; housing finance systems; state housing policies: subsidizing housing, rent control, social rented housing; unauthorized housing.

CRP 476 Housing Research (3-0)3

Research projects are formulated on relevant subjects and presented to the class and completed in the light of class discussion.

CRP 478 Urban Residential Transformation and Change in Turkish Cities (3-0)3

Perspectives on urban residential structure; The Chicago School and the Ecological Tradition, Neo-Classical Economic Models and the Behavioral Approach, Neo-Weberian Approaches and Urban Managerialism, Political Economy Approach , Humanist Approach, Sociological Approaches. Processes of residential differentiation; invasion-succession, segregation, filtering process, neighbourhood life cycle. Urban residential transformation; urban renewal and revitalization, urban redevelopment and regeneration. Urban residential structure and transformation in Turkey; urban growth and change in Turkey, urban housing and residential structure in Turkey, legislative background of urban residential transformation in Turkey, case studies.

CRP 479 Implementational Aspects of Urban Planning with reference to Legal and Administrative Issues (3-0)3

Aims to present current issues and debates on the planning legislation related to coastal areas, natural and built environment, privatization of public land, touristic development and similar subjects all of which are closely attached to the implementation of plans and the practice of planners involved in professional life.
Prerequisite: Consent of Instructor

CRP 483 Policy Design and Evaluation (3-0)3

Introduction to policy analysis, design and evaluation. The process of public policy making, the analytical options open to the policy analyst, the key concepts and arguments of policy and program design, the methods and practice of social policy/program evaluation, new directions in policy field.

CRP 485 Evolving Gender Issues in Contemporary Urban Planning (3-0)3

Presents the current issues and debates on the interrelations between gender issues and the urban planning discipline. Provides and overview of various approaches within feminist geography and their relevance for a new agenda in urban planning.

CRP 486 Urban Regeneration: Strategies, Policies, Organization and Design (3-0)3

Evolution, definition and purpose of urban regeneration. Strategy and partnership in urban regeneration. Economic regeneration and funding. Physical and environmental aspects. Social and community issues. Employment, education and training. Housing issues. Legal and institutional aspects, and organizational and management bases of urban regeneration. Experiences in Europe, North America and Turkey.

CRP 488 Institutional Aspects of Urban and Regional Planning (3-0)3

An overview of globalization and the new economy. Issues of institutional change and governance. In-depth discussions on regional and urban governance together with the analysis of case studies.

CRP 490 Summer Practice: Municipal, Public or Private Planning Office NC

Students work in private planning offices or public bodies, especially in municipalities, in order to familiarize themselves with the current planning practice.

CRP 495 Urban Political Analysis (3-0)3

Structured around the political aspects of urban life. Embraces power and politics from the very emergence of the human settlements. Introduction to the basic concepts and theories of, state, local state, urban studies and planning within the context of different methodologies.

CRP 499 Seminar in Selected Urban Political Issues (3-0)3

Seminar course around the contemporary topics in urban political context. The aim of the course is to concentrate students' previous theoretical knowledge on different urban issues; to reexamine and evaluate the current urban problems of our cities by using the frameworks developed by those theories; to test the relevance and the validity of different paradigms in this context. Major areas of concern are politics of urban spatial structuration, urban service provision, land ownership, social movements and the politics of urban planning issues.

GRADUATE PROGRAMS AT THE DEPARTMENT OF CITY AND REGIONAL PLANNING

The Department of City and Regional Planning offers three graduate programs: graduate program in City Planning leading to Master of City Planning degree; graduate program in Regional Planning leading to Master of Regional Planning degree, and graduate program in Urban Design leading to Master of City Planning in Urban Design degree. Although the graduate programs in City Planning and Regional Planning are, in principle, open to students from different backgrounds, the Department may ask candidates to take some complementary undergraduate courses. The graduate program in Urban Design accepts the graduates of city planning, architecture and landscape architecture programs.

The Department of City and Regional Planning also offers a Ph.D. degree in City and Regional Planning. The University requirements governing the graduate and Ph.D. programs are described in Academic Rules and Regulations of this catalog.

In addition, the Department also runs joint graduate programs with other departments in METU: Urban Policy Planning and Local Government; Geodetic and Geographic Information Technologies, and Settlement Archeology. The details concerning these programs are described in the relevant parts of the catalog.

GRADUATE CURRICULUM

MASTER OF CITY PLANNING

First Semester				Second Semester			
CP	501	Planning Studio I	(4-8)8	CP	502	Planning Studio II	(4-8)8
RP	511	Planning Theory	(3-0)3	CP	558	New Modes of Intervention in Planning	(3-0)3
CP	537	Urban Property Development and Planning	(3-0)3	Elective			(3-0)3
Elective			(3-0)3	Elective			(3-0)3
				CP	570	Thesis Seminar	NC

Third Semester				Fourth Semester			
CP	500	M.C.P. Thesis	NC	CP	500	M.C.P. Thesis	NC

Total minimum credit: 34
Number of courses with credit (min): 8

MASTER OF REGIONAL PLANNING

First Semester				Second Semester			
RP	501	Regional Planning Studio I	(4-8)8	RP	534	Changing Economic and Political Structure	(3-0)3
RP	511	Planning Theory	(3-0)3	RP	546	Workshop on Regional Economic Restructuring	(3-0)3
RP	532	Methods of Regional Analysis And Spatial Organization	(3-0)3	Elective			(3-0)3
Elective			(3-0)3	Elective			(3-0)3
				CP	570	Thesis Seminar	NC

Third Semester				Fourth Semester			
RP	500	M.R.P. Thesis	NC	RP	500	M.R.P. Thesis	NC

Total minimum credit: 29
Number of courses with credit: 8

MASTER OF CITY PLANNING IN URBAN DESIGN

First Semester				Second Semester			
UD	501	Urban Design Studio I	(4-8)8	UD	502	Urban Design Studio II	(4-8)8
Elective			(3-0)3	Elective			(3-0)3
Elective			(3-0)3	Elective			(3-0)3
Elective			(3-0)3	Elective			(3-0)3
				CP	570	Thesis Seminar	NC

Third Semester				Fourth Semester			
UD	500	M.C.P. Thesis (Urban Design)	NC	UD	500	M.C.P. Thesis (Urban Design)	NC

Total minimum credit: 34
Number of courses with credit (min): 8

Ph.D. IN CITY AND REGIONAL PLANNING

If admitted by M.S. degree:

CRP	640	Doctoral Seminar	NC	Elective			(3-0)3
CRP	600	Ph.D. Thesis	NC	Elective			(3-0)3
CRP	601	New Tendencies in Planning Thought	(3-0)3	Elective			(3-0)3
				Elective			(3-0)3
CRP	602	Space Concepts and Organization in the New Age	(3-0)3	Elective			(3-0)3

Total minimum credit: 21
Number of courses with credit (min): 7

If admitted by B.S. degree, the students have to select one of the following options:

1. City Planning Option:

CP	501	Planning Studio I	(4-8)8	CRP	602	Space Concepts and Organization in the New Age	(3-0)3
CP	502	Planning Studio II	(4-8)8	Elective			(3-0)3
RP	511	Planning Theory	(3-0)3	Elective			(3-0)3
CP	537	Urban Property Development and Planning	(3-0)3	Elective			(3-0)3
				Elective			(3-0)3
CP	558	New Modes of Intervention in Planning	(3-0)3	Elective			(3-0)3
				Elective			(3-0)3
CP	570	Master's Seminar	NC	Elective			(3-0)3
CRP	640	Doctoral Seminar	NC	Elective			(3-0)3
CRP	600	Ph.D. Thesis	NC	Elective			(3-0)3
CRP	601	New Tendencies in Planning Thought	(3-0)3				

Total minimum credit: 55
Number of courses with credit (min): 15

2. Regional Planning Option:

RP	501	Regional Planning Studio	(4-8)8	CP	570	Master's Seminar	NC
RP	511	Planning Theory	(3-0)3	CRP	640	Doctoral Seminar	NC
RP	534	Changing Economic and Political Structure	(3-0)3	CRP	600	Ph.D. Thesis	NC
				CRP	601	New Tendencies in Planning Thought	(3-0)3
RP	532	Methods of Regional Analysis And Spatial Organization	(3-0)3				
				CRP	602	Space Concepts and Organization in the New Age	(3-0)3
RP	546	Workshop on Regional Economic Restructuring	(3-0)3				
CP	524	Application of Advanced Statistical Methods	(3-0)3	Elective			(3-0)3

Elective			(3-0)3	Elective		(3-0)3
				Elective		(3-0)3
Elective			(3-0)3	Elective		(3-0)3
Elective			(3-0)3			

Total minimum credit: 50
Number of courses with credit (min): 15

3. Urban Design Option:

UD	501	Urban Design Studio I	(4-8)8	Elective		(3-0)3
UD	502	Urban Design Studio II	(4-8)8	Elective		(3-0)3
CP	570	Master's Seminar	NC	Elective		(3-0)3
CRP	640	Doctoral Seminar	NC	Elective		(3-0)3
CRP	600	Ph.D. Thesis	NC	Elective		(3-0)3
CRP	601	New Tendencies in Planning Thought	(3-0)3	Elective		(3-0)3
CRP	602	Space Concepts and Organization in the New Age	(3-0)3	Elective		(3-0)3
				Elective		(3-0)3
				Elective		(3-0)3
				Elective		(3-0)3
				Elective		(3-0)3

Total minimum credit: 55
Number of courses with credit (min): 15

GRADUATE COURSES

CP	500	M.C. Thesis	NC
CP	501	Planning Studio I	(4-8)8
CP	502	Planning Studio II	(4-8)8
CP	507	Urban Risk Mitigation and Research Project	(2-4)4
CP	510	Urban Social Theory and Planning	(3-0)3
CP	517	Issues in Urban Archaeology	(3-0)3
CP	520	History of Housing	(3-0)3
CP	522	Methods in Urban Planning Research	(3-0)3
CP	524	Application of Advanced Statistical Methods	(3-0)3
CP	527	Modernity, Postmodernity and Urban Studies	(3-0)3
CP	530	Topics in Planning Economics	(3-0)3
CP	531	Cultural Heritage Management	(3-0)3
CP	534	Theory of Public Goods	(3-0)3
CP	535	Urban Studies in the Middle East and North Africa	(3-0)3
CP	536	Urban Planning Approaches in the Middle East and North Africa	(3-0)3
CP	537	Urban Property Development and Planning	(3-0)3
CP	541	The Urban Design and Planning Process	(3-0)3
CP	542	Workshop in Urban Design and Planning Process	(3-0)3
CP	545	Urban Studies Workshop	(3-0)3
CP	550	Solar Energy and Urban Planning	(3-0)3
CP	551	Theories and Principles of Urban Design	(3-0)3
CP	556	Urban and Regional Transformation in the Global Age: Policy and Planning	(3-0)3
CP	558	New Modes of Intervention in Planning	(3-0)3
CP	560	Advanced Research in Planning	(3-0)3
CP	562	Urban Risks and Mitigation Planning	(2-2)3
CP	564	Urban Systems and National Development	(3-0)3
CP	566	Evolution of Civic Design	(3-0)3
CP	570	Thesis Seminar	(0-2)NC
CP	580	Urban Field Research	(3-0)3
CRP	600	Ph.D. Thesis	NC
CRP	601	New Tendencies in Planning Thought	(3-0)3
CRP	602	Space Concepts and Organization in the New Age	(3-0)3
CRP	640	Doctoral Seminar	(0-2)NC
CRP	7XX	Special Topics in Planning	(3-0)3
CRP	8XX	Special Studies in Planning	(4-2)NC
CRP	9XX	Advanced Studies in Planning	(4-0)NC
RP	500	M.R.P. Thesis	NC
RP	501	Regional Planning Studio	(4-8)8
RP	511	Planning Theory	(3-0)3
RP	521	Agricultural Land Use and Environment	(3-0)3
RP	522	Development and Agriculture	(3-0)3
RP	531	Theory of Spatial Organization	(3-0)3
RP	532	Methods of Regional Analysis And Spatial Organization	(3-0RP
	533	Economic Development and Regional Planning	(3-0)3

RP	534	Changing Economic and Political Structure	(3-0)3
RP	540	Environmental Policies and Planning	(3-0)3
RP	546	Workshop on Regional Economic Restructuring	(3-0)3
RP	7XX	Special Topics in Regional Planning	(3-0)3
RP	8XX	Special Studies in Regional Planning	(4-2)NC
RP	9XX	Advanced Studies in Regional Planning	(4-0)NC
UD	500	M.C.P. Thesis (Urban Design)	NC
UD	501-502	Urban Design Studio I-II	(4-8)8
UD	511	Design Methodology	(3-0)3
UD	531	Political Background of Urban Design	(3-0)3
UD	532	Legislative Background of Urban Design	(3-0)3
UD	7XX	Special Topics in Urban Design	(3-0)3
UD	8XX	Special Studies in Urban Design	(4-2)NC
UD	9XX	Advanced Studies in Urban Design	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

CP 500 M.C.P. Thesis NC
Program of research leading to Master of City Planning arranged between student and a faculty member. Student register to this course starting from their third semester while the research program or write-up of thesis in progress

CP 501-502 Planning Studio I-II (4-8)8
Studies of current and prospective processes in the formation, use, and control of urban environment and life; Theory and methodology in exploring and solving contemporary urban problems; Surveys and analyses of techno-economic and socio-spatial phenomena; Development of effective policy prescriptions and devising appropriate tools of implementation; Spatial assignments and physical design; Impact and risk analyses and multi-dimensional assessment of proposals; Visual presentations and policy communication.
Prerequisite for CP 502: CP 501

CP 507 Urban Risk Mitigation Research Project (2-4)4
Natural and technological sources of hazards; objectives of the new international disasters policy; Resilient cities programs; organizational and legal frameworks for disaster risk reduction; concepts and tools in mitigation planning; principles of risk assessment in urban setting; participatory project development in urban risk sectors; approaches in urban mitigation strategies; identification and management of projects in risk reduction; interdisciplinary mitigation research and project development in urban and spatial contexts; cost effectiveness in mitigation; coordinating emergency and mitigation plans.

CP 510 Urban Social Theory and Planning (3-0)3
Analysis of the planning process; ideological framework of planning; role of planner in a changing world; community involvement; public and private participation in planning; maintenance and sustainability of urban plans.

CP 517 Issues in Urban Archaeology (3-0)3
International-national archaeological heritage policies, integrated protection policies, non-destructive survey techniques, data management, archaeological impact studies. Spatial characteristics of archaeological potentials in historic towns, handling archaeological heritage underneath the urban areas in planning, management and presentation of archaeological heritage, project appraisal in heritage management.

CP 520 History of Housing (3-0)3
'House' as a human social relation beyond the nest and shelter; its development in the matrilineal clan, its transformation in the patriarchal society, its role in the class relations of slave holding city-states and empires; medieval housing as a part of the feudal bondage; Ottoman urban housing and relations between central state and local communities; housing after the industrial revolution as a part of the conflict between capital and labor, “gecekondu” as a specific form of labor housing and the housing market in Turkey.

CP 522 Methods in Urban Planning Research (3-0)3
Philosophy and methodology in Geography; the meaning of explanation, scientific explanation, the model of natural science, problems of explanation in the social sciences and history, explanation in geography; the role of theories, laws and models in explanation in geography, model languages for geographic explanation. Models for description in geography, models for explanation in geography.

CP 524 Application of Advanced Statistical Techniques (3-0)3

Application of advanced statistical methods and techniques to city and regional planning. Package program of SPSS/PC+. Mainly, regionalization and grouping: analysis of variance and covariance, factor analysis and cluster analysis.

Prerequisite: CP 423 is strongly recommended.

CP 527 Modernity, Postmodernity and Urban Studies (3-0)3

The origins of modernity and Enlightenment thought, secularization of power, binary oppositions of modernity. The birth of 'postmodern condition', poststructuralist critique of modern subjectivity, language and representation, time and space in modern and postmodern thought, politics and conceptions of democracy, local/global dichotomy, locality as a political unit, globalization and dynamics of urban change, postmodernity as a spatial phenomenon, planning and modernism/ postmodernism debate, urban studies and postmodernism.

CP 530 Topics in Planning Economics (3-0)3

Urban micro-economics; urban land use allocation; residential land use and housing market; economics of urban transport. Economics of the environment. Ecological concepts; the common property and environmental externalities; cost-benefit and multicriteria analysis for environmental design and management. Urban Public Economics; rationale behind the government intervention; the definition of government output, local public goods; pricing and investment decisions; urban public finance.

CP 531 Cultural Heritage Management (3-0)3

Scope of cultural heritage and its management, cultural resource and its authenticity in different contexts, treatment approaches to the management of cultural heritage, integrated and sustainable conservation strategies, environmental impact assessment issues, legislative and economic considerations, case studies illustrate all types of physical environment close to existing heritage resources: designated conservation areas, world heritage sites, areas of archaeological importance and wider historic landscapes.

CP 534 Theory of Public Goods (3-0)3

The evolution of public expenditures, the functioning of the public and private economy. The characteristics of public goods and methods of analysis, the price formation and decision making procedures. Supply, demand; local vs. central financing and locational problems.

CP 535 Urban Studies in the Middle East and North Africa (3-0)3

Historical evolution of city system in the Middle East and North Africa; cultural and environmental factors effecting similarities and variations; comparative analysis of urbanization and social change in capital-rich and capital-poor countries of the region; changing physical morphology of the major cities (old and new national capitals, ports, new towns and holly cities) and transformations in city centers due to over urbanization.

CP 536 Urban Planning Approaches in the Middle East and North Africa (3-0)3

Cultural background, geographical factors and socio-economic variations effecting culturalist vs. progressist approaches in urban planning systems of the region; comparative case studies and evaluation of some large scale projects on urban conservation, low-cost housing (site and services, self-help, upgrading etc.), public transportation and urban development.

CP 537 Urban Property Development and Planning (3-0)3

The relationship between the real estate investments and the national economies; the role of the land use planning and environmental regulations in real estate development at the local level; demand, supply and price of the real estate assets; evaluation methods of real estate investments; financing real estate development; property rights; real estate taxes.

CP 541 The Urban Design and Planning Process (3-0)3

An overview of urban design and planning processes through case studies. Metropolitan municipalities and urban policy, plan, program and project identification. Formulation, design, finance, management and implementation of urban projects. Social, political, financial, institutional, legal and technical issues in urban project implementation with a particular focus on 'resettlement'.

CP 542 Workshop in Urban Design and Planning Process (3-0)3

Research on urban design and planning processes. Metropolitan municipalities. Urban policy, plan, program and project identification. Studio work on a selected real life urban design and planning problem with particular emphasis on social, political, financial, institutional, legal and technical issues of implementation.

CP 545 Urban Studies Workshop (3-0)3
Overviews on classical and recent urban theories and research methods, key themes in contemporary spatial thought and methodologies, current issues in urban and regional contexts, recapitulation of basic analytical concepts for the chosen topic of study, comprises a term project to be prepared on a previously provided database, workshop aims to enhance theoretically learned empirical research capacity, prepare the ground for substantive urban research, interests and professional practice, students are expected to formulate, undertake and finalize empirical urban study on the chosen research topic.

CP 550 Solar Energy and Urban Planning (3-0)3
Solar energy as an alternative energy. Solar energy and town structure. Utilization of the solar energy in towns. Climate and its effects on urban structure. Solar architecture. Solar systems of architecture. Solar systems and urban planning. Solar energy and urban morphology. The concept of solar town.

CP 551 Theories and Principles of Urban Design (3-0)3
Positive and normative theories of design; substantial and procedural aspects of design theory; models of man-environment relations; man-environment relations in the historical context and schools of design; urban elements; squares, house; Jungian approach to the analysis of urban elements.

CP 556 Urban and Regional Transformation in the Global Age: Policy and Planning (3-0)3
The primary focus of this course is on ongoing changes taking place in the urban and regional systems along with the accelerating effects of globalization. The course also covers such issues as: urban restructuring, redevelopment and institutional change. After taking this course, students are expected to have a general understanding of evolving urban theories and an in-depth understanding of urban and regional strategies of transformation. Topics of the course are: An overview of globalization process. A general discussion on urban theory. Discussions and the analysis of case studies on redevelopment and urban transformation. Current issues of urban governance. In-depth discussions on planning and the rise of civil society in a global age, together with performing cultures and identities in the new economy.

CP 558 New Modes of Intervention in Planning (3-0)3
The need for intervention and its goals in modern societies; tools of intervention; the distortions stemming from intervention; neoliberal philosophy and rational choice theory versus critical approaches; systematic competitiveness; selling places or city marketing and local development initiatives; social spatial justice, justice in time; social governance capacity of the urban; conflict management and negotiation process; promoting quality of organizations and quality of life; intervention design.

CP 560 Advanced Research in Planning (3-0)3
Guidance in carrying out scientific research. Direction in all aspects of designing and performing research and equipment with theoretical and empirical tools of analysis, survey design techniques and a full library research covering the original and recent sources of information. A preliminary study before the start of the thesis. Professional practice.

CP 562 Urban Risks and Mitigation Planning (2-2)3
Risk analyses in different disciplines; Cities and risk society; Natural and technological hazards in the urban environment; International, national, local level policies in risk management; Vulnerabilities and risk sectors in urban systems; Social, institutional, individual perceptions of risks; Forms of planning related to disaster policies; Local and city-level risk management approaches; Analysis of emergency conduct; Forms of 'contingency' and 'mitigation' planning; Spatial and non-spatial tools in mitigation implementation.

CP 564 Urban Systems and National Development (3-0)3
Discussion of national urban population as one of the pressing problems of developing countries. Description and the analysis of the urban systems with quantitative scientific techniques, relation with the national development and possible future trends. A term paper to be prepared about possible future trends in the urban systems, possible effects of high technology, global markets and technopolis strategies.

CP 566 Evolution of Civic Design (3-0)3
Emergence of the nineteenth century urban design schools and the twentieth century urban design models within a framework of the evolution of urban design approaches.

CP 570 Thesis Seminar (0-2)NC
Enables the student to perform a detailed study of his/her thesis subject. Guidance in research and regular progress reports submitted to discuss specific problems of student's research. Lectures on theoretical and empirical analysis, research design techniques, data collection and survey methods.

CP 580 Urban Research Field (3-0)3
To provide students with an introduction towards different research approaches about urban space, how and where they can be used, and in-depth discussion on the selected methods and techniques; to identify directions towards conducting research for understanding the urban space that involves multi-dimensional aspects; different types of research approaches in design and planning, their ontological positions and epistemological frameworks, selected research methods and techniques; the selection, development, and analysis of various types of methodological instruments and procedures for conducting research about socio-spatial matters; research processes and comparison among different methods through a review of applied research projects. To allow students to start up with developing the proposal of their post-graduate research projects; to increase students' analytical abilities in defining different research approaches, principles, and a research design by using appropriate methods and techniques.

CRP 600 Ph.D. Thesis NC
Program of research leading to Ph.D in City and Regional Planning arranged between student and a faculty member. Student register to this course starting from their third semester while the research program or write-up of thesis in progress.

CRP 601 New Tendencies in Planning Thought (3-0)3
Limits of predictabilities and instrumental rationality in planning. Critics of representative democracy. Human rights and citizenship. Civil society and governance. Emerging planning categories in the last two decades.

CRP 602 Space Concepts and Organization in the New Age (3-0)3
Spatial foundations of social life, a socio-spatial epoch in the capitalist development, the emergence of networks and districts, new form of spatial organization and local economic development, regional problem in network society.

CRP 640 Doctoral Seminar NC
Students prepare and present studies related to their doctoral theses in round table discussions participated in by the students and members of the Department.

CRP 7XX Special Topics in Planning (3-0)3
Courses not listed in this catalog. Contents vary from one year to another depending on the interest of students.

CRP 8XX Special Studies in Planning (4-2)NC
Students choose and study a topic under the guidance of a faculty member, normally their supervisors.

CRP 9XX Advanced Studies in Planning (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally their supervisors.

RP 500 M.R.P. Thesis NC
Program of research leading to Master of Regional Planning arranged between student and a faculty member. Student register to this course starting from their third semester while the research program or write-up of thesis in progress

RP 501 Regional Planning Studio (4-8)8
Origin, evolution and characteristics of regional development projects in different countries. Nature and practical applications of techniques used by regional planners for both policy formulation and assessment of social and resource problems. Introduction to planning issues. Basic tools of the profession and their use in various practical research exercises. Individual and group work.

RP 511 Planning Theory (3-0)3
Basic concepts and functions of planning types and their interrelations. Public expenditure decisions, planning theories and processes, models of rational choice, decision environment, policy design, programming techniques and strategies, problems of goal formulations, problems of projections, project evaluation.

RP 521 Agricultural Land Use and Environment (3-0)3
Describes farming in both developed and developing countries highlighting social and economic factors which influence agricultural sector. Provides basic knowledge on definition of agriculture, modernisation of agriculture, agricultural pollution, side effects of modern farming, land use for non-agricultural activities and re-politization of agricultural sector.

RP 522 Development and Agriculture (3-0)3
Examines issues affecting development through agricultural sector such as the role of agriculture in economic development, the farm and the farmer, nature of agricultural sector, agriculture in capital accumulation. Provides a comprehensive analysis of sectors that create changes in today's countryside.

RP 531 Theory of Spatial Organization (3-0)3
Introduction to neo-classical location theory. Various approaches to location theory, basic determinants of location decisions, industrial location theory, agricultural and urban rent theory and land uses, central place theory as settlement systems, urbanization economies. An overall evaluation of neo-classical location theory.

RP 532 Methods of Regional Analysis and Spatial Organization (3-0)3
Introductory course on techniques of analysis on spatial and regional issues. Alternative modes of representation of space and modelling; basic determinants of spatial organization; industrial location analysis, market systems and central place systems, economic base models, descriptive model of regional analysis, flow analysis, gravity models, regional I-O analysis.

RP 533 Economic Development and Regional Planning (3-0)3
The meaning of development in different economic theories, main issues of development economics. Unbalanced and balanced growth, dualism, economic "take-off", income distribution, labor market, Development planning and desegregation of national plans, and regional growth theories.

RP 534 Changing Economic and Political Structure (3-0)3
Designed to present theoretical debates after the 1970s in terms of economic development and the role of the state. Consequences of changing economic and political structure on spatial organisation. Empirical evidence on
changes in economic systems and new forms of governance and their relevance to urban and regional planning.

RP 540 Environmental Policies and Planning (3-0)3
Evolution of environmental consciousness, concerns and policies since 1960s. Discussions, future possible developments of environmental policies. The changes of environmental policies at global, regional, national and local levels. Juridical, administrative and sectional aspects of policies. The worldwide and nationwide statistics about population and natural resources.

RP 546 Workshop on Regional Economic Restructuring (3-0)3
Deals with regional restructuring and policy adjustment, globalization trends and regions. Transformation of economic systems, integration to global networks, social characteristics as an asset in regional transformation; learning regions, formulation of policies and strategies for integration to global networks.

RP 7XX Special Topics in Regional Planning (3-0)3
Courses not listed in this catalog. Contents vary from one year to another depending on the interest of students.

RP 8XX Special Studies in Regional Planning (4-2)NC
Students choose and study a topic under the guidance of a faculty member, normally their supervisors.

RP 9XX Advanced Studies in Regional Planning (4-0)NC
Graduate students as a group or a Ph.D. student chooses and studies advanced topics under the guidance of a faculty member, normally their supervisors.

UD 500 M. C.P. Thesis (Urban Design) NC
Program of research leading to Master of City Planning in Urban Design arranged between student and a faculty member. Student register to this course starting from their third semester while the research program or write-up of thesis in progress

UD 501-502 Urban Design Studio I-II (4-8)8
Concentrates on developing theoretical and analytical studies about the topics undertaken in any academic year. The objective is to generate new frameworks, languages and techniques at the macro, meso and micro scale urban form, identity and activity studies and to enhance students' skills and knowledge in managing the design of the city or its parts through financial and legal tools.
Prerequisite for UD 502: UD 501

UD 511 Design Methodology (3-0)3
Methods of design, procedural theory in design, phases of design and their related activities,

hermeneutic approach to design problems, agents and co-agents in design and design models.

UD 531 Political Background of Urban Design (3-0)3

Urban space and production relations. In addition to epistemological or technical considerations, evolution of urban space to understand the relations among the factors of production, namely capital, labor, land and the following property relations to understand the transformation of urban space in time for different societies. Political background of urban design approaches.

UD 532 Legislative Background of Urban Design (3-0)3

Property relations, supplied finance, enacted legislation (planning and building codes) and constructed infrastructure. Those facades of urban environment with case studies.

UD 7XX Special Topics in Urban Design (3-0)3

Courses not listed in this catalog. Contents vary from one year to another depending on the interest of students.

UD 8XX Special Studies in Urban Design (4-2)NC

Students choose and study a topic under the guidance of a Department member, normally their supervisors.

UD 9XX Advanced Studies in Urban Design (4-0)NC

Graduate students as a group or Ph.D. students choose topics under the guidance of a Department member, normally their supervisors.

DEPARTMENT OF INDUSTRIAL DESIGN

PROFESSORS

HASDOĞAN, Gülay ***(Department Chair)***: B.ID., M.S. in Building Science, METU;
Ph.D., Central St Martin's College of Art and Design, London.

ASSOCIATE PROFESSORS

ERBUĞ, Çiğdem: B.ID., M.S., Ph.D. in Building Science, METU.
PEDGLEY, Owain F.: B.Sc. in Industrial Design and Technology, Loughborough University;
Ph.D. in Industrial Design, Loughborough University.
ŞENER-PEDGLEY, Bahar: B.ID., METU; M.A. in Graphic Design, Hacettepe Üniversitesi;
Ph.D. in Industrial Design, Loughborough University.

ASSISTANT PROFESSORS

BÖREKÇİ, Naz A.G.Z.: B.ID., METU; M.F.A. in Interior Design, Bilkent University;
Ph.D. in Industrial Design, Kent Institute of Art and Design/University of Kent at Canterbury.
DOĞAN, Çağla ***(Vice Chair)***: B.ID., M.Sc. in Industrial Design, METU;
Ph.D. in Environmental Design (EVDS), University of Calgary.
KAYGAN, Harun ***(Vice Chair)***: B.ID., M.Sc. in Industrial Design, METU;
Ph.D. in Architecture and Design, University of Brighton.
KAYGAN, Pınar: B.ID., METU; Ph.D. in Sociological Studies, Sheffield University.
KORKUT, Fatma: B.ID., METU; M.Sc. in Design, IIT, Chicago;
Ph.D. in Industrial Design, Mimar Sinan Üniversitesi.

INSTRUCTORS

GÜRSU, Hakan: B.ID., M.S. in Building Science, Ph.D. in Urban Environmental Design, METU.
IŞIK, Figen: B.ID., M.A. in History of Architecture, METU.
ÖZGEN, Dalsu: B.F.A in Graphic Design, Bilkent University; M.F.A in Design and Technology,
Parsons School of Design/New School University, New York;
Proficiency in Art in Graphic Design, MSGSÜ.
TOKSÖZ, Refik: B.Arch., KTÜ; M.A. in Communication, Ankara Üniversitesi.
ÜNLÜ, Canan E.: B.ID., M.S. and Ph.D. in Educational Sciences, METU.
YAZICI, Barış: B.I.D., M.I.D., Pratt Institute, New York.

GENERAL INFORMATION: Industrial designers are the creative agents and facilitators of change who develop inspirational, desirable, engaging, evolving, empowering and resource-effective products and systems integrating various scales of production, spanning do-it-yourself, special commissions, craft, batch and mass production, and open design.

Industrial designers focus on the whole product lifespan by taking into account individual, social, cultural, environmental, technical and economic considerations. Industrial design expertise involves exploring and understanding user behavior and user needs so as to incorporate local knowledge; applying foresight to predict usage and interaction scenarios that lead to positive user experiences; reflecting on areas in need of change through developing inspirational and enduring products; extending the lifespan of products through enabling product repair, re-use and recovery; and encouraging responsible means of production and use considering the Earth’s limited resources.

In order to bridge the gap between product development and product use, industrial designers benefit from various human-centered design research methods. These range from exploratory and evaluative methods such as observation, interviews and focus groups, to generative and participatory methods such as design workshops, 2D and 3D collages, Velcro modeling and cultural probes.

The services provided by industrial designers as consultants or in-house professionals are sought by private companies specializing in various sectors, including electrical household appliances, medical equipment, cookware, packaging, furniture, lighting and transportation. NGOs, public institutions and governmental bodies also have potential to benefit from the expertise of industrial designers.

PROGRAMS OF STUDY: The industrial design courses that were started at METU Department of Architecture in 1969 by the American industrial designer David K. Munro are the first courses on industrial design offered in Turkey. Established as a separate unit in 1979, METU Department of Industrial Design became the first Turkish member of the International Council of Societies of Industrial Design (ICSID) in 1981. Currently the Department offers an extensive portfolio of undergraduate and graduate programs: A four-year undergraduate program leading to a Bachelor of Industrial Design (B.ID.), an interdisciplinary Master of Science (M.Sc.) Program in Industrial Design, a joint international M.Sc. Program in Design Research for Interaction with Delft University of Technology (TU Delft), and a Ph.D. program in Industrial Design.

A leading provider of undergraduate industrial design education and a pioneer in its field, METU Department of Industrial Design attracts students with the most competitive profile in Turkey. The Department features an educational approach which encourages critical and reflective thinking. Design studios, where student projects are conducted in collaboration partners from diverse sectors, and the open jury system are the core elements of our education. The Graduation Projects Exhibitions, staged every year since 2002, has exhibited student projects advised by around one hundred different participating firms. In recent years, the Department has also taken significant steps towards integrating design considerations for sustainability into its educational approach. We are committed to empower our graduates to become creative, visionary, socially and environmentally aware members of the local and global professional design community.

The aim of the graduate programs at METU Industrial Design is the generation and dissemination of designerly knowledge, tools, techniques and methods based on design research. Our graduate programs have contributed to the training of design researchers who have had significant impact on academia and industry in Turkey and abroad. Since 2003, the METU/BILTIR UTEST Product Usability Unit has been supporting industry-funded research projects carried out by graduate students of the Department. The Design Research for Interaction joint program with TU Delft has provided opportunities for international academic exchange and research collaboration, with graduates becoming specialists in research and design for user-product interaction. In addition to pursuing research projects funded by the industry or the government, our graduate students integrate the educational environment of the design studios into their research practice with the purpose of developing tools, techniques and methods for improving industrial design education and practice.

The Department has international student and staff exchange agreements with design schools across the world. We are active participants in local design events, competitions, fairs and exhibitions as well as international design events, research symposia and design networks, having regularly hosted international workshops with partner schools from around the world. Our graduates contribute to the design of products and systems with local and global impact, and fulfil academic leadership positions at industrial design departments across Turkey. METU is recognized globally as one of the most prestigious educational institutions in Turkey; our department has been ranked among top design institutions in Red Dot Design Rankings and among Europe's Top 100 Architecture and Design Schools by the Domus Magazine.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

ID	101	Basic Design I	(4-8)8
ID	111	Design Communication I	(2-2)3
ID	122	Origins and Attitudes in Industrial Design I	(3-0)3
PHYS	101	Physics for Nonscientists I	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

ID	102	Basic Design II	(4-8)8
ID	112	Design Communication II	(2-2)3
ID	121	Introduction to Industrial Design	(3-0)3
PHYS	102	Physics for Nonscientists II	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

ID	201	Industrial Design I	(4-8)8
ID	211	Design Communication III	(2-2)3
ID	221	Origins and Attitudes in Industrial Design II	(3-0)3
ID	233	Structures	(3-0)3
ME	212	Principles of Production Engineering	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC
ID	290	Elementary Workshop Practice and Computer Literacy in Design	(3-5)NC

Fourth Semester

ID	202	Industrial Design II	(4-8)8
ID	212	Design Communication IV	(2-2)3
ID	222	Origins and Attitudes in Industrial Design III	(3-0)3
ID	236	Manufacturing Materials	(3-0)3
ID	242	Ergonomics	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

ID	301	Industrial Design III	(4-8)8
ID	311	Computers in Design	(2-2)3
BA	3702	Introduction to Marketing	(3-0)3
Departmental or Non-departmental Elective			
Departmental or Non-departmental Elective			
TURK	303	Turkish I	NC
ID	390	Summer Practice in a Production Establishment and Computer Literacy in Design	NC

Sixth Semester

ID	302	Industrial Design IV	(4-8)8
ID	321	Design and Culture	(3-0)3
ID	480	Introduction to Design Management	(3-0)3
Departmental or Non-departmental Elective			
Departmental or Non-departmental Elective			
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

ID	401	Industrial Design V	(4-8)8
ID	451	Professional Practice	(3-0)3
Departmental or Non-departmental Elective			
Departmental or Non-departmental Elective			
ID	490	Summer Practice in a Design Office	NC
ID	495	Portfolio Presentation	(2-2)3

Eighth Semester

ID	402	Graduation Project	(4-8)8
Departmental or Non-departmental Elective			
Departmental or Non-departmental Elective			
Departmental or Non-departmental Elective			

ELECTIVE COURSES

ID	305	Design Presentation I	(2-2)3
ID	306	Design Presentation II	(2-2)3
ID	310	Model Making	(2-2)3
ID	312	Computer Graphics I	(2-2)3
ID	313	Interactive Multi-media Design I	(2-2)3
ID	314	Interactive Multi-media Design II	(2-2)3
ID	317	Introduction to Visual Media	(2-2)3
ID	363	Visual Narrative in Design I	(2-2)3
ID	364	Visual Narrative in Design II	(2-2)3
ID	365	Color in Product Design	(2-2)3
ID	371	Digital Art: Designing the Audio Visual Realm	(2-2)3
ID	405	Introduction to Interior Design	(2-2)3
ID	406	Jewellery beyond Tradition I	(2-2)3
ID	408	TV Stage Design	(2-2)3
ID	413	Interactive Prototyping for Designers	(2-2)3
ID	421	Design Research in Action	(3-0)3
ID	424	Intellectual Property Rights	(3-0)3
ID	427	Automobile Design and Designers in the 20th Century	(3-0)3
ID	483	Jewellery beyond Tradition II	(2-2)3
ID	485	Ceramic Form I	(2-2)3
ID	486	Ceramic Form II	(2-2)3
ID	489	Design and Cinema	(3-0)3

Courses from other departments with the consent of the Department.

MINOR PROGRAM IN PRODUCT DESIGN

The minor program in product design aims to introduce the discipline from theoretical, methodological, historical, professional and managerial perspectives. The program consists of five compulsory courses including a second year twelve-hour industrial design studio which helps students get familiar with the product design and development process first hand.

Compulsory courses

ID	121	Introduction to Industrial Design	(3-0)3
ID	201	Industrial Design I	(4-8)8
ID	222	Origins and Attitudes in Industrial Design III	(3-0)3
ID	451	Professional Practice	(3-0)3
ID	480	Introduction to Design Management	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

ID 101-102 Basic Design I-II (4-8)8
Introduction to the basic concepts of design, visual thinking, nature of materials and structural principles. Elementary skills of sketching, drawing and modeling. Approaching a problem area beyond its conventional definition.
Prerequisite for ID 102: ID 101

ID 111 Design Communication I (2-2)3
The purpose of this course is to give basic information about drawing as a pictorial explanation. Concepts of drawing (perception, line, proportion, composition, etc.) are studied with examples of three-dimensional objects.

ID 112 Design Communication II (2-2)3
Lettering, applied geometry, orthographic drawing and sketching. Pictorial methods, axonometric, oblique and isometric projections and their applications are the major subjects to be covered.

ID 121 Introduction to Industrial Design (3-0)3
Historical development of industrial design as a discipline and profession in Turkey. Ethical thinking and professional ethics in reference to industrial design. Introduction to intellectual property rights and design registration in Turkey. Aesthetic judgment, kitsch, art, craft and design. Design for sustainability and social innovation, emerging approaches and trends in design practice. Industrial design profession as practiced in Turkey discussed by guest designers from various sectors.

ID 122 Origins and Attitudes in Industrial Design I (3-0)3
A general survey of origins and attitudes of creation of art in history in accordance with the technical and sociological contexts of different eras.

ID 201-202 Industrial Design I-II (4-8)8
Issues of innovation, styling, redesign and human-product interaction. Introduction to a wide range of design criteria. Design problems focusing on physical and functional requirements of a product. Introduction to systematic thinking and scenario building. Producible and usable design solutions with a conceptual approach.
Prerequisite for ID 201: ID102
Prerequisite for ID 202: ID 201

ID 211 Design Communication III (2-2)3
While "developing the habit of visualizing in 3D" is the major concern of this section of the course, topics such as the fundamentals of perspective drawing, developing surfaces of 3D objects with basic geometric forms, intersecting basic 3D objects and fundamentals of producing sectional views, assembly drawing and dimensioning will be covered.

ID 212 Design Communication IV (2-2)3
Ways of communication, the basic elements and principles of communication. Training of the hand, the eye & the memory. Rendering a perspective view from observed reality. Rendering of different surfaces and materials from every day life. The third-dimension; perspective and rendering of the solid form constructing perspective views with geometrical tools; one, two and three point perspective; measuring point perspective. The construction principles of the three-dimensional grid systems. The concepts of light, shade and shadow in rendering. Shadow and reflections. Rendering principles.

ID 221-222 Origins and Attitudes in Industrial Design II-III (3-0)3
Aims to survey developments which led to the emergence of industrial design as a separate

profession, and to develop an overall perspective on concepts and prominent issues related to design and industrial design. The first part covers the period from industrialization (from the mid 18th century toward the end of the 19th century) to the years between two world wars. The second part covers the period roughly from inter-war years to today.

ID 233 Structures (3-0)3
The fundamental relationships between external disturbances, structures and structural response. Types of loads. Physical and mechanical properties of materials. Effect of geometry. States of stress and deformation. Stiffness and flexibility. Structural forms. The effects of tension, compression, bending and torsion. Load carrying action of simple structures.

ID 236 Manufacturing Materials (3-0)3
Aims to develop and establish an awareness and sensibility for selecting appropriate materials and manufacturing processes for industrial design. Subjects include properties of materials, material families, finishing, joining, shaping, and the principles of 'materials experience'. Includes an industry field trip.

ID 242 Ergonomics (3-0)3
Aims to develop awareness in product safety and usability. Study of the relationships between the user and the product. The human body and its physical functions. Anthropometry in equipment design. Practical aspects of equipment layout, instrumental displays and controls.

ID 290 Elementary Workshop Practice and Computer Literacy in Design (3-5)NC
Six weeks in the Faculty's workshops. Introduction to CAD. Production drawing of objects involving sectioning, dimensioning, assembly drawings. Developing practical skills related to the use of basic workshop tools. Exercises on metals, wood, paper and plastics.

ID 301-302 Industrial Design III-IV (4-8)8
Development of product family, designing for engaging user experience, product-service systems thinking, effective use of resources, incorporating local values and practices, reflecting product value and identity, extending product life-span. Incorporating innovative, participatory and generative design research methods and tools, scenario building, collaboration with industry partners, communities and civil society organizations. Developing individual design approach, style and context-awareness.
Prerequisite for ID 301: ID 202
Prerequisite for ID 302: ID 301

ID 305-306 Design Presentation I-II (2-2)3
Techniques and effects of sketching in product design; planning a sketch, establishing a point of view; rendering the basic shapes; analysing a sketch for its components. The decision making process of the right angle, type and techniques; exploded drawings in colour perspective. Cut-away drawing in design presentation in a grid based system; phantom drawings in design presentation in a grid based system; colour drawings in design presentation (line drawings, renderings, marker /coloured methods and techniques, colour-pencil approach to design drawings. Rendering in mix-media, advanced illustration techniques.

ID 310 Model Making (2-2)3
The course aims to teach and train students in basic industrial design model making skills, to build and increase confidence in producing models to industry standards and to manage the model making process for the production of one-off models of their designs.

ID 311 Computers in Design (2-2)3
Introduction to three dimensional modeling, material editing and rendering using Rhinoceros, 3D Studio Max and Alias Wave-Front (Design Studio).

ID 312 Computer Graphics I (2-2)3
Advanced three dimensional modeling, material editing, rendering and animation using recent programs. Different modeling techniques such as laser scanning, modeling from photos.

ID 313-314 Interactive Multi-media Design I-II (2-2)3
Integrating text, graphics, animation, digital video and sound in order to create interactive multi-media applications; learning multi-media authoring programs such as Macromedia Director and its programming language; producing multimedia learning materials on CD, presentation with multimedia; designing attractive and effective user interface, emphasis is given to recent web design programs such as Flash, and Dreamviewer in the second semester.

ID 317 Introduction to Visual Media (2-2)3
Fundamentals and methods of visual media combining the aspects of photographic presentation with aesthetical considerations. Applied projects and their collective criticism and discussion. Portfolio preparation.

ID 321 Design and Culture (3-0)3
Understanding the cultural meaning and significance of industrial design; developing critical and reflexive thinking in relation to the designer's practice; discourses and practices in the field of design; the role of design in consumer culture, consumption as a creative activity; designed objects as carriers of meaning and cultural significance; outstanding social and cultural issues related to designer's practice.

ID 363-364 Visual Narrative in Design I-II (2-2)3
A new look at the design process through storytelling and visual communication. Aims to provide students with basic concepts and thinking tools of visual narrative to find new ways of exploration, explanation and presentation. Study of different narrative approaches and practice on different creation techniques. Exercises on graphic storytelling, game development, paper-prototyping, scenario building, storyboarding and film making.

ID 365 Color in Product Design (2-2)3
The course aims to make students aware of the power of color and its methods of application in design process and to make them able to respond creatively to design concepts with their own point of views. Since color is the sensation caused by certain qualities of light, 'color and light' inseparably, their psychological, physiological, visual, aesthetic and technical aspects will be covered by the course.

ID 371 Digital Art: Designing the Audio-visual Realm (2-2)3
This course reveals the dynamics that are involved in the production of contemporary digital art. Mainly focusing on aspects, such as, computer music, digital imaging, motion graphics, and video art, the course contemplates the construction processes of audial and visual assets in the context of art. The course consists of discussions on artworks by various artists as well as hands-on practice with related computer software/hardware.

ID 390 Summer Practice in Production Establishment and Computer Literacy in Design NC
Two weeks in the Faculty's computer workshop, learning and practicing a modeling program. Four weeks in a production establishment, making observation, and reporting its main production processes.

ID 401 Industrial Design V (4-8)8
Issues of culture, life style, ecology, future forecasting, globalism, design for export etc. Design problems dealing with social and market values of a particular culture. Fitness to real-life business situations, marketability, responsible design.
Prerequisite: ID 302

ID 402 Graduation Project (4-8)8
Collaborative design projects with industry. Synthesizing real-life design problems with a critical and professional approach.
Prerequisite: ID 401

ID 403-404 Collaborative Design I–II (2-2)3
This course aims to support interdisciplinary collaboration among engineering and industrial design students for developing innovative products or systems. The first part of the course is devoted to the generation of ideas and development of innovative product concepts through interdisciplinary team-work. Special emphasis on the pleasurability and usability aspects of the concept. In the second part of the course, the teams are required to continue to work on the product concept and develop a fully functioning model. Special emphasis on economic and technological constraints. The students who pass the first part of the course, must register to the second part in the following semester.

ID 405 Introduction to Interior Design (2-2)3
This course aims to introduce the basic concepts of Interior Design related to, perception, elements, presentation, planning and design of space as well as maintaining a medium to exercise designing of a space and its elements as a part of a whole.

ID 406 Jewellery beyond Tradition I (2-2)3
This course is an exploration of contemporary jewellery design that promotes the conception of ideas through the use of non-traditional materials, both industrial and crafts processes and the consciousness of human body. Through a series of projects some basic aspects such as scale, form, influences of art movements and other disciplines, preciousness, wearability, consciousness of body and innovative and appropriate use of materials and processes will be studied.

ID 408 TV Stage Design (2-2)3
The purpose of this course is to teach the basic principles about TV stage design. Students will have the opportunity to analyse stage, camera, director, scenario and recording which are considered to be the basics of TV broadcasting.

ID 413 Interactive Prototyping For Designers (2-2)3

This course offers an introduction to the fundamentals of electronics and programming through building working prototypes of interactive devices and systems. By taking a hands-on approach, which means spending a lot of time building circuits, coding, playing with sensors and controls, the students will observe how best to make all of these things relate to the user's expression or environmental changes. These experiments will also allow students to test and observe the affordances of their designed systems. Course work will involve weekly readings and exercises for learning the technical skills; additionally there will be midterm and final projects that will allow students to think outside the box and have some fun while making something of choice.

ID 421 Design Research in Action (3-0)3

This course is based on the presentation of research activity carried out in the Department of Industrial Design. It consists of a series of seminar sessions in which exemplary pieces of design research done by the faculty are presented and discussed. Chiefly offered to the students who are to undertake research in design discipline, this course intends to demonstrate various examples of design research in action.

ID 424 Intellectual Property Rights (3-0)3

Definitions and protection methods of intellectual and industrial property. (Copyright, patent, utility model, industrial design, trademark) National and international dimensions of this issue with related laws, codes in force.

ID 427 Automobile Design and Designers in the 20th Century (3-0)3

This course is designed to give basics, techniques, social and economic conditions and various applications of automobile design, and to introduce famous designers of the field and their design objectives, principles and motivations.

ID 451 Professional Practice (3-0)3

Practical information pertaining to the profession of Industrial Design. Relations with clients. Legal, financial, administrative problems. Office organization. Guest lecturers.

ID 480 Introduction to Design Management (3-0)3

Tracing the scope and definitions of design management throughout the evolution of the discipline in both the global and the local contexts; exploration of the wider social and economic context in which design is practiced; organisational aspects of design management including different models of design management; forms of employment for industrial designers including a comparison of consultancy and in-house design teams; interdisciplinary relations in NPD processes; design briefs; significance of understanding the user and the context from the view point of the designer.

ID 483 Jewellery beyond Tradition II (2-2)3

An introductory review of jewellery beyond tradition. Contemporary approaches to non-traditional jewellery in Turkey. Review of jewellery designers, companies, exhibitions, galleries and fairs in Europe, USA and Turkey. Workshops by experts and in-class exercises on various materials and techniques with particular emphasis on plastics and metal.

ID 485-486 Ceramic Form I-II (2-2)3

Development of concept of form through the medium of clay. Hand-building, slip casting and wheel techniques in pottery making are practiced. Special emphasis on form, function and detailing.

ID 489 Design and Cinema (3-0)3

Aims to survey the various design needs in film-making which is a multi-competent process, and to give the basics of design techniques, methods and applications used for each component.

ID 490 Summer Practice in a Design Office NC

Six weeks in a design office, participating to the designing activities, and reporting/presenting them to the department.

ID 495 Portfolio Presentation (2-2)3

Collection, documentation and presentation of physical reference materials of design students in relation to their design works. Students prepare and present their works, called a portfolio, either in the form of print, or in the form of electronic media.

GRADUATE PROGRAMS AT THE DEPARTMENT OF INDUSTRIAL DESIGN

The Master of Science in Industrial Design is a research oriented program which focuses on current issues and new problem areas in industrial design, and puts special emphasis on the multidisciplinary character of the field. The program is intended for applicants who wish to pursue academic careers in industrial design, and for those who wish to develop design related research and organizational skills for their professional career. In addition to industrial design graduates, the program welcomes applicants from diverse backgrounds and disciplines, such as other fields of design, the fields of engineering, management and social sciences. Graduates of other disciplines are required to follow a deficiency program which involves undergraduate courses, through which they develop an understanding of the industrial design activity, including the terminology, techniques, and communication skills.

The International Joint Master of Science Program in Design Research for Interaction, which commenced in Fall 2008-09, is a prestigious exchange program between METU Department of Industrial Design and the Faculty of Industrial Design Engineering, Delft University of Technology, the Netherlands. Research studies on user behavior; user-product relationships; and use environments have risen in recent years, leading to a considerable rise in knowledge in the field of design. Industrial design, more specifically, has become an increasingly evidence-based activity with increased importance on innovation, discovery and matching solutions to uncovered needs. The Joint Program equips industrial design graduates to become evidence-based designers within an international platform, capable of planning and undertaking research that will feed into the design and development of new and improved products, services and systems. The central theme is exploration of user-product interactions and their effects on user experiences. Students complete a jointly supervised graduation project / thesis in their final semester, for which the inclusion of design practice alongside research practice is strongly encouraged.

The Department offers a Ph.D. Program in Industrial Design for applicants with a Master's degree, and an Integrated Ph.D. Program in Industrial Design for those with a Bachelor's degree. The programs are offered to applicants seeking an academic career in industrial design and are research oriented. The Ph.D. thesis aims at a comprehensive and explicit account of the conduct and findings of an original research study. A critical appraisal of prior research, and close attention to the principles and practice of research methodology are essential. The conduct of a single, major systematic investigation and the delivery of an original and substantial contribution to knowledge are required.

GRADUATE CURRICULUM

MASTER OF SCIENCE PROGRAM IN INDUSTRIAL DESIGN

First Semester

ID	503	Research Methods in Industrial Design I	(3-0)3

3 elective courses

Second Semester

ID	501	Advanced Project Development in Industrial Design	(3-6)6

2 elective courses

Third Semester

ID	500	M.S. Thesis	NC
ID	592	Graduate Seminars in Industrial Design	(0-2)NC

Total minimum credit: 24
Number of courses with credit (min.): 7

Fourth Semester

ID	500	M.S. Thesis	NC
ID	8XX	Special Studies	(4-2)NC

THE INTERNATIONAL JOINT MASTER OF SCIENCE PROGRAM IN DESIGN RESEARCH FOR INTERACTION

First Semester (at METU)

ID	535	Design for Interaction	(3-0)3
ID	503	Research Methods in Industrial Design I	(3-0)3
ID	506	Design Methods	(3-0)3

Introduction Days at METU (ID4200)
1 elective course

Second Semester (at TU Delft)

Generic and Professional Skills 2 (ID4200)
Project Usability and User eXperience in Design (ID4255)
Interactive Technology Design (ID4220)
Internationalisation (ID4050)
Research Project (ID5502)
1 elective course

Third Semester (at TU Delft)

Generic and Professional Skills 3 (ID4200)
Product Understanding, Use and Experience (ID4210)
Context and Conceptualization (ID4216)
Project Exploring Interactions (ID4250)

IDDI	500	MS Thesis	NC
IDDI	8XX	Special Studies	NC

Fourth Semester (at METU)

IDDI	500	M.S. Thesis	NC
IDDI	8XX	Special Studies	(4-2)NC
IDDI	592	Graduate Seminars in Industrial Design	(0-2)NC

Ph.D. IN INDUSTRIAL DESIGN

ID	600	Ph.D. Thesis	NC

7 elective courses

Total minimum credit: 21
Number of courses with credit (min): 7

GRADUATE COURSES

ID	500	M.S. Thesis	NC
ID	501	Advanced Project Development in Industrial Design	(3-6)6
ID	503	Research Methods in Industrial Design I	(3-0)3
ID	505	Qualitative Methods for Industrial Design Research	(3-0)3
ID	506	Design Methods	(2-2)3
ID	507	Directed Studies in Industrial Design	(1-0)1

ID	511	Media and Design	(2-2)3
ID	521	Cultural Analysis of Design	(3-0)3
ID	522	Material Culture and Consumption in Everyday Life	(3-0)3
ID	531	Methods of User Research	(3-0)3
ID	535	Design for Interaction	(2-2)3
ID	542	Design Management	(3-0)3
ID	543	Legal Rights and Responsibilities of Practising Designers	(3-0)3
ID	553	Structural Analysis in Product Design	(3-0)3
ID	561	Product Design for Sustainability	(2-2)3
ID	592	Graduate Seminars in Industrial Design	(0-2)NC
ID	600	Ph.D. Thesis	NC
ID	7XX	Special Topics in Industrial Design	(3-0)3 or (2-2)3
ID	8XX	Special Studies	(4-2)NC
ID	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

ID 500 M.S. Thesis NC
The thesis is required to be a comprehensive, explicit and defensible account of conduct and findings of the research in which a set essay, a critical review, a laboratory report, a product specification etc. may be incorporated or to which they may be accompanied.

ID 501 Advanced Project Development in Industrial Design (3-6)6
An application oriented course with a specific emphasis on exploring new methods, new approaches and new problem areas in the cross-disciplinary area of industrial design. Students are encouraged to choose subjects related to their thesis topic. Topics of study: Design strategies, design processes, analysis of use, analysis of production processes, language of design. design constraints, interface analysis, cost benefit analysis, cultural analysis, market analysis.

ID 503 Research Methods in Industrial Design I (3-0)3
Research methods relevant to the cross-disciplinary area of Industrial Design. Design research as an academic activity and "research" for and through the industrial design process: The science tradition of research, the humanities tradition of research, research through art and design action, research and academic degrees, tools of research, methodologies of research design.

ID 505 Qualitative Methods for Industrial Design Research (3-0)3
Underlying principles and historical context of qualitative research; deeper understanding of a range of qualitative research methods; adopting and creatively using qualitative methods in design research; issues regarding the collection and analysis of data using these methods; ethical issues, power issues and the role of the researcher in qualitative research; planning, carrying out and reflecting on fieldwork.

ID 506 Design Methods (2-2)3
A survey on design methods developed and employed in the field; definitions of design and design methodology from various perspectives; emergence of industrial design as a profession; theoretical and practical implications of early and recent design methods; models for structuring the design process; discussions on the nature of the act of design and the role of the designer.

ID 507 Directed Studies in Industrial Design (1-0)1
One or more students choose and study a topic in Industrial design field under the guidance of a department member.

ID 511 Media and Design (2-2)3
Principles and theories of communication. Techniques, methods and various applications of using visual and audio-visual media tools.

ID 521 Cultural Analysis of Design (3-0)3
Definition of design in general and industrial design in particular as cultural phenomena. Identification and establishment of the disciplinary frameworks within which design activity, designed products and their contexts are analyzed in terms of a wide range of paradigms. A general knowledge of the various modes of interpretation and analysis of products as material culture. Critical sense of observation and discrimination in the course of designing and encountering products.

ID 522 Material Culture and Consumption in Everyday Life (3-0)3
Current paradigms in material culture, consumption and everyday life. A short fieldwork/socio-ethnographic case study to understand the meaning of products which is embedded in everyday life practices, and to analyze certain lifestyle understandings. Central to the course is to come to grips with the socio-cultural significance of the

consumption and using patterns of products in everyday life.

ID 531 Methods of User Research (3-0)3
Methods of data collection concerning people. Methods of synthesizing data into ergonomically sound design concepts, prototypes and final design outcomes. Subsequent evaluation of designs in terms of usability and safety. Contains lectures, applied research and library research.

ID 535 Design for Interaction (2-2)3
Introductory course defining the three-way relationship between users, products and technologies for interaction. Definition of terms and concepts for various domains of interaction encountered in product design. Instruction on history of interaction, tangible and intangible interactions, multisensory interactions, digital and non-digital interactions, user needs requirements for interaction. Review of state-of-the-art technologies for user-product, product-product and user-product-environment interactions. Includes a product analysis assignment and a research and design project.

ID 542 Design Management (3-0)3
Management of design as a strategic resource. Exploration of the wider business context in which design is practiced. Product marketing strategies, audits, design audits, standards and legislation driven audits, quality and design, tools and techniques for effective new product development, benefits or risks of investment in design, the impact of regulatory legislation on the practice of design, research in design management.

ID 543 Legal Rights and Responsibilities of Practising Designers (3-0)3
Covers professional rights, responsibilities and obligations of designers practicing at national or international levels. Reviews the basics of the national regulations concerning patents, utility models, industrial designs, trademarks, copyright, unfair competition, and consumer protection. Puts special emphasis on industrial design registration in Turkey. Provides an international overview of the standards, environmental regulations, and product liability issues.

ID 553 Structural Analysis in Product Design (3-0)3
Review of basic concepts of structural mechanics. Internal force diagrams. Concepts of stress and strain. Introduction to finite element method of analysis. Finite element modeling techniques for various products of different materials. Material and element behavior: Evaluation of the findings

ID 561 Product Design for Sustainability (2-2)3
Definition of approaches, concepts and insights into product design, sustainability and contemporary issues by addressing three strands of sustainability, ecological, economic and ethical. Review of various systems thinking and design-based approaches as they relate to sustainability and product design. Design and conduct of research projects by students through examining the nature of objects and their relationship to sustainability within a design-centred approach.

ID 592 Graduate Seminars in Industrial Design (0-2)NC
Consists of seminar presentations of the students who are in their third semester. The students demonstrate the progress in their thesis work, their time and task plan etc.

ID 600 Ph.D. Thesis NC
A comprehensive and explicit account of the conduct and findings of the research. A critical appraisal of prior research; close attention to the principles and practice of research methodology; the conduct of a single, major systematic investigation; and the delivery of an original and substantial contribution to knowledge.

ID 7XX Special Topics in Industrial Design (3-0)3 or (2-2)3
Courses not listed in the catalogue. Topics vary from year to year according to interest of students and faculty in charge.

ID 8XX Special Studies (4-2)NC
M.S. student chooses and studies a topic under the guidance of a faculty member, normally his/her advisor.

ID 9XX Advanced Studies (4-0)NC
Graduate students as a group choose and study an advanced topic under the guidance of a faculty member, normally the advisor of the students.

FACULTY OF ARTS AND SCIENCES

Dean : AKYILDIZ, Ersan, Prof. Dr.;
Ph.D. : Univ. British Columbia, Vancouver, Canada
B.S. : Department of Mathematics, METU

Associate Dean : DOĞAN, Özdemir, Prof. Dr.;
Ph.D.: Case Western Reserve University
M.S.: METU
B.S.: METU

Associate Dean : GÜNDÜZ HOŞGÖR, Ayşe, Prof. Dr.;
Ph.D.: Sociology, University of Western Ontario, Canada
M.S.: Statistics, METU
B.S.: Statistics, METU

Assistant to the Dean : YEDİERLER, Burak; Assoc. Prof. Dr.;

Ph.D: Department of Physics METU
M.S.: Department of Physics, METU
B.S.: Department of Physics, METU

GENERAL STATEMENT AND PROGRAMS OF STUDY

The Faculty of Arts and Sciences has nine departments:

Department of Biological Sciences
Department of Chemistry
Department of History
Department of Mathematics
Department of Philosophy
Department of Physics
Department of Psychology
Department of Statistics
Department of Sociology

There are ten undergraduate programs offered by these departments. The Department of Biological Sciences offers two core programs; “Biology” and “Molecular Biology and Genetics”.

The Departments also offer programs at M.A., M.S. and PhD. levels. Psychology and Philosophy Departments have additional M.S. and M.A. programs in Industrial and Organizational Psychology and Applied Ethics, respectively.

The basic philosophy of the Faculty of Arts and Sciences is to enable students to become well-educated, innovative, professionally capable and enlightened university graduates and to stimulate in them an enthusiasm for their subject coupled with a spirit of intellectual tolerance and critical awareness. In line with this philosophy, the departments of the Faculty specifically aim at:

- Providing the best possible learning environment to stimulate both learners and teachers,
- Designing course structures that are flexible, accessible and attractive,
- Training students to work independently, both in group context and individually so as to foster self-confidence, autonomy and the ability to innovate and display initiative,
- Encouraging students to go beyond their major disciplines through a continuous emphasis on interdisciplinary study,
- Providing for students the opportunity to explore the approaches and methodologies adopted by other disciplines through the inter-disciplinary structure at the university level, and to instill in them an openness and flexibility to alternative views.

The Faculty is one of the leading Faculties of Arts and Sciences in Turkey, offering students the unique combination of high academic stand, well-developed research facilities and employment success.

Students are provided with a sound theoretical and practical foundation in natural and social sciences. In addition, elective courses are offered for the students of all the Faculties in METU. Approximately 250 elective courses are offered by nine departments to help students to develop additional interests in different subject matters.

Teaching methods include lectures, tutorials and seminars. In the departments of physics, chemistry, and biology practical laboratory work plays a vital role. The departmental laboratories are shared for research and teaching, and are periodically updated. Suitable equipment and well-qualified technical and support staff are available for the teaching activities.

The departments of the Faculty provide a wide range of minor and double major programs. The aim of the minor undergraduate programs is to enable academically successful students for furthering their education in other subjects they are interested in. Double major undergraduate programs are designed for outstanding students to have a second undergraduate diploma from another department within the Faculty or from other departments of four Faculties of the University.

The aim of the graduate programs is to give graduates the opportunity to achieve qualification, which enables them to make an immediate contribution to their future careers. The departments place considerable emphasis upon graduate student research and encourage M.A. / M.S. and Ph.D. students to publish their research findings in national and international periodicals. The Faculty and its departments, in collaboration with the Graduate School of Natural and Applied Sciences, the Graduate School of Social Sciences and the Institute of Applied Mathematics, conduct several interdisciplinary graduate programs in various areas. These are Archaeometry, Gender and Women's Studies, Science and Technology Policy Studies, Biochemistry, Biotechnology, Polymer Sciences and Technology, Settlement Archaeology, Eurasian Studies, Media and Cultural Studies, Cryptography, Financial Mathematics, Scientific Computing, Actuarial Sciences, and Middle East Studies.

The Faculty organizes symposia, seminars and workshops to create an environment in which current scientific discussions can be made and to encourage and stimulate national and international collaborative work.

The Faculty is comprised of a motivated and dynamic academic staff engaged in research at the forefronts of basic and social sciences and technologies. The Faculty is also leading in the number and quality of papers published in internationally and nationally well established journals.

DEPARTMENT OF BIOLOGICAL SCIENCES

PROFESSORS

ADALI, Orhan ***(Department Chair)***: B.S., M.S., Ph.D., METU.
BEKLİOĞLU, Meryem: B.S., M.S., METU; Ph.D., University of Liverpool.
DOĞAN, Musa: B.S., Ankara University; M.S., Ph.D., Edinburg University.
GÜNDÜZ, Ufuk: B.S., M.S., Iowa State University; Ph.D., METU.
GÜRAY, Tülin: B.S., M.S., Ph.D., METU.
HASIRCI, Vasıf: B.S., M.S., METU; Ph.D., University of Reading.
İZGÜ, Fatih: B.S., M.S., Ph.D., Ankara University.
KAYA, Zeki: B.S., İstanbul University; M.S., Ph.D., Oregon State University.
KOCABIYIK, Semra: B.S., Ankara University; M.S., Ph.D., METU.
ÖKTEM, Hüseyin Avni: B.S., M.S., METU; Ph.D., Universitatis De Attila Jozsef.
ÖZCENGİZ, Gülay: B.S., Hacettepe University; M.S., Ph.D., METU.
SEVERCAN, Feride: B.S., Ankara University; M.S., University of Rochester; Ph.D., Hacettepe University.
TOGAN, İnci: B.S., METU; M.S., Johns Hopkins University; Ph.D., METU.
YÜCEL, Meral: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

BANARJEE, Sreeparna: B.S., Calcuta University; M.S., Ph.D., University of Leeds.
BİLGİN, Can: B.S., M.S., Ph.D., METU.
DOĞRU, Ewa: B.S., M.S., Warsaw University; Ph.D., Polish Academy of Sciences.
ERSON, Ayşe Elif: B.S., METU; M.S., Ph.D., University of Michigan.
GÖZEN, Ayşe Gül ***(Vice Chair)***: B.S., METU; Ph.D., Michigan State University.
GÜRSEL, Mayda: B.S., M.S., METU, Ph.D., University of London
MUYAN, Mesut: B.S.; Ankara University; Ph.D., Ankara University and University of California at Davis
ÖNDE, Sertaç **(*Vice Chair*)**: B.S., M.S., METU, Ph.D., University of Leeds.
SON, Çağdaş Devrim: B.S., M.S., METU; Ph.D., University of Tennessee, Knoxville.
YANIK, Tülin: B.S., Ege University; M.S., Ph.D., The George Washington University.

ASSISTANT PROFESSORS

BİRAND, Ayşegül: B.S., M.S., METU; Ph.D., New Mexico State University.
SOMEL, Mehmet: B.S., M.S., METU; Ph.D., University of Leipzig.

GENERAL INFORMATION: The Department of Biological Sciences offers courses on the biological, chemical, physical and mathematical principles governing the behavior of living matter at the molecular, cellular, organism and population levels. Fundamental subjects such as molecular and cell biology, genetics, physiology, microbiology, biochemistry, plant biology, ecology and environmental biology are supplemented by a wide variety of elective courses to prepare students for careers in teaching and research, and for applied work in industry, agriculture, forestry and public health. The Department of Biological Sciences offers two major programs, "Molecular Biology and Genetics" and "Biology", at undergraduate level.

The Biology Program harbors all elements of modern biology. The students are offered a wide range of core and elective courses covering the majority of contemporary fields in the biological sciences. Among the rich elective courses students can select subjects suiting their interests. Most of the core courses in the program are supported with laboratory sessions. Furthermore, special project courses allow students to become involved in research projects and acquire further laboratory skills.

The Molecular Biology and Genetics Program focuses on molecular and cellular aspects of biology. The B.Sc. program in Molecular Biology and Genetics aims to prepare students for the science of tomorrow. In addition to the core, students choose elective courses suiting their interests from Biological Sciences or other science and mathematics departments as well as engineering to complete the program. The combination of

fundamentals and diversity along with flexibility makes Molecular Biology and Genetics Program appropriate for those planning to become research scientists.

Department of Biological Sciences also offers programs leading to M.Sc. and Ph.D. degrees in Biological Sciences. The graduate program mainly focuses on training students in basic and applied research fields, which are described below.

RESEARCH INTERESTS AND FACILITIES: Graduate level research activities are conducted mainly in the following laboratories:

1. Biochemistry Laboratory: Current research activities in this laboratory include large scale purification of enzymes, structural and functional aspects of monooxygenase, cytochrome systems, transferases, membrane-bound proteins, hormone and drug receptors, kinetic studies on regulatory enzymes, drug-DNA interactions, antioxidants and antioxidant enzymes, biochemical and genetic toxicology and molecular pharmacology. Characterization of stress proteins (heat cold, metal and salt) in different crop plants and photosynthetic reactions in plants and bacteria (mainly *Halobacterium halobium*), and signal transduction in plants are among the other research topics.

2. Biomaterials Laboratory: Research conducted in this laboratory is mainly concentrated on preparation and characterization of materials for use in biomedical applications. Immobilization of enzymes and free cells for biotechnological aims, controlled release of drugs, pesticides and vaccines and study of liposomes as model membranes and drug carriers are being studied. Of special interest is the production and application of microbial polyesters in construction of biodegradable controlled antibiotic release systems and bone fracture repair rods.

3. Cancer Biology Laboratory: Investigation of mutations associated with certain tumors, the use of molecular methods in cancer diagnosis and the study of involvement of isoenzymes in cancer are among the current research projects. Another area of cancer research in the Department focuses on the structural and functional characterization of novel cancer genes that may have roles during the initiation or the maintenance of the transformed phenotype of breast cancer cells.

4. Cellular and Molecular Neurobiology Laboratory: Research in this laboratory focuses on the studying, processing, intracellular trafficking, and secretion of neuropeptides and peptide hormones in neuronal and endocrine cells with an emphasis on the cellular organization. Neuropeptides and peptide hormones are synthesized from larger precursors, and their biosynthesis may be regulated at many levels in the cell. Understanding cellular and molecular mechanisms of neuro/peptides have provided an insight into the molecular basis of diseases such as obesity which result from intracellular missorting of cocaine amphetamine regulated transcript (CART) to the constitutive pathway. The studies are conducted using a multidisciplinary approach. Whole animals, fresh tissues and organs, cell cultures are analyzed using various biochemical, immunological, and recombinant-DNA techniques. These include ELISA, immunocytochemistry, confocal microscopy, recombinant-DNA methodology, Western blot and in situ hybridization.

5. Ecological and Evolutionary Genetics Laboratory: Research on ecological genetics of insecticide resistance, aiming to develop methods to avoid and delay evolution of resistance in insect populations, studies on population differentiation of various species of organisms where molecular as well as behavioral, morphometric, electrophoretic, and computer simulation modeling approaches are used.

6. Freshwater Ecology Laboratory: Interactions between physical, chemical and biological processes in lakes, and the influence of human activities on these processes to describe the causes and consequences of eutrophication and biomanipulation as a restorative measure are within main research interest. To investigate governing mechanisms especially the differential role of top-down control and hydrology in structuring periphyton, macrophytes, phytoplankton, zooplankton, benthic macroinvertebrates and in shallow lakes are among the scopes. The laboratory has the facility of a climate room to culture phytoplankton, zooplankton and fish for studying chemical communication between the fish and the prey, *Daphnia*, behavioral ecology of *Daphnia* and ecotoxicology.

7. Microbial Ecology Laboratory: Research in this laboratory involves the studies on bacterial populations of soil and aquatic environments. The interactions of soil bacterial populations with plants are studied in terms of

increasing the productivity in sustainable agriculture practices. The potential of soil bacteria are also explored for soil bioremediation especially in terms of pesticide biodegradations. Aquatic bacterial populations are investigated in conjunction to signaling between the fish and aquatic invertebrates. Bacterial populations enriched from soil and freshwater sources are screened in terms of the production of industrially important enzymes to be taken advantage in the design of environmentally safe products and processes. Thermophilic bacteria obtained from soil and aquatic sources are given special attention for their enzyme production.

8. Microbiology Laboratory: The major research areas of interest are; bioconversion of agricultural and industrial residues and use of enzymes and cells in industrial processes, plasmid association of the enzyme mediated antibiotic resistance, genetic and enzymatic characterization of microbial biodegradation.

9. Molecular Biophysics Laboratory: The researches in this laboratory include; spectroscopic investigations of lipid-lipid, protein-lipid and drug-lipid interactions in biological membranes, structure-function and stability of proteins, related biotechnological applications and magnetic resonance studies of pathological cells and body fluids.

10. Molecular Genetics Laboratory: Research activities involve; analysis of molecular mechanisms underlying thermostability in thermophilic enzymes by genetic and protein engineering, investigations of genetic and enzymatic basis of biodegradation, isolations, characterizations and cloning of novel proteolytic enzymes (specifically proteasomes and other ATP-dependent proteolytic nanoscale machines) from thermophilic bacteria and Archaea, structure-function relationships of antibiotic modifying enzymes.

11. Neurophysiology Laboratory: The laboratory is well equipped for research in various aspects of the function of the nervous system. Selective activation of peripheral nerve fibber groups, short and long latency cerebral somatosensory evoked potentials and spinal evoked potentials are the topics of current research.

12. Pharmaceutical Biotechnology Laboratory: This laboratory is established for research and development on recombinant DNA derived drugs and their quality controls according to European Pharmacopoeia regulations. Ongoing projects are based on gene isolation and cloning, recombinant protein expression with various systems including bacteria, yeast and mammalian cells, stable cell line production, laboratory scale cell culture and purification of a drug substance. It is well equipped and supported by the leading pharmaceutical companies in Turkey.

13. Plant Biotechnology Laboratory: Genetic manipulation of crop plants via *Agrobacterium*, particle bombardment (biolistic) and electroporation techniques. Target plant species include tobacco (model), potato, tomato, eggplant, legumes (lentil and chickpea) and cereals (wheat and maize). Research focused on agronomic characters, include; improvement tolerance against herbicides, abiotic stress resistance (salt, drought), plant parasitic nematodes and insects (Bruchid and Eurygaster -suni bug, species). In addition, construction of plant transformation vectors and microtuber production in potato are among current research interests.

14. Plant Sciences Laboratory: Modern methods are employed to study the genetics and biology of local forest trees. Ecological and population genetics of Turkish conifers as well as related biotechnological research is conducted by using DNA markers and tissue culture techniques. The effects of environmental conditions such as extreme heat cold drought and salinity on crop plants such as wheat and lentil, and the tissue culture of poppy, wheat, sunflower, chick pea, sugar beet and saffron as well as their improvement by gene transfer are the topics of research. Recently interdisciplinary research together with Archeologists, we start to identify plant species by ancient DNA analysis as well as together with Taxonomists we establish molecular phylogenies of plants.

15. Structural Biology Laboratory: Research focus on the identification of protein-protein interactions by quantitative Förster resonance energy transfer (FRET) measurements as well as by florescence intensity ratio (FIR) analysis in live cells. The group is interested in G-protein Coupled Receptor (GPCR) dimerization, and effects of post-translational modifications and ligand interactions on receptor dimerization.

16. Terrestrial Ecology and Conservation Laboratory: Current research is focused on wildlife ecology and population biology of threatened species in Turkey. Birds are the primary subject of such research although ungulates and carnivores are also studied. Applied areas such as biodiversity assessment for conservation,

impacts of exotic species, and wildlife management are within the scope of our research, and provide valuable input for decision makers.

TEACHING AND RESEARCH INFRASTRUCTURE: In the Biological Sciences Department, the laboratories are equipped with basic research laboratory equipment. In addition, the following instruments and facilities are present in the Departmental laboratories; High speed and ultracentrifuges, microcentrifuges, bench-top centrifuges, spectrofluorimeter, single and double beam spectrophotometers, Fourier transform infrared spectrometer, HPLC, autoclaves, ice machines, light microscopes, fluorescence microscope, inverted microscope with accessories, dissecting microscopes with camera attachments, balances, laminar flow hoods, carbondioxide incubators, freeze drying unit, spin vacuum drying system, microtiter plate reader, genebooster particle bombardment system, electroporator, ultrasonicator, extruder, conventional and refrigerated orbital incubators, growth chambers, thermocyclers, RT-PCRs, Flow Cytometer, deep freezers. A cold-room, dark room and an experimental animal care facility and animal tissue culture suit are also available for teaching and research laboratory use.
The department has a well-equipped computer laboratory providing technical support to undergraduate and graduate students.

BIOLOGY UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
BIO	101	General Biology I	(4-4)6	BIO	102	General Biology II	(4-4)6
CHEM	101	General Chemistry I	(4-2)5	CHEM	102	General Chemistry II	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4	ENG	102	English for Academic Purposes II	(4-0)4
MATH	117	Calculus I	(4-2)5	IS	100	Introduction to Information Technologies and Applications	NC
				MATH	118	Calculus II	(4-2)5

SECOND YEAR

Third Semester				Fourth Semester			
BIO	203	Cell Biology	(3-0)3	BIO	252	Physiology	(3-0)3
BIO	251	Cell Biology Laboratory	(0-4)2	BIO	254	Physiology Laboratory	(0-4)2
BIO	206	Ecology	(3-0)3	BIO	220	Introduction to Biometry	(3-2)4
CHEM	231	Organic Chemistry	(3-4)5	ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC	HIST	2202	Principles of Kemal Atatürk II	NC
PHYS	111	Physics I (Mechanics)	(4-2)5	PHYS	112	Physics II (Electricity and Magnetism)	(4-2)5
						Non-technical Elective*	(3-0)3

THIRD YEAR

Fifth Semester				Sixth Semester			
BIO	351	Genetics	(4-0)4	BIO	356	Plant Biology	(3-2)4
BIO	353	Biochemistry**	(4-0)4	BIO	310	Biochemistry Laboratory	(0-4)2
BIO	303	Microbiology	(3-0)3	BIO	352	Genetics Laboratory	(0-4)2
BIO	355	Microbiology Laboratory	(0-4)2	TURK	304	Turkish II	NC
TURK	303	Turkish I	NC			Technical Elective	(3-0)3
		Technical Elective*	(3-0)3			Technical Elective	(3-0)3
						Non-technical elective	(3-0)3

FOURTH YEAR

Seventh Semester

BIO	404	Evolution	(3-0)3
GENE	479	Current Research in Biological Sciences	NC
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3

Eighth Semester

BIO	360***	Summer Practice	(0-4) NC
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3

MOLECULAR BIOLOGY AND GENETICS UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

GENE	103	Molecular and Cellular Biology I	(4-2)5
CHEM	105	General Chemistry I	(4-4)6
ENG	101	English for Academic Purposes I	(4-0)4
MATH	117	Calculus I	(4-2)5

Second Semester

GENE	104	Molecular and Cellular Biology II	(4-2)5
CHEM	106	General Chemistry II	(4-4)6
ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC
MATH	118	Calculus II	(4-2)5

SECOND YEAR

Third Semester

GENE	205	Ecology and Evolutionary Biology	(4-0)4
BIO	321	Bioanalytical Chemistry	(3-4)5
BIO	220	Introduction to Biometry	(3-2)4
HIST	2201	Principles of K. Atatürk I	NC
PHYS	111	Physics I (Mechanics)	(4-2)5
		Non-technical elective*	(3-0)3

Fourth Semester

BIO	252	Physiology	(3-0)3
CHEM	231	Organic Chemistry	(3-4)5
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of K. Atatürk II	NC
PHYS	112	Physics II (Electricity and Magnetism)	(4-2)5
		Non-Technical Elective	(3-0)3

THIRD YEAR

Fifth Semester

GENE	365	General and Molecular Genetics	(4-0)4
GENE	367	General and Molecular Genetics Laboratory	(0-4)2
BIO	303	Microbiology	(3-0)3
BIO	307	Biochemistry I	(4-0)4
BIO	355	Microbiology Lab.	(0-4)2
TURK	303	Turkish I	NC
		Technical Elective*	(3-0)3

Sixth Semester

GENE	366	Molecular Biology of The Gene	(3-0)3
BIO	308	Biochemistry II	(4-0)4
BIO	310	Biochemistry Lab.	(0-4)2
BIO	356	Plant Biology	(3-2)4
TURK	304	Turkish II	NC
		Technical Elective	(3-0)3

FOURTH YEAR

Seventh Semester

GENE	473	Molecular Biology of the Cell	(3-0)3
GENE	475	Molecular Biology Laboratory	(0-4)2
GENE	479	Current Research in Biological Sciences	NC
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3

Eighth Semester

GENE	472	Special Project	(0-6)3
GENE	480	Student Seminars in Molecular Biology and Genetics	NC
BIO	423	Recombinant DNA Techniques	(3-0)3
BIO	360***	Summer Practice	(0-4) NC
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3
		Technical Elective	(3-0)3

*Maximum 4 Technical Electives can be taken from other departments. Generally, Biological Sciences consider courses which are offered by the Physics, Chemistry, Mathematics and Statistics Departments of Faculty of Arts and Sciences as technical elective as well as Engineering courses. Rest of the courses offered in METU can be taken in non-technical elective status.
** If BIO 307 is registered instead of BIO 353, in this case BIO 307 is in must status and student are required to take BIO 308 in following semester in technical elective status.
*** Students who completed their summer practice under ERASMUS program must register to 361 as a must course.

DOUBLE MAJOR PROGRAM IN BIOLOGY

The program consists of all the required courses in the undergraduate curriculum and technical electives. The equivalency of the previously taken courses will be judged by the department.

Students from social sciences are required to take MATH 119, 120, CHEM 101, 102 and 231 as well as PHYS 111, 112 courses or their equivalents.

MINOR PROGRAM IN BIOLOGY

The Minor Program in Biology aims at providing an opportunity to successful students of other departments to gain basic knowledge and foundation in biology. The students are expected to benefit in finding wider job opportunities, and to be in the position to apply to graduate programs in biology.

Compulsory Courses

BIO	101	General Biology I
BIO	102	General Biology II

Elective Courses
Four courses offered under BIO code except BIO 106 and 107 must be taken to complete the minor program.

MINOR PROGRAM IN MOLECULAR BIOLOGY AND GENETICS

Compulsory Courses

GENE	103	Molecular and Cellular Biology I			
GENE	104	Molecular and Cellular Biology II			
GENE	365	General and Molecular Genetics	*or*	GENE 366	Molecular Biology of the Gene
BIO	423	Recombinant DNA Technology			

And any two of the following four courses:

GENE	473	Molecular Biology of the Cell
BIO	303	Microbiology
BIO	353	Biochemistry
BIO	427	Biotechnology

DESCRIPTION OF UNDERGRADUATE COURSES

BIO 101 General Biology I (4-4)6
Unifying concepts in Biology. The cellular basis of life. Chemical constituents, cell structure and function, material exchange with the environment, the role of cell membrane, cellular energy, photosynthesis, cellular respiration, control of cellular activity, cell reproduction and genetic basis of life are the major headings of the course.

BIO 102 General Biology II (4-4)6
The course content includes evolution and diversity, structure and function at level of organisms, response of the organisms to their biological and physical environments and basic concepts in ecology.

BIO 106 General Biology (3-0)3
A condensed (one-semester) course for non-biology students. Offered both semesters.

BIO 107 Concepts in Biology (3-0)3
A condensed (one semester) course for Food Engineering students aiming to introduce concepts of Biology such as Chemistry of Life, Cell Biology, Microbiology, Biochemistry, Genetics etc. required for Food Engineering curriculum.

BIO 203 Cell Biology (3-0)3
Topics of this course include structural and functional analysis of the nuclear and cytoplasmic compartments of the cell, principles of cellular transport and communication, cell cycle and cell death.

BIO 206 Ecology (3-0)3
A course that covers the interaction of organisms with their biological and physical environments. Topics include the ecosystem concepts, environmental requirements of organisms, limiting factors, energy cycles in ecological systems, biogeochemical cycles, and principles of population ecology and community ecology.
Prerequisite: Consent of the instructor.

BIO 208 Introduction to Freshwater Ecology (3-0)3
This course aims to introduce the non-biology students to freshwater ecosystems. The course focuses on interactions of chemical, physical and ecological characteristics of freshwater bodies including plankton, aquatic plants, fish and productivity of the edges and bottoms of rivers and lakes. The alteration of fresh water bodies caused by human activities is also discussed.

BIO 215 Introduction to Genetics (3-0)3
The course content includes the following titles; The role of genetics in health, reproduction, agriculture, and conservation of living resources. Basic principles of inheritance. Mendelian genetics of humans. Genetics of sex. Informational macromolecules, control of gene expression, and misinformation. Genetic diversity, population genetics, and evolution. Genetic engineering. The course intended for non-biology students.

BIO 220 Introduction to Biometry (3-2)4
Subjects covering statistical methodology in collecting and analyzing biological data. elementary probability distributions, hypothesis testing, analysis of variance, regression and correlation analysis of frequencies, some of the nonparametric tests with emphasis on the use of computers in processing data in biological sciences.

BIO 250 Ecology (3-0)3
This course aims to introduce the non-biology students to basic principles of ecology focusing on applied problems related to ecosystems.

BIO 251 Cell Biology Laboratory (0-4)2
Practice of fundamental staining techniques employed to study cellular and subcellular structures. The techniques include; cytochemical methods, sub-cellular fractionation, cell cultures, karyotyping, and permanent slide preparation.
Prerequisite: BIO 203

BIO 252 Physiology (3-0)3
This is a compact course of comparative animal physiology with emphasis on the functions of the human body. The course presents a general survey of operation of all physiological systems, their interactions and cooperation to maintain homeostasis and increase individual and species capacity for adaptation to different and variable life conditions.
Prerequisites: BIO 101, BIO 102

BIO 254 Experiments in Animal Physiology (0-4)2
During the course, students get acquainted with some electric/electronic equipment frequently used in physiological studies, learn how to handle the laboratory animals, and how to make tissue and organ preparation for physiological recordings. Some of the experiments are done on human subjects. Experiments performed in this course constitute an illustration of concepts and processes described in the theoretical animal physiology course.

Prerequisite: BIO 252

BIO 255 Molecular Cell Biology (3-0)3
This course is designed to introduce molecular cell biology and genetics concepts to non-biology majors. Topics of the course include introductory cell biology, principles of genetics, human genome project, basics of molecular biology techniques, immune system and cancer.

BIO 303 Microbiology (3-0)3
A survey of bacterial morphology, biochemistry and physiology with special emphasis on the cultivation, identification and control of microorganisms is intended.
Prerequisites: BIO 101, BIO 102 or GENE 103, GENE 104

BIO 306 Molecular Genetics (3-0)3
This course provides the students with a coherent view of molecular genetics from current perspective. Attention is paid to detailed treatment of gene structure and function (such as chemistry of gene, replication, transcription, translation, regulation of gene expression, gene mutation, and viral genetics), and the recent applications of molecular genetics. Prokaryotic and eukaryotic molecular genetics are given equal weight.
Prerequisite: Consent of the instructor.

BIO 307 Biochemistry I (4-0)4
Basic discussion of the structure and properties of biomolecules with special emphasis on carbohydrates, lipids, nucleic acids, proteins, enzymatic catalysis, membrane assembly and function. Bioenergetics is also discussed at an introductory level.
Prerequisite: Consent of the instructor.

BIO 308 Biochemistry II (4-0)4
A study of the structural and metabolic relationship of carbohydrates, lipids, proteins and nucleic acids.
Prerequisite: BIO 307 or BIO 353

BIO 309 Ecology of Major Ecosystems (3-0)3
Renewable natural resources that we consume in our daily life are produced either on land or in water ecosystems. Intelligent management and use of these resources are possible only through full understanding of the ecology of these ecosystems. Terrestrial (land) and aquatic (freshwater, marine, and estuarine) ecosystems are discussed in some detail. Urban ecology and the impact of environmental pollution on natural sources are also covered.

BIO 310 Biochemistry Laboratory (0-4)2
The experiments in this course have been designed to provide the students with basic experience in a wide variety of biochemical research techniques. Chemical and enzymatic analysis are performed using calorimetric, potentiometric, electrophoretic, pectrochometric and chromatographic techniques.
Prerequisite: BIO 307 or BIO 353

BIO 311 Instrumental Methods in Biology (2-2)3
A comprehensive course on the principles and applications of techniques widely used by biologists. The techniques include; centrifuga tion, chromatography, spectrophotometry, electrophoresis, and use of radioisotopes and microscopy.

BIO 313 Microbiology (3-0)3
Same as BIO 303, but without laboratory. Offered to non-Biology students.

BIO 317 Molecular Biology (3-0)3
An introductory course offered to non-Biology students, covering the structure and properties of biomolecules, their interactions, organization of genes on chromosomes, replication and transcription of genetic material, protein synthesis and genetic engineering techniques.

BIO 319 Computer Applications in Biology (3-0)3
Introduction to IBM-PC and MS-DOS systems. Problem solving by BASIC and PASCAL programming languages. UNIX, and Internet application, Windows and Word processing under window environments, spread sheets and other software applications.

BIO 321 Bioanalytical Chemistry (3-4)5
A course designed to teach the theory and techniques of quantitative analysis of biologically important ions and compounds. Teaching of laboratory techniques such as volumetry, gravimetry, *chromatography* and spectrophotometry constitute the major aspects of the practical part of the course.
Prerequisite: CHEM 102 or CHEM 106 or consent of the department

BIO 322 Bacterial Diversity (3-0)3
Explores the metabolic diversification of bacteria and phylogenetic relations. Molecular methods used in systematics of bacteria, major bacterial groups such as proteobacteria (α, β, γ, δ, ε, ζ) , *Actinobacteria*, cyanobacteria, *Flavobacteria*, *Cytophaga*, Green sulfur and nonsulfur bacteria, hyperthermophilic bacteria, Deinococci, *Nitrospira* and so on.

Prerequisite: BIO 303 OR BIO 313 OR FDE 311

BIO 351 Introduction to Genetics (3-0)3
This course provides the students with the basic concepts of classical genetics and with the view of molecular genetics from today's perspective. General principles of Mendelian Genetics, chromosome theory of inheritance, linkage and mapping, structure and function of genes, gene expression and its regulation, chromosomal aberrations and mutations are covered. Elementary principles that govern developmental, quantitative, behavioral, population and evolutionary genetics are also discussed.
Prerequisites: BIO 101, BIO 102

BIO 352 Genetics Laboratory (0-4)2
A laboratory course for BIO 306 and BIO 351. A variety of experimental techniques using Drosophila and bacteria in exploring transmission genetics, gene interactions, linkage and genetic mapping, and molecular genetics are covered. Basic recombinant DNA methods for manipulation of *Escherichia coli* DNA and human chromosomal DNA are also included.
Prerequisite: Consent of the instructor.

BIO 353 Biochemistry (3-0)3
This course provides the students with the basic concepts of biochemistry. An introduction to properties of aqueous systems, description of the structure and functions of proteins, enzymes, carbohydrates, lipids and nucleic acids are covered. Discussions will be made on metabolic reactions of these biomolecules with emphasis on bioenergetics and their regulation, and on the expression and transmission of genetic information.
Prerequisite: Consent of the instructor.

BIO 355 Microbiology Lab (0-4)2
Laboratory course for BIO 303.

BIO 356 Plant Biology (3-2)4
An introductory course on plant sciences, which covers mainly the elementary aspects of plant morphology (forms and structures of plant parts), plant physiology (functional processes), plant ecology (relationships between plants and their environment) and plant genetics (inheritance of traits in plants).
Prerequisite: Consent of the instructor.

BIO 360 Summer Practice (0-4)NC
Thirty working day of compulsory summer practice, which should be completed either in biology-related private or government sector.
Prerequisite: Consent of the coordinator.

BIO 361 International Summer Practice (0-4)NC
A course designed for students who will complete their compulsory summer practice scheme under the Erasmus Summer Practice Mobility Program.

BIO 401 Molecular Cell Biology (3-0)3
Analysis of cellular structure and function at the molecular level. The course covers recent advances in cellular energetic, the cytoskeleton and cell movement, the cell cycle and cell division, intercellular recognition and cell adhesion, chemical signaling between cells and cellular differentiation.
Prerequisites: BIO 101, 102

BIO 402 Developmental Biology (3-0)3
Development includes all the changes that take place during the entire life of an organism from conception to death. The course covers the analysis of development following the fertilization; the cleavage, embryonic polarization and gastrulation phases, limb development, eye development, and gonad development and sex differentiation.

BIO 403 Conservation Biology (3-0)3
The impact of mankind on the biological systems of the planet earth has been accelerated during the recent decades. Many plant and animal species along with thousands of valuable gene combinations are in danger of extinction. This course discusses the factors that threaten natural communities, and presents justifications and principles of conservation of ecosystems and species in maintaining rich biological diversity in our environment.

BIO 404 Evolution (3-0)3
A course on the basic concepts of evolution of organisms; theory of natural selection, cosmic evolution and origin of life. The evidence for evolution (from biogeography, taxonomy, comparative anatomy, embryology, biochemistry and palaeontology), the mechanism of evolution (mutation, migration, natural selection, genetic drift) and the speciation process and products of evolution (plants and animals) are the main titles to be covered.

BIO 405 Immune System Related Diseases (3-0)3
Introduction to failures of host defense mechanisms, allergy and allergic diseases, autoimmunity, and manipulation of the immune response
Prerequisites: BIO 407

BIO 406 Animal Behavior (3-0)3
This course reviews conceptual and experimental approaches of ethnologists, experimental psychologists, and neurophysiologists to studies on animal behavior. Distinction between innate and

learned behaviors is made. Control mechanisms over execution of various behaviors (including triggering stimuli, motivation, hormones, biorhythms) are discussed. Survey of such behaviors as spatial orientation and navigation, migration, habitat selection, social organization and communication, mating systems and parental care is presented.

BIO 407 Immunology (3-0)3
A survey of the immune system and immunological mechanisms. Students are not only introduced to the field of immunology but are also prepared to benefit from their own life time experiences.

BIO 408 Plant Tissue Culture (3-4)5
The main objective of the course is to give biology students information, concerning recent developments and advances made in plant tissue culture and plant biotechnology
Prerequisites: BIO 356, BIO 351

BIO 409 Introduction to Neurobiology (3-0)3
An introductory course presenting short history of neuroscience, and basic conceptual and experimental approaches to studies in different areas of neurobiology including macro and microanatomy of the mammalian central nervous system, cellular and molecular neurobiology, electrophysiology, neural networks operation, and animal behavior. The course will also cover some issues related to developmental and adult neural plasticity, and aging of the brain.
Prerequisite: BIO 252

BIO 412 Applied Microbiology (3-0)3
Established and in pipe technologies of biotechnological processes using prokaryotic or eukaryotic microbes for production, transformation, degradation and detection of substances, characterization of biotechnologically relevant enzymes and proteins (known or novel) and their purification on a technical scale, directed evolution and all other aspects of strain improvement including metabolic engineering and enzyme engineering.
Prerequisites: BIO 303,BIO 307,BIO 308

BIO 415 Physical Chemistry for Biological Sciences (3-0)3
Basic thermodynamic and kinetic principles applied to processes in solution with special reference to systems of biological interest: acid-base equilibrium, membrane phenomena; transition state theory, structure-reactivity correlation, catalysis, and chemical kinetics.
Prerequisite: Consent of the instructor.

BIO 416 Infectious Diseases (3-0)3
This course covers the microorganisms of medical importance, their taxonomic position, general characteristics, and procedures for their cultivation and identification. Immuno diagnostic tests, laboratory tests in chemotherapy and molecular methods in clinical microbiology are also discussed.

BIO 417 Neurochemistry (3-0)3
An introductory course which covers the biochemistry of the nervous tissue with emphasis on cell to cell signaling, neurotransmitter action and functions. Detailed molecular mechanisms of action potential generation and propagation, neurotransmitter release and adaptation process, brain biochemistry related to possible mechanisms of learning, memory (LTP), some mental diseases and mode of drug action are the main titles to be discussed.
Prerequisite: Consent of the instructor.

BIO 418 Population Biology of Plants (3-0)3
Seed biology, competition and neighboring, natural dynamic of plant populations, life cycles and fertility schedules, community structures and diversity in plants are discussed. Field trips are scheduled.
Prerequisites: BIO 351,BIO 356

BIO 419 Biochemical Calculations (3-0)3
This course provides biology students with some of the mathematical problems in biochemistry discussed in introductory courses. It covers problems in bioenergetics, metabolism expression of genetic information. Enzyme kinetics and radioisotopes in biochemistry
Prerequisite: BIO 307 or BIO 353

BIO 420 Biochemistry (3-0)3
This course is intended for non-biology students. The cell as the unit of structure and function, the chemistry of major constituents of the cell; energy generating and synthetic pathways and their regulation and molecular genetics are the main titles to be discussed.
Prerequisite: Consent of the Department.

BIO 422 Nutrition (3-0)3
Fundamental concepts and principles of nutrition, energy yielding nutrients (carbohydrates, lipids and proteins), energy balance, weight control and fitness, vitamins and minerals, the sources, deficiency, and toxicity of nutrients and nutrition applications in the life cycle-food safety are the main titles to be discussed.

BIO 423 Recombinant DNA Techniques (3-0)3
The course has been designed to acquaint the student with the fundamental techniques of genetic engineering; manipulation of DNA *in vitro*, transformation techniques, library construction and screening methods, expression systems and host-vector systems. Recent applications of recombinant DNA technology in the analysis of biological processes, diagnosis of human diseases, isolation of human genes, DNA finger printing, gene therapy and the development of commercial products are also covered.
Prerequisite: Consent of the instructor.

BIO 424 Clinical Biochemistry (2-4)4
The main object of the course is to deal with the quantitative analysis of body fluids such as blood and urine. The changes in the composition of body constituents under pathological conditions are discussed.
Prerequisite: Consent of the Department.

BIO 425 Molecular Pharmacology (3-0)3
In this course a molecular approach to pharmacology is intended. Drug-receptor interactions, dose-response and structure activity relationships (drug administration, transference, metabolism and excretion) are the topics to be covered.
Prerequisite: Consent of the Department.

BIO 427 Biotechnology (3-0)3
The fundamental aspects and underlying principles of biotechnological processes are covered. Pharmaceutical, agricultural, environmental applications are discussed.
Prerequisite: Consent of the instructor.

BIO 428 Population Biology (3-0)3
Topics generally considered in population genetics and biology are combined to study processes, which determine the abundance, distribution, composition and evolution of species.
Prerequisites: BIO 206, BIO 351

BIO 430 Sensory Physiology (3-0)3
Biochemical and molecular mechanisms of sensory coding; visual system and photo transduction. Biochemistry of auditory, olfactory, taste and chemical sensations. The skin senses. Opiates and pain control.

BIO 432 Plant Biodiversity (3-0)3
The theoretical foundations of plant taxonomy and the types of evidences used in constructing plant classification and identification procedures are explained. Variation in morphology, predominant breeding systems, dispersal syndromes and other features between families of vascular plants in Turkish flora are examined. Students learn key characteristics for identification of important families of ferns, allies, conifers and other flowering plants.
Prerequisite: Consent of the instructor.

BIO 433 Introduction to Evolution (3-0)3
A course dealing with the basic concepts of evolution. The topics to be covered: nature of science and evolution; evolution as science; origin of matter, universe and earth; from molecules to cells and organisms; universal tree of life; principles and process of evolution; the origin of selection; natural selection; nature and origin of species; human origins and evolution; human culture and evolution. Offered to Science Education Majors.

BIO 435 Animal Diversity (3-0)3
This course aims to introduce the students to the vast animal diversity from an evolutionary perspective. Animal groups in systematic order follow a brief theoretical introduction on speciation, zoogeography and taxonomy. Each group is treated in terms of its evolutionary relationship, basic form and function, reproductive biology, basic ecology and relevance to human systems (agriculture, medicine, etc.) Presentations include audio-visual material.

BIO 437 Plant Hormones (3-0)3
Hormones are the most important factors determining the development of a plant and hence the understanding of the types and the effects of these substances on plant development and genetic activity has the utmost importance.

BIO 438 Freshwater Ecology (2-2)3
This course aims to introduce the students to both theoretical and practical aspect of freshwater ecosystems. There will be a brief introduction on properties of water, interactions of freshwater with land and atmosphere, their origins and evaluation of fresh water animals. The course will cover the interactions of chemical, physical and ecological characteristics of freshwater bodies including plankton, aquatic plants, fish and productivity of the edges and bottoms of rivers, their floodplains (including swamps and marshes), lakes, pools and other standing bodies. Theoretical aspects of these will be combined with the field sampling and laboratory analyses.

BIO 442 Experimental Plant Physiology (1-4)3
This course is designed to teach students some practical methods in plant physiology and

biochemistry experiments on bioenergetics, membrane stability, and protein and lipid metabolism under abiotic stress conditions such as salt and drought. Additional experiments on Agrobacteria-mediated gene transfer will be conducted.

BIO 444 Introduction to Enzyme Kinetics (3-0)3
The course deals with enzyme-catalyzed reactions. General enzyme concepts, including steady-state kinetics, inhibition and activation analysis, cooperative interactions, factors affecting enzyme activities, industrial uses of enzymes and fundamentals of immobilized enzyme kinetics will be discussed.

BIO 445 Microbial Physiology (3-0)3
A course on distribution and regulation of major routes of energy supply among microorganisms; Photosynthesis in Cyano bacteria and anoxygenic photographic bacteria, Halobacterial photophosphorylation, carbon dioxide metabolism in non-phototrophic autotrophs and heterotrophs. Microbial metabolism of hydrogen, oxidation of iron and sulfur compounds, Methylotrophs and methanogens are discussed. Applications in biotechnology are also mentioned with reference to each physiological group.

BIO 447 Microbial Ecology (3-0)3
The course covers interactions among microbial populations, interactions of microbes with plants and animals, microbial communities, detection of microbial populations, habitats of microorganisms, ecology of aquatic microorganisms. The biotechnological aspects of microbial ecology such as microbial interactions with xenobiotics and inorganic pollutants, as well as approaches to bioremediation are included.
Prerequisite: BIO 303 or BIO 313 or FDE 311

BIO 448 Field Ecology (2-2)3
A course for 4th-year students, covering both basic theory and practice of terrestrial ecological methods. Topics include measuring abiotic factors (climate, soil properties, mapping), detecting presence of wildlife, collecting and preserving specimens, behavioral field study techniques, estimating abundance by mark-recapture, quadrat counts and line transects, and estimating basic community parameters. Students are expected to be involved in group work in the field.
Prerequisite: Consent of the Department.

BIO 452 Plant Biotechnology (3-0)3
The course covers the basic aspects of plant biotechnology. Particular emphasis will be given to: Manipulation of energy production pathways in plants, environmental factors affecting the overall system and crop productivity, plant growth and development *in vitro*, plant cell and tissue culture, cloning and somatic cell genetics, conventional and biotechnology supported plant breeding, techniques of transferring foreign genes into plants (*Agrobacterium*, particle bombardment, etc.), practical application of transgenic plant technology for plant health, human/animal health and nutrition, biosafety aspects of transgenic plants. The future of plant biotechnology will be also covered.
Prerequisite: BIO 356, BIO 307 or BIO 353

BIO 454 Ornithology (2-2)3
A course for senior students, emphasizing adaptive morphology and behavior of birds. Lectures cover various aspects of the biology of birds, including morphology, physiology, systematic, evolution, behavior, ecology, and biogeography, with examples from the regional avifauna. Laboratory and fieldwork include studies of skeletons and plumages, teaching basic identification skills and field work (censusing, recording behavior, breeding ecology) on common species. *Prerequisite: BIO 206*

BIO 460 Special Project (0-6)3
Research project carried out under the supervision of a staff member. Offered to 4th year students with a cumulative average of 3.00 or above.

BIO 461 Biophysics I (3-0)3
An introduction to some selected topics in biophysics, with emphasis on molecular background of structure and function is aimed.
The course content includes; introduction to molecular biophysics, radiation biophysics, medical imaging techniques, microscopic and sub-microscopic methods in biological structure and function analysis.

BIO 462 Biophysics II (3-0)3
An introductory course that covers the physical foundation of the molecular organization and dynamics of membranes, thermodynamic basis of life process, transport across membranes, electric properties of resting and excelled cells, nerve conduction and biophysics of the sensory systems.

BIO 470 Applied Ecology (3-0)3
Applications of ecological principles and knowledge to environmental problems, such as terrestrial and
environmental pollution, conservation, population regulation and biodiversity are the main titles to be covered.
Prerequisite: BIO 206

BIO 478 Wetland (3-0)3
This course is designed to provide the student with an overview of the basic structure and function of wetlands, controlling factors for their distribution and community composition, major environmental problems worldwide, appropriate management techniques, and developing approaches for their utilization and conservation. Particular emphasis will be placed on understanding relationship and changes along gradients of wetlands hydrology, biogeochemistry, and different group of species including bacteria, plants and animals.
Prerequisite: Consent of the Department.

BIO 479 Cell Cycle and its Regulation (3-0)3
This course provides the students with a comprehensive understanding of the cell cycle. Topics include genetic analysis of cell cycle, cell cycle stages and the controlling enzymes, checkpoints to monitor the integrity of cellular events, intrinsic and extrinsic programmed cell death mechanisms, and cell cycle related disorders.

BIO 480 Introduction to the Biology of Aging (3-0)3
This course introduces evolutionary models explaining aging and the evolution of life-history traits, provides a physiological and molecular overview of the aging process, as well as current-day research on the subject. Recent research on the subject. Recent research papers on topics including oxidative stress, telomere shortening, Alzheimer's disease, and comparative aging will be discussed.

GENE 103 Molecular and Cellular Biology I (4-2)5
The topics include; the origin of living organisms, their cellular basis, the chemical building blocks of the cell, biology of the cell, cell membrane and permeability, cell to cell interactions and cell signaling, structure and function of sub-cellular organelles, energy flow in cells, chemotropic and phototropic energy metabolism, mitochondria and chloroplast structure, the basis of cellular information flow, DNA structure, chromosomes and nucleus.

GENE 104 Molecular and Cellular Biology II (4-2)5
Cell cycle, DNA replication and mitosis, sexual reproduction, meiosis and genetic variability, patterns of inheritance, molecular genetics, cellular mechanisms of development, cellular differentiation and specialization, molecular aspects of cancer.

GENE 205 Ecology and Evolutionary Biology (4-0)4
Principles of evolution with special emphasis on the impacts of advancements in molecular evolution, diversity of life in an evolutionary framework and fundamentals of ecology, focusing on concepts of ecosystems and problems caused by humans, will be discussed. The course has been designed for the students of Molecular Biology and Genetics Program.
Prerequisite: Consent of the instructor.

GENE 365 General and Molecular Genetics (4-0)4
In this course general principles of Mendelian Genetics, chromosome theory of heredity, linkage and mapping, structure and function of both prokaryotic and eukaryotic genes, gene expression and its regulation, changes in genetic material, chromosomal aberrations and mutations are covered. Elementary principles that govern developmental, quantitative, population and evolutionary genetics are included. Fundamentals of recombinant DNA technology are also included from a biotechnological perspective. The course has been designed for the students of Molecular Biology and Genetics Program.
Prerequisite: GENE 104

GENE 366 Molecular Biology of the Gene (3-0)3
The course presents prokaryotic and eukaryotic molecular genetics with a comparative and unifying approach. DNA structure and organization, replication, transcription, translation, regulation of gene expression and interactions of proteins and RNAs with DNA are discussed. Examples from bacteria, yeasts, plant and humans are covered. Advances at the molecular level in the areas of aging, gene therapy, and mitochondrial inheritance will be emphasized. Recent advances in recombinant DNA technology (such as genome sequencing, DNA microarray) also are included.
Prerequisite: Consent of the Department.

GENE 367 General and Molecular Genetics Laboratory (0-4)2
A laboratory course emphasizing the principles of genetics. Experiments include the application of transmission and population genetics using Drosophila as the model organism, such as segregation and independent assortment, sex linkage, linkage analysis and gene mapping, epistatic interactions, and gene frequency changes in populations. Polytene chromosomes and allozyme electrophoresis are also done with Drosophila. Chromosomal DNA, RNA and plasmid isolation techniques, UV induced mutations, genetic

manipulation by recombinant DNA techniques and PCR are covered. The course has been designed for students of Molecular Biology and Genetics Program.

GENE 405 Animal Cell Culture Techniques (3-0)3
This course aims to guide the students systematically through the fundamental principles of animal cell culture. It will also provide useful information for setting up a cell culture laboratory. Students will learn sterilization techniques, culture media preparation, basic animal cell culture techniques, microscopy of living cells, preparation of primary cell cultures, isolation of new cell lines, growing specialized cells in defined conditions, cell fusion, cloning, maintaining and controlling the quality of cell stocks, prevention and control of contamination and good laboratory practice.
Prerequisite: BIO 101 or GENE 103 and GENE 104

GENE 433 Molecular Modeling and Protein Structure Prediction (2-2)3
Current developments in biology, nanotechnology, biotechnology and large scale DNA sequencing increased the role of protein structure prediction more important than ever. The objective of this course is to provide a background for the molecular biologist by outlining the principle concepts and limitations in 3D protein modeling. The available algorithms, programs and data banks used in modeling and protein structure prediction will be reviewed. More importantly methods to evaluate the performance of these algorithms and programs will be discussed as a new approach in modeling and structure prediction emerges almost every day.

GENE 471 Endocrinology (3-0)3
A comprehensive course covering the major endocrine systems in animals at the cellular and molecular level. The course will stress topics that include structure and functions of endocrine glands in a traditional way and also the molecular aspects of hormone action, including hormone-receptor interactions, second messenger generation, gene regulation of hormones, and related topics.
Prerequisite: BIO 353 or BIO 308

GENE 472 Special Project (0-6)3
This is a single-term independent research project to gain practical experience in various subjects of molecular biology and genetics. The student is guided by an academic adviser. The project must consist of literature search and laboratory work ending with a formal report and presentation.
Prerequisites: GENE 270, GENE 367 and GENE 475

GENE 473 Molecular Biology of the Cell (3-0)3
This course brings together a variety of subjects intimately linked to modern molecular and cellular biology. It ideally suits, in content and complexity, for the fourth year students with a basic background in molecular biology. Main topics are; cell structure and function, the cytoskeleton and cell movement, structure and organization of actin filaments, microtubules, molecular medicine, the cell surface, structure of plasma membrane, transport of small molecules, extracellular matrix, cell to cell interactions, cell regulation signaling, the cell cycle, regulators of cell cycle progression, development, differentiation and programmed cell death and molecular aspects of cancer. The course has been designed for the students of Molecular Biology and Genetics Program.
Prerequisite: Consent of the instructor.

GENE 475 Molecular Biology Laboratory (0-4)2
The experiments have been designed to acquaint the students with the fundamental techniques of molecular biology, and with selected applications of recombinant DNA technology. The course has been designed for the students of Molecular Biology and Genetics Program.
Prerequisite: GENE 367

GENE 479 Current Research in Biological Sciences NC
This is a course designed to familiarize the students with the current status of research institutes, industrial firms and corporations operating especially in the fields of molecular biology, genetics and biotechnology. The seminars are to be presented by invited scientists and representatives of leading institutes and industrial firms. Attendance is obligatory. The course has been designed for the students of Molecular Biology and Genetics Program.

GENE 480 Student Seminars in Molecular Biology and Genetics NC
The students are expected to give a formal presentation over a topic of their interest. Full attendance and at least one seminar presentation is obligatory. The course has been designed for the students of Molecular Biology and Genetics Program.

GRADUATE PROGRAMS AT THE DEPARTMENT OF BIOLOGICAL SCIENCES

Our department offers the Biology graduate program leading to M.S. and Ph.D. degrees. Objectives of the program are mainly to train students to carry out basic and applied research in areas covering Molecular Genetics, Ecological and Evolutionary Genetics, Biochemistry (Enzymology, Toxicology), Microbiology (Microbial Genetics, Microbial Physiology, Industrial Microbiology and Microbial Ecology), Cancer Biology, Plant Sciences (Plant Tissue Culture, Plant Population Genetics, Plant Physiology, Plant Biotechnology, Plant Molecular Genetics, Plant Systematics, Plant Morphology and Anatomy) Molecular Biophysics, Structural Biology, Biomaterials, Bioengineering, Biosensors, Biotechnology, Physiology (Endocrinology, Neurophysiology, Behavioral Sciences), Pharmacology (Psychopharmacology), Conservation Biology, and Terrestrial Ecology (Wildlife Ecology, Ornithology) and Freshwater Ecology.

The general university requirements for the M.S. and Ph.D. degrees are described in Academic Rules and Regulations (Graduate Programs) section of this catalogue.

All students admitted to our graduate program are required to designate their supervisor and thesis topic by the end of their first semester.

GRADUATE CURRICULUM

M.S. in Biology

BIO	500	M.S. Thesis	NC
BIO	501	Seminar in Biology I	NC
BIO	502	Seminar in Biology II	NC

7 Elective Courses

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. in Biology

BIO	520	Biometry	(2-2)3
BIO	600	Ph.D. Thesis	NC
BIO	601	Seminar in Biology	NC

6 Elective Courses

Total minimum credit: 21
Number of courses with credit (min): 7

GRADUATE COURSES

BIO	500	M.S. Thesis	NC
BIO	501	Seminar in Biology I	(0-2)NC
BIO	502	Seminar in Biology II	(0-2)NC
BIO	503	Intermediary Metabolism and its Regulation	(3-0)3
BIO	505	Advanced Molecular Genetics	(3-0)3
BIO	506	Radiation Biology	(3-0)3
BIO	507	Neurobiology	(3-0)3
BIO	509	Enzyme Kinetics	(3-0)3
BIO	510	Structure and Function of Biological Membranes	(3-0)3
BIO	512	Quantitative Problems in Biochemistry	(3-0)3
BIO	513	Biology of Cancer	(3-0)3
BIO	514	Biomaterials	(3-0)3
BIO	516	Control Mechanisms in Biochemistry	(3-0)3
BIO	517	Numerical Taxonomy	(3-0)3
BIO	520	Biometry	(2-2)3
BIO	522	Metabolic Aspects of Conjugation Reactions	(3-0)3
BIO	523	Yeast genetics and Molecular Biology	(3-0)3
BIO	525	Population Genetics	(3-0)3
BIO	527	Transgenic Plant Technology	(3-0)3
BIO	528	Quantitative Genetics	(3-0)3
BIO	529	Pharmaceutical Biotechnology	(3-0)3
BIO	532	Experiment in Molecular Genetics	(1-4)3
BIO	535	Genomics and Proteomics	(3-0)3
BIO	537	Genetic Engineering	(3-0)3
BIO	539	DNA Repair	(3-0)3
BIO	541	Advanced Microbiology	(3-0)3
BIO	543	Experimental Enzymology	(1-4)3
BIO	544	Control Mechanisms in Molecular Biology	(3-0)3
BIO	546	Plant Genetics and Breeding	(3-0)3
BIO	554	Macromolecules in Biomedicine and Biotechnology	(3-0)3
BIO	555	Ecology of Shallow Lakes	(3-0)3
BIO	556	Freshwater Ecology	(3-0)3
BIO	562	Spectroscopy of Biological	

		Molecules and Membranes	(3-0)3
BIO	571	Advanced Ecology	(3-0)3
BIO	574	Major Concepts in Ecology	(3-0)3
BIO	576	Advanced Plant Systematics	(3-0)3
BIO	577	Eutrophication and Restoration of Lake Ecosystem	(3-0)3
BIO	578	Evolutionary Genetics and Environmental Stress	(3-0)3
BIO	580	Controlled Release Systems and Drug Targeting	(3-0)3
BIO	584	Advances in Biomaterials	(3-0)3
BIO	586	Human Genetics	(3-0)3
BIO	587	Plant Biodiversity Conservation	(3-0)3
BIO	588	Biodiversity and Habitat Conservation	(3-0)3
BIO	600	Ph.D Thesis	NC
BIO	601	Seminar in Biology	(0-2)NC
BIO	7XX	Special Topics in Biology	(3-0)3
BIO	8XX	Special Studies	(4-2)NC
BIO	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

BIO 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between students and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or thesis writing is in progress.(F&S)*

BIO 501 Seminar in Biology I (0-2)NC
Presentation of topics of general interest, current research activities and recent developments in biological sciences and related fields by graduate students, staff members and invited speakers.(F)*

BIO 502 Seminar in Biology II (0-2)NC
Graduate students prepare a compilation of research articles on topic of interest in their field of study and present. Students may also include results and progresses of their own research. Presentations are followed by discussions among the faculty members and graduate students attending the seminars. (F/S)

BIO 503 Intermediary Metabolism and Its Regulation (3-0)3
(See also BCH 503)
Intensive study of the metabolic pathways of carbohydrates, lipids and nitrogenous compounds and their interrelationships, including control mechanisms. The effects of hormonal and nutritional status on the activity of these major pathways. (S)*

BIO 505 Advanced Molecular Genetics (3-0)3
Major advances made in the field in recent years and their interpretation at the molecular level are reviewed. The course material requires that the students be familiar with various techniques applicable to the study of prokaryotes and eukaryotes.(R)*

BIO 506 Radiation Biology (3-0)3
Effects of radiation on biological systems. The types of radiation, radiation chemistry of water, effects of radiation on biopolymers and on living systems.
Prerequisite: Consent of the Department.

BIO 507 Neurobiology (3-0)3
A general survey of the biochemistry of nervous tissues with special emphasis on the functions and mechanisms of action of neurotransmitters and on neurotransmitter receptors. Brain biochemistry as related to possible mechanisms underlying mental illness and the mode of drug action.(R)*

BIO 509 Enzyme Kinetics (3-0)3
(See also BCH 509)
Steady-state treatment of simple and multistep enzymatic reactions. Inhibition analysis, activation, cooperative interactions. Multi substrate systems. Environmental effects on enzyme activity. Transient state kinetics. (A, F/W, E)*

BIO 510 Structure and Function of Biological Membranes (3-0)3
(See also BCH 510)
Biochemistry of basic elements of natural (mammalian, plant and bacterial) and reconstituted membranes (liposomes, black lipid membranes). Techniques used in the study of membranes. Topics in cell biology and physiology, structure -function relationships of membranes depending on lipid fluidity, membrane fusion, cell recognition, hormone- receptor interactions, enzyme activities and transport phenomena.(R)*

BIO 512 Quantitative Problems in Biochemistry (3-0)3
(See also BCH 512)
Solution of numerical problems in biochemistry involving acid-base chemistry, blood buffers, chemistry of biological molecules, enzymes,

biochemical energetics, spectrophotometry, isotopes and scintillation counting.(R)*

BIO 513 Biology of Cancer (3-0)3
Viral, chemical and physical causes of cancer, tumor types, comparison of embryonic and neoplastic cells, cancer genes, molecular and metabolic properties of cancer cells, testing of anti tumor agents and suspected carcinogens, cancer diagnosis, methods of therapy, and prevention.(AF)*

BIO 514 Biomaterials (3-0)3
The multidisciplinary subject of biomedical application of materials obtained from natural and synthetic sources. Solid properties, various materials used in biomaterials, tissue-material interactions, in situ, in vitro and in vivo application methods and sterilization are discussed. Important soft and hard tissue applications involving tissue engineering, drug delivery, implant design, and imaging are discussed with special emphasis on bio and synthetic polymers. (F /WE)*
Prerequisite: Consent of the Instructor.

BIO 516 Control Mechanisms in Biochemistry (3-0)3
(See also BCH 516)
Transcriptional, translational and post-translational control of protein level and activity in response to changes in the intracellular and extra cellular environment (R)*

BIO 517 Numerical Taxonomy (3-0)3
Aims and principles of numerical taxonomy. The choice and definition of taxonomic characters. The estimation of taxonomic resemblance between organisms and the clustering of organisms into taxa on the basis of these resemblance. A survey of the application of numerical taxonomy to fields other than biological systematic. (R)*

BIO 520 Biometry (2-2)3
The statistical techniques applicable in biological research. Emphasis will be given on the use of computers in biological sciences. Data in biology, descriptive statistic, elementary probability distributions, estimation and hypothesis testing, analysis of variance, regression, correlation and certain non-parametric tests are the topics covered. *(Compulsory for Ph.D. students)* (S/WE)*

BIO 522 Metabolic Aspects of Conjugation Reactions (3-0)3
Basic biochemical and molecular aspects of conjugation reactions and the conjugates. The glucuronidation, sulfation, acetylation, O-, N-, S-methylation, amino acid and glutathione conjugation reactions with emphasis on enzymological, metabolic, biological pharmacological and molecular biological concepts.(R)*

BIO 523 Yeast Genetics And Molecular Biology (3-0)3
Presents up to date information on genome dynamics, protein synthesis, energetic and gene expression of the yeast Saccharomyces, as a model eukaryote. Applications of these principles in academic research and biotechnology industry are also covered.

BIO 525 Population Genetics (3-0)3
This course is concerned with the statistical consequences of Mendelian inheritance in populations of organisms. Hardy-Weinberg Principle, linkage disequilibrium, genetic drift, inbreeding, mutation and neutral theory, natural selection, migration, molecular population genetics, ecological genetics and speciation are discussed.

BIO 527 Transgenic Plant Technology (3-0)3
Recovery of transgenic plant species by gene transfer techniques. Critical assessment of past and future applications of this technology in the world and in Turkey.(R)*

BIO 528 Quantitative Genetics (3-0)3
Science of genetics. Genetic constitution of a population, changes of gene frequencies, quantitative inheritance, analyses of quantitative characteristics, heritability, artificial selection, inbreeding and partitioning of variance.(R)*

BIO 529 Pharmaceutical Biotechnology (3-0)3
Provides connection between the biological sciences involved in the study of cellular system at the molecular level and the technological developments involved in exploiting rDNA technology and presenting the active material as a pharmaceutical product. Upstream and downstream processes, methods for analyzing and characterization of new generation drugs including their purity, stability and formulation are covered. Particular attention is placed on the method and process validation. The rules governing rDNA technology derived medicinal products in European Community, current good manufacturing process (cGMP)and current good laboratory practices (cGLP) for the product manufacturing in the pharmaceutical industry are also included.

BIO 532 Experiments in Molecular Genetic (1-4)3
A research oriented laboratory course. (R)*

BIO 535 Genomics and Proteomics (3-0)3
To introduce biology, biotechnology, biochemistry and medical informatics graduate students to the field of structural, comparative and functional genomics (transcriptomics and proteomics) and their high throughput tools. Overview of genomes and genome projects, physical mapping of genome, sequencing platforms and technologies, annotation, metagenomics, comparative and evolutionary genomics, array- and nonarray-based transcriptomics, epigenomics and proteomics by an integrated approach.

BIO 537 Genetic Engineering (3-0)3
Recent revolutionary advances in recombinant DNA technology. Basic principles of gene manipulation and its various applications.(R/WE)*

BIO 539 DNA Repair (3-0)3
DNA repair processes per se, and its relations with mutagenesis, carcinogenesis, aging and the hereditary DNA repair defects in humans. (R)*

BIO 541 Advanced Microbiology (3-0)3
The course aims at offering a deeper understanding of microbes with particular emphasis on new insights derived from the application of molecular biology and genetics to fundamental questions. It will emphasize critical evaluation of existing knowledge and strive to build an appreciation of the methods and scientific advances which have made microbiology a significant contributor in the elucidation of fundamental biological questions.

BIO 543 Experimental Enzymology (1-4)3
(See also BCH 543)
A laboratory course concerned with biochemical and molecular aspects of enzyme function. Purification and characterization of the enzymes, optimization of the enzyme assays, simple enzyme kinetics, spectrophotometry, SDs-polyacrylamide gel electrophoresis, enzyme linked immunosorbent assays (ELISA). (AF)*

BIO 544 Control Mechanisms in Molecular Biology (3-0)3
Gene expression with a structural and mechanistic understanding. Control mechanisms at the transcriptional level, in prokaryotes, and at the levels of messenger RNA processing and translation, in eukaryotes. The metabolic activities concerned with the regulation of gene's potential for expression. Review and discussion of various topics in recent articles.(R)*

BIO 546 Plant Genetics and Breeding (3-0)3
Plant genetics and its application in agriculture and forestry. Genetic resources in plants and their use in plant breeding, hybridization and creating new crop varieties, and application of biotechnology in plant breeding.(R)*

BIO 554 Macromolecules in Biomedicine And Biotechnology (3-0)3
Classification, synthesis and transformation of biopolymers (polynucleotides, polypeptides and polysaccharides). Merrifield solid state synthesis. Classification, synthesis and transformation of synthetic macromolecules. Chemical and biological transformation. Solution behavior, helix-coil transition. Structure, morphology and properties of biological polymers in the solid state. Single crystal formation. Applications in Biomedicine and Biotechnology. (S/WE)*
Prerequisite: Consent of the instructor.

BIO 555 Ecology of Shallow Lakes (3-0)3
Governing mechanisms in shallow lakes; light, sedimentation and resuspension, nutrient dynamics; biotic factors: phytoplankton, trophic cascades, vegetation. Managing and restoration eutrophic shallow lakes; nutrient management, biomanipulation, hydrological adjustment.

BIO 556 Freshwater Ecology (3-0)3
Advanced theoretical aspects of freshwater ecology, impact of land and water use on lakes, interaction between physical, chemical and biological components of freshwater lakes, eutrophication, global changes, and biodiversity of the organisms.

BIO 562 Spectroscopy of Biological Molecules and Membranes (3-0)3
Basic theory, instrumentation and recent research applications of spectroscopic techniques in biological macromolecules and biological membranes. (R/WE)*

BIO 571 Advanced Ecology (3-0)3
Life and the physical environment. Response to physical environment. Climate, topography and the diversity in the natural environment. Population interactions. The structure and the functioning of ecological communities. Energy flow in terrestrial and aquatic ecosystems. Species extinction and their causes.(F)*

BIO 574 Major Concepts in Ecology (3-0)3
Origins and the present status of ecosystem concept, ecological niche, competitive exclusion principle, and ecological succession.(S)*

BIO 576 Advanced Plant Systematics (3-0)3

The basis of plant taxonomy; cytogenetics; phytogeography, structural botany biosystematics and evolutionary theory, causes of plant variation, nomenclature, ecotypes, genetic isolation and hybridization, modes of speciation, breeding systems in plant populations and modern techniques in plant systematics. Extensive field and herbarium studies.

BIO 577 Eutrophication and Restoration of Lake Ecosystems (3-0)3

This course aims to introduce the post graduate students to eutrophication problems and the restoration measures which have been taken to ensure high water quality in lake ecosystems. The course will cover the characteristics and symptoms of eutrophication in deep and shallow lakes. The emphasis will be given to the factors affecting the degree of water quality deterioration by eutrophication and qualifying the nutrients load. (R)*

BIO 578 Evolutionary Genetics and Environmental Stress (3-0)3

This course gives a multidisciplinary approach, with an emphasis on the interface of ecology, genetics, physiology, and the study of behavior and development, and evolutionary processes. Application of information from molecular biology to the organismic and higher levels of organization. Major topics in this interdisciplinary course include the concept of stress and its evolutionary and ecological importance; genetic variation in stress response and the effects of stress on genetic variation; costs and benefits involving stress responses. (R)*

BIO 580 Controlled Release Systems and Drug Targeting (3-0)3

Overview of the approaches to bioactive agent administration *s*ystems used in the targeting and delivery of biologically active materials and their fate in the body. Carriers such as liposomes, colloidal carriers, membranes, biodegradable systems, are to be covered. Approaches to genetic material delivery relevant with gene therapy and various anticancer, pain relief, antibiotic administration are *d*iscussed using current literature.
Prerequisite: Consent of the instructor.

BIO 584 Advances in Biomaterials (3-0)3

The most important and novel topics of the biomaterials field are studied in the form of discussion using the latest literature: Testing of biomaterials, biostability, mechanisms of degradation, bio-and hemocompatibility of materials, sterilization of biomedical devices, cell-biomaterial interactions, drug delivery via biodegradable vehicles, hard and soft tissue augmentation, implants, dental applications and bone cements, tissue engineering, biomedical instrumentation and imaging.
Prerequisite: BIO 514 or CHEM 568

BIO 586 Human Genetics (3-0)3

This course aims to introduce fundamental genetic concepts of human traits and diseases. Both classical and current research papers will be examined. Main topics include simple and complex/multifactorial diseases, cancer genetics, cytogenetics, immunogenetics, human genome project, gene therapy and counseling.

BIO 587 Plant Biodiversity Conservation (3-0)3

This course aims to introduce the major themes and concepts of the diverse and dynamic field of conservation biology within the context of plant biodiversity conservation. The course will cover the principles which characterize plant diversity conservation in relation with the application of basic conservation principles to the understanding and resolution of plant biodiversity conservation by means of *in-situ* and *ex-situ* practices. This course also covers management issues, monitoring and modeling of biodiversity, endangered threatened species' recovery programs, restoration practices, reserve designs for effective plant biodiversity conservation, as well as ethical and philosophical aspects of plant biodiversity conservation. (S)

BIO 588 Biodiversity and Habitat Conservation (3-0)3

The first part of the course provides an overview of the current knowledge of the living world and various problems of associated with its conservation, utilization and management for sustainability. In the second part, the habitat conservation approach and landscape ecology concept for sustainable natural resource management are discussed with selected systems such as mountain, agriculture and forest resources, important watersheds and riparian systems. The third part of course is devoted to the Turkish biodiversity and natural resources management activities and current issues in Turkey. In the last part of the course, the challenging current and future issues of natural resource management and utilization are tackled.(F)*
Prerequisite: Consent of the instructor.

BIO 600 Ph.D. Thesis NC

Program of research leading to Ph.D. degree, arranged between student a faculty member. Students registered to this course in all semesters

starting from the beginning of their fifth semester while the research program or writing of thesis is in progress.

BIO 601 Seminar in Biology (0-2)NC
Students pursuing Ph.D. degree prepare a compilation of research articles on topic of interest in their field of study and present. Students may also include results and progresses of their own research. Presentations are followed by discussions among the faculty members and graduate students attending the seminars. (F/S)*

BIO 7XX Special Topics in Biology (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and the instructor in charge. Typical contents include Cell Biology, Endocrinology, Developmental Biology, Quantitative Genetics, Evolutionary Biology, Ecology, Neuroscience, Plant Biology, Molecular Biophysics, Current Issues in Microbiology etc.(R)*

BIO 8XX Special Studies (4-2)NC
M.S students chosen to study a topic under the guidance of a faculty member normally his/her thesis advisor. (F/S)*

BIO 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph. D. student chose and study advanced topics under the guidance of a faculty member normally their supervisor. (F/S)*

* F: Fall, S: Spring, A: Alternative year, R: upon request, WE: wide elective

DEPARTMENT OF CHEMISTRY

PROFESSORS

AKKAYA, Mahinur: B.S., METU; M.S., Ph.D., Ohio State University.
BALCI, Metin: B.S., M.S., Ph.D., University of Köln
BAYRAMLI, Erdal: B.S., M.S., METU; Ph.D., Mc Gill University.
DOĞAN, Özdemir: (Associate Dean of the Faculty of Arts and Sciences) B.S., M.S., METU; Ph.D., Case Western Reserve University.
GÖKAĞAÇ, Gülsün: ***(Vice Chair)***: B.S., M.S., METU; Ph.D., The University of Sydney.
GÖKMEN, Ali: B.S., M.S., METU; Ph.D., University of Maryland.
GÖKMEN, İnci: ***(Vice Chair)***: B.S., M.S., METU; Ph.D., University of Maryland.
GÖKTÜRK, Hale: B.S., M.S., Ph.D., METU.
HACALOĞLU, Jale: B.S., M.S., Ph.D., METU.
HASIRCI, Nesrin: B.S., M.S., Ph.D., METU.
KAYRAN, Ceyhan: B.S., M.S., Ph.D., METU.
ÖNAL, Ahmet M.: B.S., M.S., Ph.D., METU.
ÖZKAN, İlker ***(Department Chair)***: B.S., METU; Ph. D. Rudgers University.
ÖZKAR, Saim: B.S., M.S., ITU; Ph.D..Dipl.Chem., Dr.rer.nat., Technische Universitaet von München.
TANYELİ, Cihangir: B.S., M.S., Ph.D., METU.
TİNÇER, Teoman: B.S., M.S., Ph.D., METU.
TOPPARE, Levent: B.S., M.S., Ph.D., METU.
TUNCEL, Semra: B.S., M.S., METU; Ph.D., University of Maryland.
TÜRKER, Lemi: B.S., M.S., METU; Ph.D., University of East Anglia.
VOLKAN, Mürvet: B.S., M.S., Ph.D., METU.
ZORA, Metin: B.S., Atatürk University; M.S., METU; Ph.D., University of Maryland.

ASSOCIATE PROFESSORS

ÇIRPAN, Ali: ***(Vice Chair)***: B.S., M.S., Ph.D., METU.
ÇORUH, Nursen: B.S., M.S., METU; Ph.D., University of Missouri.
DANIŞMAN, Mehmet Fatih: B.S., M.S., METU; Ph.D., Princeton University
ERTAŞ, Gülay: B.S., M.S., Ph.D., METU.
ESENTÜRK, NALBANT Emren: B.S., M.S., METU; Ph.D., University of Maryland.
ESENTÜRK, Okan: B.S., M.S., METU; Ph.D., University of Maryland.
TOFFOLI, Daniele: B.S., M.S., Ph. D., University of Trieste
YILMAZ, Ayşen: B.S., M.S., Ph. D., METU.

ASSISTANT PROFESSORS

AKDAĞ, Akın: B.S.,M.S.,METU;Ph.D.Auburn University
GÖKTEPE, EREL İrem ; B.S,ITU,Ph.D.Stevens Instıtute of Technology
ÖZÇUBUKÇU, Salih:B.S.,M.S.,METU;Ph.D.,RWTH Aachen University
GÜNBAŞ, E.GÖRKEM: B.S.,M.S.,METU;Ph.D.University of California

GENERAL INFORMATION: The main objective of the Chemistry Department is to educate students as chemists capable of conducting research and development studies in chemical and related industries as well as analytical work required for quality control in various related laboratories. The department aims particularly at equipping students with knowledge and practical skills for the fundamental research essential for technological progress in our modern world. B.S. candidates in chemistry must follow a four year program as prescribed below. The students are required to complete a summer practice in industry after their third year. Our B.S. graduates can also enroll to the interdisciplinary graduate programs in Polymer Science and Technology (PST), Biochemistry, Biotechnology and Archeometry.

Our graduates have career opportunities in the following areas: Several of our graduates have academic positions at several universities in Turkey and abroad. They have career opportunities in Research and Development Laboratories of Chemical, Petrochemical, Medicinal, Paint, Mining, Metallurgical,

Electronic, Plastic, Textile, Ceramic, Glass Pulp, Food and Paper etc. industries. Our graduates also work at Biomedical and Medical Laboratories, Sales and Technical Service Departments of Scientific Instruments and Chemical Companies.

Chemistry Department has the following undergraduate laboratories: General Chemistry Laboratories, Analytical Chemistry Laboratory, Physical Chemistry Laboratory, Organic Chemistry Laboratory, Inorganic Chemistry Laboratory, Organic and Inorganic Industrial Chemistry Laboratory, Instrumental Analysis Laboratory, Polymer Science and Technology laboratory. In addition, there numerous research laboratories of the chemistry faculty.

RESEARCH INTERESTS AND FACILITIES: The major research interests of the faculty is summarized below.

Characterization and synthesis of natural products, highly strained organic compounds, organic reaction mechanism, singlet oxygen chemistry, high temperature bromination of organic compounds. Synthesis and reactions of alycyclic compounds. Catalytic asymmetric synthesis of organic compounds and design of chiral ligands. Electronic absorption spectra, electrochemistry, kinetics and mechanisms of ligand substitution reactions of transition metal complexes. Photo catalytic reactions of olefins. Intrazeolite organometallic chemistry. Preparation and characterization of organometallic compounds. Carbon supported and unsupported Pt and "Pt + second metal" nanoparticle catalysts for direct methanol fuel cells. Electrochemical properties of minerals and mineral enrichment. Solid state reactions of rare earths. Preparation and crystallographic investigation of inorganic materials. Physicochemical studies of colloids and soils. Negative ion studies in the gas phase. Application of quantum chemical methods to spectroscopic studies. Measurement and control of hazardous substances in various environments. Application and development of nuclear, analytical, atomic spectroscopic and chromatographic techniques for pollution studies and for analysis of trace elements in biological materials. Development of various atomic spectrometric techniques. Synthesis and characterization of polymeric materials for industrial use. Application of electrochemical, thermal, radiochemical and r.f. plasma methods for preparation and/or modification of polymeric materials. Developing new methods for preparing ionic, stereoregular and flame-retardant polymers. Conducting polymers. Studies on composites and polymer blends. Simulation studies of polymers and surface dynamics. Synthesis and characterization of polymers for medical and biotechnological applications. Enzyme immobilization, controlled release, biocompatibility studies. Artificial enzymes and fluorescent chemosensors, molecular marker isolation for mapping and genotyping of plants, enzyme kinetics.

Research laboratories are equipped with the following instruments: MS/MS/MS Triple Quadrupole Mass Spectrometer Electrospinning System, 400 MHz solid-liquid Bruker NMR, GC-MS, Huber X-ray diffractometer, Rigaku Miniflex X-Ray Diffractometer, Small Angle X-Ray Scattering, Magnetic Susceptibility meter, Numerous FTIR, UV-Visible, AA, ICP, ICP-OES, and ICP-MS, Fluorescence spectrometers, GC and HPLC, Nuclear Analytical instruments with Ge-Li detector, Lloyd Mechanical Tester, Thermal Analysis (DSC, TGA), Mechanical Dynamic Analyzer, Contact Angle Goniometer, Instron Mechanical Tester, various mechanical property testing devices, Branbender Extruder, hot presses, RF Cold Plasma system, ESR, GPC, automated viscometer, and potensiostats cyclic voltametry and related electrochemical studies. The department also has machine and glass-blowing shops.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

CHEM	105	General Chemistry I	(4-4)6
PHYS	111	Physics I (Mechanics)	(4-2)5
MATH	119	Calculus with Analytic Geometry	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4

Second Semester

CHEM	106	General Chemistry II	(4-4)6
PHYS	112	Physics II (Electricity and Magnetism)	(4-2)5
MATH	120	Calculus for Functions of Several Variables	(4-2)5
ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

SECOND YEAR

Third Semester

CHEM	221	Analytical Chemistry l I	(4-0)4
CHEM	223	Analytical Chem. Lab.I	(0-6)3
CHEM	233	Introduction to Organic Chemistry	(2-0)2
CHEM	257	Mathematics for Chemists	(4-0)4
Non-technical elective			(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC
CHEM	200	Colloquium in Chemistry I	(0-2)NC

Fourth Semester

CHEM	234	Organic Chemistry I	(4-0)4
CHEM	236	Organic Chemistry Lab.I	(0-4)2
CHEM	252	Physical Chemistry I	(4-0)4
CHEM	254	Physical Chemistry Lab.I	(0-4)2
ENG	211	Academic Oral Presentation Skills	(3-0)3
Non-technical Elective			(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

CHEM	301	Organic Chemistry II	(4-0)4
CHEM	303	Organic Chemistry Lab.II	(0-6)3
CHEM	353	Physical Chemistry II	(4-0)4
CHEM	355	Physical Chemistry Lab. II	(0-4)2
CHEM	361	Inorganic Chemistry I	(4-0)4
TURK	303	Turkish I	NC

Sixth Semester

CHEM	322	Analytical Chemistry II	(4-0)4
CHEM	324	Analytical Chem. Lab.II	(0-6)3
CHEM	350	Quantum Chemistry	(3-0)3
CHEM	362	Inorganic Chemistry II	(4-0)4
CHEM	364	Inorganic Chemistry Lab.	(0-4)2
ENG	311	Advanced Communication Skills	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

CHEM	413	Biochemistry	(0-3)3
Restricted Elective			(3-0)3
Restricted Elective			(3-0)3
Technical Elective			(3-0)3

Eighth Semester

Restricted Elective	(3-0)3
Restricted Elective	(3-0)3
Technical Elective	(3-0)3

CHEM	401	Summer Practice	(0-2)NC
CHEM	400	Colloquium in Chemistry II	(0-2)NC

Restricted Elective Courses:

1.	CHEM	403	Industrial Chemistry I	(3-0)3
2.	CHEM	408	Analytical Chemistry III	(3-0)3
3.	CHEM	441	Reaction Mechanism in Organic Chemistry	(3-0)3
4.	CHEM	455	Polymer Chemistry I	(3-0)3
5.	CHEM	471	Spectroscopic Methods in Organic Chemistry	(3-0)3
6.	CHEM	481	Advanced Inorganic Chemistry	(3-0)3
7.	CHEM	499	Undergraduate Research	(1-4)3

DOUBLE MAJOR PROGRAM IN CHEMISTRY

The program consists of all courses in the undergraduate program where the applicant must fulfill the Double Major requirements of the University. For the Chemistry Education students a special protocol exists among the two Departments concerned with a lower CGPA limit.

MINOR PROGRAM IN CHEMISTRY

The Chemistry Minor Program aims at providing an opportunity to the successful B.S. students from other departments to attain a basic knowledge and foundation in chemistry. Through this program it will be possible for the students to apply to a wider job market which will not be limited by their major program, and also, they will be in a position to apply to graduate programs in chemistry and chemistry related departments.

To satisfy the minor requirement the six of the following courses must be taken:CHEM 221, CHEM 223, CHEM 252, CHEM 254, CHEM 234, CHEM 236, CHEM 301, CHEM 303, CHEM 322, CHEM 324, CHEM 353, CHEM 355, CHEM 361, CHEM 362, CHEM 364, "Chemistry Elective "

DESCRIPTION OF UNDERGRADUATE COURSES

CHEM 101 General Chemistry I (4-2)5
(For BIO, ESE, PHYS and PHED students)
A basic course emphasizing the metric system, introduction to stoichiometry, the structural and physical properties of matter, i.e., electronic structure of atoms, chemical binding, molecular geometry, hybridization and molecular orbitals and the states of matter, i.e., gases, liquids and solids.

CHEM 102 General Chemistry II (4-2)5
(For BIO, ESE, PHYS and PHED students)
Continuation of CHEM 101. Discussion of physical properties of solutions, chemical kinetics, chemical equilibrium, chemical thermodynamics and electrochemistry.
Prerequisite: CHEM 101 or CHEM 105 or CHEM 109 or CHEM 111.

CHEM 105 General Chemistry I (4-4)6
(For CHEM and CHED students.)
A basic course primarily intended for majors in chemistry includes experiments related to basic chemical principles. Properties of matter, periodic table, chemical bond and states of matter. Laboratory work includes some basic chemical reactions.

CHEM 106 General Chemistry II (4-4)6
(For CHEM and CHED students.)
This course is the continuation of CHEM 105 and includes experiments related to the topics of the course: Chemical thermodynamics, Kinetics, Equilibrium, i.e., acid-base Equilibria, Solubility, Electrochemistry, Nuclear, Organic and Biochemistry.
Prerequisite: CHEM 101 or CHEM 105 or CHEM 109 or CHEM 111.

CHEM 107 General Chemistry (3-2)4
(One term course for students of EE, CE, IE, FDE, ENVE, CENG, AEE, ME.) Introduction to atomic and electronic structure, chemical bonding, molecular structure and bonding theories, properties of liquids, solids and solutions, chemical equilibrium, kinetics, thermodynamics, metal complexes, organic compounds and nuclear chemistry.

CHEM 111 General Chemistry I (3-2)4
(For GEOE, METE, MINE, PETE, GENE and CHE students)
A basic course emphasizing the metric system, introduction to stoichiometry, the structural and physical properties of matter, i.e., electronic structure of atoms, chemical binding, molecular geometry, hybridization and molecular orbital and the states of matter, i.e., gases, liquids and solids.

CHEM 112 General Chemistry II (3-2)4
(For GEOE, METE, MINE, PETE.GENE and CHE students) Discussion of physical properties of lutions, chemical kinetics, chemical equilibrium, chemical thermodynamics and electrochemistry.
Prerequisite: CHEM 101 or CHEM 105 or CHEM 111.

CHEM 200 Colloquium in Chemistry I (0-2)NC
A course to inform students about the nature of chemistry and chemistry education and to orientate students. The course is to be conducted in the form of seminars and conferences by the faculty and respected chemists from industry. Should be taken only one semester during the first two years.

CHEM 220 Organic Chemistry (3-2)4
(For CHE students)
Introduction to Organic Chemistry. A new mechanistic approach to the study of chemical reactions and survey of hydrocarbons, alcohols, esters, aldehydes, ketones, carboxylic acids (and their derivatives), amines. The course emphasizes the fundamental properties of organic compounds.
Prerequisite : CHEM 102 or CHEM 106 or CHEM 107 or CHEM 110 or CHEM 112.

CHEM 221 Analytical Chemistry I (4-0)4
(For CHEM and CHED students)
Fundamental principles and theories of analytical chemistry. Quantitative analysis by gravimetry. Aqueous solution chemistry. Theory of titrimetric methods of analysis, quantitative analysis by volumetry, data evaluation and statistical treatment.
Prerequisite: CHEM 102 or CHEM 106 or CHEM 107 or CHEM 112.

CHEM 223 Analytical Chemistry Laboratory I (0-6)3
(For CHEM and CHED students)
Gravimetric and volumetric methods of analysis, applications. Related projects.
Prerequisite or corequisite: CHEM 221

CHEM 229 Organic Chemistry for Engineers (3-2)4
An Introduction to Organic Chemistry. A new mechanistic approach to the study of chemical reactions and survey of hydrocarbons, alcohols, ethers, aromatic compounds, aldehydes and ketones, carboxylic acids and their derivatives, carbohydrates, amino acids and proteins. This course emphasizes fundamental properties of organic compounds.
Prerequisite: CHEM 102 or CHEM 106 or CHEM 107 or CHEM 112

CHEM 230 Analytical Chemistry for Engineers (3-2)4
Fundamentals and theories of analytical chemistry. Data evaluation, errors. Theory and applications of volumetry and electroanalytical chemistry,
Prerequisite: CHEM 102 or CHEM 106 or CHEM 107 or CHEM 112

CHEM 231 Organic Chemistry (3-4)5
(For Chem Students)
Introduction to Organic Chemistry. A new mechanistic approach to the study of chemical reactions and survey of hydrocarbons, alcohols, esters, aldehydes and ketones, carboxylic acids and their derivatives, amines, amino acids and proteins.
Prerequisite: CHEM 102 or CHEM 106 or CHEM 107 or CHEM 110 or CHEM 112

CHEM 233 Int. to Organic Chemistry (2-0)2
(For Chem Students)
An introduction to Organic Chemistry. A short summary of chemical bonds, Lewis structures, formal charge, resonance, atomic and molecular orbitals, hybridization of organic molecules and geometries. Representative carbon compounds: functional groups. Fundamental principles of Organic reactions. Nomenclature and conformational analysis of Alkanes. The course emphasizes Stereochemistry and ionic reactions i.e. nucleophilic substitution and elimination reactions.
Prerequisite: CHEM 106

CHEM 234 Organic Chemistry I (4-0)4
((For Chem Students)
Introduction to Organic Chemistry. A new mechanistic approach to the study of chemical reactions and a survey of Alkanes, Alkenes, Alkynes, Alcohol and Ethers. The course emphasizes Stereochemistry and fundamental properties of organic compounds.
Prerequisite: CHEM 220 or CHEM 229 or CHEM 231 or CHEM 233

CHEM 236 Organic Chemistry Lab. I (0-4)2

Applications of general organic chemistry laboratory techniques.
Prerequisite: CHEM 233
Prerequisite or co requisite: CHEM 234.

CHEM 252 Physical Chemistry I (4-0)4
This course is designed to provide the basic knowledge on thermodynamics and the first and the second laws of thermodynamics. The first part of this course covers material equilibrium, standard thermodynamics of reaction and reaction equilibrium. In the final part of the course, real gases, kinetic theory of gases and phase equilibria are discussed.

Prerequisites: PHYS 111 or PHYS 105 and CHEM 106 or CHEM 107 and CHEM 257 or MATH 219

CHEM 254 Physical Chemistry Laboratory (0-4)2
Experimental techniques related to the content of physical chemistry courses (Gases, Liquids, Colligative Properties, Phase Equilibria, Thermochemistry).
Prerequisites: CHEM 102 or CHEM 106 or CHEM 112, and CHEM 257.
Prerequisite or co requisite: CHEM 252.

CHEM 257 Mathematics for Chemists (4-0)4
Functions of single and multivariables, partial differential, Laxgrange multipliers. Newton-Raphson method. Numerical integration. First order differential equations of types exact, linear, homogenous, separable. Higher order differential equations with constant coefficients. Matrixes, and determinants. Set of linear equations. Emphasis on chemical problems.
Prerequisite: MATH 120 or MATH 152 or MATH 156.

CHEM 281 Fundamentals of Analytical and Inorganic Chemistry (3-0)3
This course is designed to give some basic concepts of analytical and inorganic chemistry. Chemical analysis, evaluation of data, gravimetry, volumetry, neutralization, precipitation, oxidation and reduction titrations, coordination chemistry, structure of solids, chemistry of metals and non-metals.
Prerequisite: CHEM 102 or CHEM 106 or CHEM 107 or CHEM 112.

CHEM 282 Fundamentals of Organic Chemistry (3-0)3
An introduction to organic chemistry. A new mechanistic approach to the study of chemical reactions and survey of hydrocarbons, alcohols, esters, aldehydes, ketones carboxylic acids and their derivatives; aromatic compounds, amines, aminoacids and proteins. The course also emphasizes fundamentals of biochemistry; enzymes, metabolic transformations, membrane structure and functions.
Prerequisite: CHEM 102 or CHEM 106 or CHEM 107 or CHEM 112.

CHEM 301 Organic Chemistry II (4-0)4
Detailed study of Aromatic Compounds, Aldehydes, Ketones, Carboxylic acids (and their derivatives), and amines. The course also introduces students to spectroscopic identification of organic compounds. Mechanistic approach is used throughout the course.
Prerequisite: CHEM 234 or CHEM 220 and consent of the department.

CHEM 303 Organic Chemistry Lab. II (0-6)3
Synthetic applications of organic laboratory techniques.
Prerequisite: CHEM 236.
Prerequisite or co requisite: CHEM 301.

CHEM 322 Analytical Chemistry II (4-0)4
(For CHEM and CHED students)
A course making students familiar with several instruments and instrumental techniques that are currently used in industry and in research laboratories. Electroanalytical, spectroscopic and chromatographic techniques.
Prerequisite: CHEM 221

CHEM 324 Analytical Chemistry Laboratory II (0-6)3
(For CHEM and CHED students)
Instrumental methods for chemical analysis. Experiments for principles and applications of atomic and molecular spectrometry, electroanalytical methods and chromatography.
Prerequisite: CHEM 223
Prerequisite or co requisite: CHEM 322.

CHEM 350 Quantum Chemistry (3-0)3
Particles and waves, principles of quantum mechanics, stationary states. Electronic structure of atoms and molecules. The chemical bond. Approximate methods. Vibrational, rotational and electronic transitions. Spectroscopy.
Prerequisites: PHYS 112 and CHEM 252, or PHYS 106 and CHEM 252 and consent of the department.

CHEM 353 Physical Chemistry II (4-0)4
This course covers an extensive application of physicochemical topics such as kinetics of elementary and complex reactions, molecular reaction dynamics, electrochemical systems and problems related to the topics.
Prerequisite: CHEM 252

CHEM 355 Physical Chemistry LaboratoryI (0-4)2
Experimental techniques related to the content of physical chemistry courses (Gases, liquids, chemical kinetics, thermochemistry, Electrochemistry).
Prerequisite: CHEM 254
Prerequisite or co requisite: CHEM 353.

CHEM 361 Inorganic Chemistry I (4-0)4
Atomic structure, periodic table, inorganic nomenclature, chemical bonds, molecular structure

and symmetry, covalent bond, molecular orbital theory, solid state, acids and bases. The course includes some demo experiments, model building and video shows.
Prerequisite: CHEM 252

CHEM 362 Inorganic Chemistry II (4-0)4
Coordination compounds, oxidation and reduction, systematic chemistry of the metals, hydrogen and its compounds, main group organometallic compounds, systematic chemistry of the nonmetals.
Prerequisite: CHEM 361

CHEM 364 Inorganic Chemistry Laboratory (0-4)2
Safety and basic techniques in inorganic chemistry laboratory, synthesis and characterization of some inorganic compounds. Structure and reactivity of some inorganic compounds.
Prerequisites: CHEM 361
Prerequisite or co requisite: CHEM 362

CHEM 400 Colloquium in Chemistry II (0-2)NC
A course to guide students about professional opportunities, issues and responsibilities; to inform about the recent advances in the field. Areas in chemistry research. The course is to be conducted in the form of seminars and conferences by the faculty and respected chemists from industry. Should be taken for only one semester during the last two years.
Prerequisite: CHEM 200.

CHEM 401 Summer Practice (0-2)NC
Six weeks of summer practice in industry after third year, under the guidance of the department.

CHEM 413 Biochemistry (3-0)3
A chemical approach to biochemistry. A study of the structures and functions of biomolecules, metabolism and bioenergetics, replication, transcription and translation processes with an emphasis on the chemical structures, transformations.
Prerequisite: CHEM 234

DESCRIPTION OF ELECTIVE COURSES

CHEM 343 Introduction to Polymer Science (3-0)3
Brief history of macromolecular science, some basic concepts of polymer science, polymers in nature, synthetic polymers, resins, blends and plastics, polymer composites, ceramics. Homo and block copolymers, branched and network polymers.
Prerequisite: Consent of the department.

CHEM 403 Industrial Chemistry I (4-0)4
Definitions of chemical plant production, economics of chemical productions, separation methods. Discussion of the properties and the production methods of basic chemicals.
Prerequisite: CHEM 221 and CHEM 234, or Consent of the department.

CHEM 404 Industrial Chemistry II (3-0)3
Discussion of basic organic chemicals, their properties industrial productions and their inter-relations with emphasis on the economic aspects of chemical production.
Prerequisites: CHEM 221 and CHEM 234, or Consent of the department

CHEM 406 Industrial Chemistry Laboratory (0-4)2
Experiments based on major industrial processes, operations and methods of analysis of industrial chemicals and materials.
Prerequisites: CHEM 221 and CHEM 234 or Consent of the department

CHEM 407 Organic Chemistry III (3-0)3
Detailed information on the chemistry of carbohydrates, lipids, amino acids, proteins and nucleic acids.
Prerequisite: CHEM 301 or Consent of the department

CHEM 408 Analytical Chemistry III (3-0)3
Topics in instrumental methods of analysis. IR and Raman spectrometry, atomic and molecular mass spectrometry, surface characterization techniques, atomic X-ray spectrometry and radiochemical analysis techniques.
Prerequisite: CHEM 322 or Consent of the department.

CHEM 412 Special Topics In Chemistry: Patents In Chemical Innovations (3-0)3

The courses are designed to deepen the students' knowledge in selected area of Chemistry. Contents may vary from year according to the interest of students and instructor in charge.

CHEM 414 Chemistry Of Metabolic Pathways (3-0)3

The course is designed as an extension to the Biochemistry course in the core curriculum of the Chemistry Program by focusing on chemical reactions involed in the fundamentals of metabolism and bioenergetics

CHEM 416 Artificial Enzymes (3-0)3

A study of synthetic molecules that mimic the actions of, or interact with the biomolecules. Using pertinent literature examples, design and synthesis of enzyme models, artificial enzymes, de novo designed proteins and molecular receptors will be discussed.

Prerequisite: CHEM 301 or Consent of the department.

CHEM 424 Analytical Separation Methods (3-0)3

A brief review of physical separation principles, solvent extraction, distillation. Theory and applications of GLC, HPLC and Ion Chromatography. Contemporary developments in chromatographic techniques.

Prerequisites: CHEM 322 or Consent of the department

CHEM 425 Atomic and Molecular Spectrometry (3-0)3

Instrumental systems and principles for chemical analysis of atoms and molecules using spectrometric techniques. Detailed studies in instrumental design, analytical parameters and applications.

Prerequisites: CHEM 322 or Consent of the department

CHEM 426 Chemometrics for Analytical Chemistry (3-0)3

Basic statistics for analytical chemistry. Principles of experimental design, factorial and fractional factorial designs. Response surface methodology.

Prerequisite: CHEM 324 or Consent of the department

CHEM 428 Inroduction to Bionalytical Sensors (3-0)3

A systematic and comprehensive introduction to the principle feactures of bionalytical sensors, their consruction and applications in a range of fields are discussed.

CHEM 429 Simulation Techniques in Theoretical Chemistry (2-2)3

Introduction to scientific computing. Simulation techniques in Theoretical Chemistry and Biology, such as Molecular Dynamics, Molecular Quantum Chemistry, protein folding and neural networks. Hands-on development of simple computational codes

Prerequisite: CHEM 257 or Consent of the instructor.

CHEM 431 Introduction to Crystallography (3-0)3

Lattice Structure, Symmetry of Crystals, Crystal Lattices and Space Groups, Properties of X-rays, Diffraction, Structure Determination by Powder Methods, Structure Determination by Single Crystal Methods.

Prerequisite: CHEM, or Consent of the department.

CHEM 432 Solid State Chemistry and Inorganic Materials (3-0)3

Solids, Bonding in Solids and Electronic Properties, Lattice Defects and Non-stoichiometry, Low Dimensional Solids, Zeolites, Optical Properties of Solids Magnetic Properties of Solids, Supercondictivity, Inorganic materials.

Prerequisite: CHEM 361 or Consent of the department.

CHEM 434 Selected Topics in Analytical Chemistry (3-0)3

A survey of selected topics dealing with experimental techniques and set-ups used in analytical chemistry.

Prerequisite: Consent of the the department.

CHEM 435 Bioorganic Chemistry (3-0)3

The important reactions in biological systems. The stereospecifity and the mechanism of reactions.

Prerequisite: CHEM 301 or Consent of the department.

CHEM 437 Inorganic Structural Chemistry (3-0)3

The course deals with the elucidation and description of the spatial order of atoms in a compound, describes the structural principles of inorganic molecules and solids using traditional concepts as well as modern approaches. Relations of structures and properties are also discussed.

Prerequisite: CHEM 361 or Consent of the department.

CHEM 438 Physical Methods in Inorganic Chemistry (3-0)3

General introduction to Spectroscopy, Electron absorption spectroscopy, Infrared Spectroscopy, Nuclear Magnetic Resonance Spectroscopy, Electron Paramagnetic Resonance Spectroscopy, Mössbauer Spectroscopy, X-Ray Diffractions.

Prerequisite: CHEM 361 or Consent of the department.

CHEM 439 Molecular Spectroscopy and Photochemistry (3-0)3
A short summary of quantum mechanics, molecular symmetry and group theory, rotational, vibrational and electronic spectroscopies, photoelectron and related spectroscopies, photochemistry, lasers and laser spectroscopy.
Prerequisite: CHEM 252 or Consent of the department.

CHEM 440 Chemistry of Nutrition I (3-0)3
This course is designed to give insights into chemistry of carbohydrates, lipids and proteins, fat and water
soluble vitamins and minerals in human nutrition. Deficiencies, requirements, sources, toxicities (if any) of these nutrients together with their interactions will be covered.

CHEM 441 Reaction Mechanisms in Organic Chemistry (3-0)3
Course is designed to show how basic principles of organic chemistry work out in explaining the variation of reactivity with structure , the occurrence of electrophiles, nucleophiles and radicals and their behaviour in the fundamental reactions of organic chemistry such as substitution, addition, elimination and rearrangement.
Prerequisites: CHEM 301

CHEM 442 Industrial Chemical Calculations (3-0)3
Units, dimensions and their conversions, review of selected topics to stoichiometric calculations, material balances, energy balances, combined material and energy balances.
Prerequisite: Consent of the department.

CHEM 443 Environmental Organic Chemistry (3-0)3
Physical and chemical properties of organic pollutants direct and indirect effect to the environment and sources of the pollutions.
Prerequisite: Consent of the department

CHEM 444 The Chemistry of Dyes and Pigments (3-0)3
Detailed information on the dyes and pigments of organic and inorganic nature.
Prerequisite: CHEM 301.

CHEM 445 Chemical Kinetics (3-0)3
In this course, the presentation of important facts and their theories relating to the rates with which chemical reactions occur, the differential and integrated forms of rate laws and the methods of experimental determinations will be outlined. The mechanisms of elementary and complex reactions will be discussed and the theories of reaction rates will be comparatively studied.
Prerequisite: CHEM 353

CHEM 446 Statistical Thermodynamics (3-0)3
Basic concepts of statistical mechanics and thermodynamics. Foundations of molecular thermodynamics. Molecular and assembly partition functions. Maxwell-Boltzmann distribution. Chemical equilibrium. Transition state theory.
Prerequisite: CHEM 252

CHEM 447 Surface Chemistry (3-0)3
Thermodynamics of interfaces, Laplace and Kelvin Equations, surface films on liquids, adsorption of gases on solids. Electrical double layer, double layer interaction and particle coagulation, stabilization and coagulation of suspensions. Emulsion stability and microemulsions.
Prerequisite: CHEM 221 and CHEM 234 or Consent of the department

CHEM 448 Heterocyclic Chemistry (3-0)3
The relationship between structure and chemical and physical properties of pi-deficient and pi-excessive heterocyclic compounds. The synthesis of heterocyclic compounds are briefly discussed.
Prerequisite: CHEM 221 and CHEM 234 or Consent of the department

CHEM 449 Electrochemistry (3-0)3
This course covers cells, types of reversible electrodes, thermodynamics of galvanic cells, standard electrode potentials, classification of galvanic cells liquid junction potentials, emf measurements, membrane equilibrium, electrode kinetics and electrical double layer.
Prerequisite: CHEM 353 or Consent of the department

CHEM 450 Electrochemistry Applications in Devices (3-0)3
Electro-reduction and oxidation mechanisms of various compounds, principles and applications of polarography, cyclic voltammetry, chrono voltammetry and similar techniques along with metal coating and corrosion are among the subjects covered in this course. Applications of these techniques in polymer chemistry and synthesis and characterization of conducting polymers.
Prerequisite: Consent of the department.

CHEM 451 Introduction to Quantum Chemistry (3-0)3
Particles and waves, stationary states. Electronic structure of atoms and molecules. The approximate methods. Spectroscopy chemical bond.

Prerequisite: CHEM 353 or Consent of the department

CHEM 452 Nuclear Analytical Techniques (3-0)3
Introduction to Nuclear sciences. Radioactive decay. Interaction of radiation with matter. Radiation detection and measurement. Radio analytical techniques and applications. Nuclear analysis techniques in medicine, geology and archeology.
Prerequisite: Consent of the department

CHEM 453 Environmental Chemistry (3-0)3
Chemical problems related to environment. Energy balance of the earth, ozone in the stratosphere, micro meteorology, acid deposition, greenhouse effect, photochemical smog and particles in the environment.
Prerequisite: CHEM 221 or Consent of the department

CHEM 455 Polymer Chemistry I (3-0)3
A comprehensive course in high polymer chemistry. Polymer chains and characterization methods. Statistics and kinetics of polymerization reaction. Structure and property relations of bulk polymers. Properties of commercial polymers.
Prerequisite: CHEM 353 or Consent of the department.

CHEM 456 Polymer Chemistry II (3-0)3
Introductory information about polymer characterization in solution and in bulk. Polymer conformation and configuration, polymer solutions, molecular weight determinations, thermal, mechanical, physical properties, polymer crystallization, morphology in solid state, polymer structure - property relations.
Prerequisite: CHEM 252 or Consent of the department

CHEM 457 Organic Chemistry of Some Biologically Active Compounds (3-0)3
The course is designed to enable students to adopt a more critical outlook towards organic synthesis. Certain fundamental chemical reactions leading to molecules with biological or synthetic significance are reviewed. Some of the classes of compounds studied: steroids, alkaloids, postglandines, B-lactams, tetracyclines. Certain aspects of the pharmaceutical industry including that of Turkey is surveyed.
Prerequisite: CHEM 301 or Consent of the department

CHEM 459 Principles of Solution and Solubility (3-0)3
Regular and near regular solutions are thermodynamically analyzed and their structures are discussed. This treatment is extended to the representative systems, with the aim of estimating (or calculating) the solubilities.
Prerequisite: Consent of the department.

CHEM 460 Advanced Organic Chemistry Laboratory (1-2)2
The synthesis of some heterocyclic compounds and their spectroscopic and chromatographic analysis.
Prerequisite: Consent of the department.

CHEM 461 Chemical Industries in Turkey (3-0)3
Basic information about the economic conditions and laws affecting the chemical industries which the students are likely to encounter in their professional life. Place of the main Turkish chemical industries are analyzed in the framework of the five year development plans. Surveys of main chemical industries in Turkey are prepared by the students.
Prerequisite: CHEM 221 or
Consent of the department

CHEM 464 Sustainable Living and Green Chemıstry (3-0)3
Sustainability with its four dimensions; ecological, economic, social and cultural/worldview. Green Chemistry, resources waste, soil, food, energy, problems, alternatives and solutions.

CHEM 465 Polymer Technology and Related Industries (3-0)3
Structure-Property relations of commercially important polymers. Manufacturing and processing of natural synthetic fibers, rubbers and plastics. The basic industrial organic chemistry of monomer and polymer synthesis. The industrial chemistry of paints, varnishes and lacquers.

CHEM 466 Chemical and Spectroscopic Techniques for Biological Macromolecules (3-0)3
This course covers theory and applications of selected chemical and spectroscopic techniques which are necessary for the study of biochemical systems. Absorption, circular dichroism, luminescence and polarization, NMR, ultra-centrifugation, viscometry, electrophoresis, x-ray scattering and diffraction techniques.
Prerequisite: Consent of the department.

CHEM 468 Polymeric Materials (3-0)3
Introduction to polymer science and classification of polymers. Basic of polymerization reactions and synthesis of polymers. Chemical and physical structure of polymers and their characteristics. Thermal and mechanical properties of polymers. Other physical properties and chemical resistance of polymers. Commodity plastics and rubbers. Engineering polymers and advanced polymer technologies.
Prerequisite: Consent of the department.

CHEM 469 Introduction to Medicinal Chemistry (3-0)3
This course focuses on how theory and technique are used as tools to understand the behaviors and properties of biological macromolecules. Thermodynamics and kinetics of conformational changes and ligand interactions.
Prerequisite: CHEM 220 or CHEM 229 or CHEM 231 or CHEM 234.

CHEM 471 Spectroscopic Methods in Organic Chemistry (3-0)3
Analysis of organic molecular structures by the use of modern spectroscopic and spectrometric methods of UV, IR, mass, and NMR.
Prerequisite: CHEM 234 or Consent of the department.

CHEM 472 Spectroscopic Methods In Chemistry (3-0)3
Structure elucidation of compounds by the use of modern spectroscopic and spectrometric methods.
Prerequisites: CHEM 221 and CHEM 234 or Consent of the department.

CHEM 473 Polymer Rheology and Processing (3-0)3
This course covers the rheology and processing of polymers utilized in our daily life. Elastic, viscous and viscoelastic behavior of polymers, deformation in polymers and related testing methods are discussed. A comparison between common commodity polymers and advanced polymers is also considered.
Prerequisite: CHEM 455.

CHEM 476 Polymer Materials Science (3-0)3
In this course, properties of polymer materials are discussed with a certain depth by stressing on the structure and property relationships. The viscoelastic properties of polymers are reviewed by use of available theories and their significance in polymer properties are discussed.
Prerequisite: CHEM 455.

CHEM 477 Non Equilibrium Plasma Chemistry and Plasma Applications (3-0)3
Equilibrium and non equilibrium plasma, theoretical background of plasma chemistry, kinetics and mechanism of plasma reactions, review of recent advances in plasma polymerization. Plasma polymerizations of hydrocarbons, fluorocarbons and organometallic compounds. Applications of plasma polymerization.
Prerequisite: Consent of the department.

CHEM 478 Polymer Composites (3-0)3
In this course, a very important class of materials known as composites are discussed. Polymer composites containing certain fillers, polymer blends and polymer foams are covered in the course emphasizing on the related equations connecting filler characteristics with various mechanical, physical and other properties
Prerequisite: Consent of the department.

CHEM 481 Advanced Inorganic Chemistry (3-0)3
Electronic spectra of complexes, Reaction Mechanism of d-Block Complexes, d-and-f- Block Organometallic Compounds, Catalysis.
Prerequisite: CHEM 362.

CHEM 483 Introduction to Surface and Colloid Chemistry (3-0)3
Basic terms in surface and colloid chemistry, the kinetic properties of disperse systems, interfacial phenomena, the optical and electrical properties of colloids, the preparation and stability of colloids, properties of gels, emulsions, foams and aerosols.
Prerequisite: CHEM 221 and CHEM 252 or Consent of the department.

CHEM 484 Polymer Solutions (3-0)3
In this course, the principles of solubility, solvation and association of polymers and swelling properties of gels are outlined. Basic principles of polymer solution thermodynamics, phase equilibria in polymer solutions and polymer solution viscosities are studied.
Prerequisite: Consent of the department.

CHEM 485 Physıcs and Chemıstry of Surfaces and Organıc Thın Fılms (2-2)3
Surface structure: Two-dimensional real and reciprocal lattices, Miller indices, notation for surface structures. Surface thermodynamics. Surface dynamics; vivrations, adsorption, desorption,diffusion. Surface chemical bonding and catalysis. Surface analytical techniques: scattering, spectroscopy,microscopy. Organıc thin

films:preparation, characterization and applications of thiol and silane SAMs.

CHEM 486 Polymeric Building Materials (3-0)3

A brief review of polymers, their synthesis and properties. Detailed information about polymers in Composites, concrete composites, foams, adhesives and sealants, solar energy conservation, roofing and flooring and polymer degradation.
Prerequisite: Consent of the department.

CHEM 489 Computational Chemistry (2-2)3

The course will cover theoretical methods of current use in computational chemistry, ranging from wave function methods to density functional theory and response theory methods. Laboratory sessions will involve hands-on practice with popular quantum chemistry software.
Prerequisite: CHEM 350 or PHYS 300

CHEM 490 Use of Computers in Chemistry I (3-2)4

Discussions of on-line and off-line applications of computers in chemistry. Basic rules of FORTRAN IV. Algorithmic problem solving.
Prerequisite: Consent of the department.

CHEM 491 Developments of Chemistry I (3-0)3

Chemical apparatus techniques and chemicals used for dying and tanning in Mesopotamia since 4000 B.C. are explained. Precious metals such as gold, silver and imitations of precious stones handled by Mesopotamian and Egyptian chemists are examined. The influence of Greek philosophers an experimental chemistry practiced in Mesopotamia and Egypt are discussed.
Prerequisite: Consent of the department.

CHEM 492 Developments of Chemistry II (3-0)3

An introduction to modern Chemistry since alchemy is made. The role of late alchemists and development of organic and inorganic chemistry are discussed. Historical development of electrochemistry, thermodynamics, chemical kinetics, polymer chemistry, chemistry of photographic emulsions, rocket propellants and nuclear chemistry are examined. The history of some basic laws of chemistry is examined.
Prerequisite: Consent of the department.

CHEM 493 Use of Computers in Chemistry II (3-2)4

Programming in PASCAL; transfer of data PASCAL
into windows environment. Graphics; applications in various fields of chemistry.
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CHEM 495 Chemistry in Popular Culture (3-0)3

Review of the chemical facts which are used in popular media. A summary of chemistry in daily life, from medicines to toxic compounds, explosives, anesthetics and daily products etc.
Prerequisite: Chem 301 or Consent of the department.

CHEM 499 Undergraduate Research (1-4)3

This course is intended to improve the research capabilities of graduating students. Each student will be project and an academic advisor; lectures will be given on research design, data evaluation and report writing. A final report and/or a seminar is required at the end of the semester.
Prerequisite: Consent of the department.

GRADUATE PROGRAMS AT THE DEPARTMENT OF CHEMISTRY

The University requirements for the M.S. and Ph.D. degrees are described in Academic Rules and Regulations (Graduate Programs) of this Catalog.

AIMS AND OBJECTIVE OF GRADUATE PROGRAM: To educate research chemists capable of applying known methods and techniques and developing new ones for the purpose of solving problems in basic and applied topics of Analytical, Inorganic, Organic, Physical, Polymer chemistry and Biochemistry.

Our M.S. and Ph.D. graduates have career opportunities in academia and research and development laboratories in chemical, pulp and paper etc. industries; biomedical and medical laboratories; sales and technical service departments of scientific instrument and chemical companies.

The Chemistry Department offers research opportunities in almost all fields of Chemistry supported by a large and experienced faculty. The department, as one of the foremost research centers of our country, takes pride in the quality of its graduates.

GRADUATE CURRICULUM

M.S. in Chemistry

CHEM	500	M.S. Thesis	NC
CHEM	501	Seminar in Chemistry I	(0-2)NC
CHEM	502	Seminar in Chemistry II	(0-2)NC

5 elective courses
2 must courses*

*Two of the following courses

CHEM	591	Advanced Topics in Organic Chemistry	(3-0)3
CHEM	592	Advanced Chemical Perspectives in Biochemistry	(3-0)3
CHEM	593	Advanced Topics in Analytical Chemistry	(3-0)3
CHEM	595	Advanced Topics in Inorganic Chemistry	(3-0)3
CHEM	597	Advanced Topics in Physical Chemistry	(3-0)3

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. in Chemistry
If admitted by M.S. degree

CHEM	600	Ph.D. Thesis	NC
CHEM	601	Seminar in Chemistry III	(0-2)NC
CHEM	602	Seminar in Chemistry IV	(0-2)NC

5 Elective courses
2 must courses*

*Two of the following courses

CHEM	591	Advanced Topics in Organic Chemistry	(3-0)3
CHEM	592	Advanced Chemical Perspectives in Biochemistry	(3-0)3
CHEM	593	Advanced Topics in Analytical Chemistry	(3-0)3
CHEM	595	Advanced Topics in Inorganic Chemistry	(3-0)3
CHEM	597	Advanced Topics in Physical Chemistry	(3-0)3

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. in Chemistry
If admitted by B.S. degree

CHEM	600	Ph.D. Thesis	NC
CHEM	501	Seminar in Chemistry I	(0-2)NC
CHEM	502	Seminar in Chemistry II	(0-2)NC
CHEM	601	Seminar in Chemistry III	(0-2)NC
CHEM	602	Seminar in Chemistry IV	(0-2)NC

10 Elective courses
4 must courses*

*Four of the following courses

CHEM	591	Advanced Topics in Organic Chemistry	(3-0)3
CHEM	592	Advanced Chemical Perspectives in Biochemistry	(3-0)3
CHEM	593	Advanced Topics in Analytical Chemistry	(3-0)3
CHEM	595	Advanced Topics in Inorganic Chemistry	(3-0)3
CHEM	597	Advanced Topics in Physical Chemistry	(3-0)3

Total minimum credit: 42
Number of courses with credit (min): 14

DESCRIPTION OF GRADUATE COURSES

CHEM 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

CHEM 501 Seminar in Chemistry I (0-2)NC
This seminar consists of meetings among the department staff, invited guests and graduate students to discuss recent developments in Chemistry.

CHEM 502 Seminar in Chemistry II (0-2)NC
A continuation of CHEM 501.

CHEM 503 Chemical Kinetics (3-0)3
Analysis of kinetic results, mechanism of elementary processes, theories of chemical kinetics gas-phase reactions, reactions in solution, reactions on surface and in the solid state. Some complex and fast reactions.

CHEM 504 Chemistry of Optoelectronic Systems (3-0)3
Organıc molecules and polymers, Conjugated Polymers, synthesis ,optical and electrical properties, Applications of conjugated systems: solar cells, light emitting diodes,electrochromic devices and transistors. Some of the characterization technigues for morphology (such as AFM,TEM,XRD, etc.)

CHEM 507 Nuclear Chemistry (3-0)3
The atomic nuclei, atomic structure and composition of nuclei, nuclear systematics. Nuclear masses and stability, angular momentum of nucleus. Radioactive decay and growth. Radioactive decay processes. The structure of nuclei. Nuclear reaction, Center of mass system, Direct interaction, Compound nucleus formation. Fission, charge and mass distribution.

CHEM 509 Statistical Thermodynamics (3-0)3
A course designed for physical chemists introducing the basic methods of statistical mechanics and their application to thermodynamic systems.

CHEM 511 Radiation Chemistry (3-0)3
Interaction of radiation with matter, ions, excited states, radicals, radiation chemistry of water and aqueous solutions. Radiation chemistry of some chemical systems. Applications.

CHEM 512 Degradation and Stabilization of Polymers (3-0)3
The concept of polymer degradation is discussed. The types of degradation and the resultant chemical changes in the polymer are reviewed. The stabilization of polymers against these undesirable deteriorating effects and some industrial problems of degradation and stabilization are discussed.

CHEM 515 Physical Organic Chemistry (3-0)3
Molecular properties. Free energy and entropy. Acids and bases, Hammet equation. Catalysis. Free energy relationships. Isotope effects. Solvent effects. Molecular structure and chemical reactivity.
Prerequisite : Consent of the Department.

CHEM 517 Colloid and Surface Chemistry of Soil (3-0)3
Disperse systems, their description and basic mechanical behavior, soil minerals, basic silicate structures and clay minerals, clay suspensions: electrical double layer theories, solid-liquid, solid-gas, solid-solid interfaces. Chemical soil stabilization. Laboratory work consist of related experiments.

CHEM 518 Coordination and Catalysis (3-0)3
A review of structures and properties of coordination compounds. The use of organotransition metal complexes to catalyze the conversion of unsaturated substance into alcohols, ketones, carboxylic acids, aldehydes, polymers, etc. Discussions of reaction mechanism of catalytic isomerization, hydrogenation, hydroformylation addition, substitution, metathesis reaction, activation of oxygen and nitrogen, and their importance in industry.

CHEM 520 Nuclear Magnetic Resonance II (3-0)3
Basic theory of NMR, macroscopic treatment, NMR in laboratory and rotating frames, NMR signal, resolution and sensitivity, NMR instrumentation, NMR parameters, proton NMR, chemical shift, Spin-spin coupling, Analysis of complex spin systems.

CHEM 522 Molecular Orbital Theory (3-0)3
Determination of atomic and molecular structure, wavefunction for simple atoms. MO and VB theories, approximate methods for obtaining molecular properties with comparison to the experimental observations.
Prerequisite : Consent of the department.

CHEM 524 High Resolution NMR (3-0)3
Principles of pulsed NMR, Fourier Transformation spectrum accumulation, double-resonance techniques, data handling, ^{13}C-NMR spectroscopy, Multiple pulse methods, INEPT and DEPT, spectrum editing, two dimensional NMR, dynamic NMR, NMR in solid state.

CHEM 525 Mass Spectroscopy (3-0)3
Basic principles of mass spectroscopy. Ionization and fragmentation processes, their thermochemical aspects. Mass spectrometers: vacuum instruments, ion sources, mass analyzers, detectors. Applications in analytical, organic, physical and polymer chemistry.

CHEM 526 Properties and Structure of Ionomers (3-0)3
Preparation of the ion-containing polymers and various methods for characterization of their structures. Survey of relaxation behaviour, viscoelastic, rheological, optical and thermal properties of ionomers. Discussions of new ionomer systems.

CHEM 528 Polymer Molecular Weights (3-0)3
Fundamental concepts on the various molecular weights of polymers and their distributions. Fractionation and their procedures, membrane osmometry, end group determination, light scattering from solutions, viscometric methods, ultracentrifuge sedimentation method and various methods for the determination of molecular weights of linear polymers related with their physical properties.

CHEM 529 Organic Stereochemistry (3-0)3
Basic concepts of stereochemistry. Resolution of racemic forms, preparation of streoisomers, asymmetric synthesis, chiroptical methods in structure elucidation.

CHEM 531 Reactive Intermediates I (3-0)3
Carbonise: structure and reactivity, generation of carbones, cycloaddition reactions of carbones, insertion and rearrangement, synthetic application. Nitrenes: generation insertions of nitrenes and rearrangement and synthetic application. Singlet oxygen: generation, reaction of singlet oxygen, chemistry of bicyclic endoperoxides. Consent of the department reaction mechanism in organic chemistry is strongly recommended.

CHEM 532 Chemistry of Nutrition (3-0)3
The Chemistry, functions, deficiencies, recommended intakes, toxicities, if any, and sources of carbonhydrates, lipids, proteins, water soluble B and C vitamins, a soluble A, D, E, K vitamins, major minerals e, g, Na, K, Ca, P and trace minerals e, g, Zn, Fe, Se, Cr, I, Cu, Mn and others in human nutrition.

CHEM 533 Organometallic Chemistry (3-0)3
A detailed study of structures, properties, characterization, synthesis and reactions of organometallic compounds as well as their applications to organic synthesis and homogeneous catalysis. Discussion of oxidative addition, reductive elimination, insertion, elimination, ligand substitution reactions, nucleophilic and electrophilic addition and abstraction. The main objective of the course is to show how organometallic chemistry has responded to the challenge of synthesizing novel organic chemicals for research and industry.

CHEM 534 Reactive Intermediates II (3-0)3
Strained Compounds: Arynes, cycloalkynes and cycloallenes, Bridgehead double bonds, tetrahedrane, benzene isomers. Radicals: Structure, generation and reactivity, decomposition mechanism of radicals. Carbocations: Generation, reactivity, rearrangement, synthetic application. Carbonions: Structure, reactivity, rearrangement. Consent of the department Reaction Mechanism in Organic Chemistry is Strongly recommended.

CHEM 535 Computer Simulation of Molecular Motion (3-0)3
Basic concepts of classical mechanics, basic principles of quantum mechanics, correspondence principle, linear dynamics, basic principles of statistical mechanics, electronic states, Born-Oppenheimer approximation, Hartree-Fock methods, population analysis, principles of molecular dynamics, semi-empirical and ab-initio methods in quantum chemistry.

CHEM 537 Organic Chemistry of Macromolecules (3-0)3
Discussion of chemistry of monomer and polymer formations. Stereochemistry of polymer structure and forces of stereoregulation. Step-growth and chain-growth polymerization reactions. Homogenous and heterogenous catalysis of polymerizations. Degradation reactions of polymers.

CHEM 539 Mechanical and Viscoelastic Properties of Polymers (3-0)3
Survey of mechanical and rheological properties of polymers, with particular emphasis on relation between molecular structure and mechanical behavior. Fundamentals of elasticity and flow

technological aspects of mechanical behaviour of high polymers.
Prerequisite : Consent of department.

CHEM 540 Group Theory and Its Chemical Applications (3-0)3
The course consists of two parts. In the first, principles, definitions and theorems of group theory, molecular symmetry, representations of groups, group theory and quantum mechanics; in the second part, applications; symmetry aspects of molecular orbital theory, ligand field theory. VIS and UV spectra of transition metal complexes, metalligand bonding, molecular vibrations, and symmetry rules are considered.

CHEM 541 Advanced Topics in Polymer Chemistry (3-0)3
New and recent polymers, composites, their properties and application area.

CHEM 542 X-Ray Analysis (3-0)3
Production and properties of X-rays. Geometry of crystals, symmetry operations, point and space groups. Theory of X-ray diffraction, powder and single crystal diffraction patterns. Determination of crystal structures and unit cell dimensions. Fourier transform Rietveld analysis. Analysis by X-ray diffraction and fluorescence methods.

CHEM 543 Physical Chemistry of Macromolecules in Solution(3-0)3
Molecular weight distribution in linear and nonlinear chains. Configuration and conformation of chain molecules. Thermodynamics of macromolecular solutions. Phase equilibria in polymer systems. Frictional properties of dissolved macromolecules. Survey of recent theories for characterization of macromolecules in dilute solutions with special emphasis on the related experimental methods.

CHEM 544 Solid State Chemistry (3-0)3
Classification of solids, lattice energies of ionic crystals, further refinements in lattice energies. Experimental investigation of lattice defects. Nonstoichiomety; structural and thermodynamic aspects. Diffusion and structural transformation in solids. Reactions of solids. Preparation of materials.

CHEM 545 Polymer Science and Technology (2-2)3
The objective of the course is to introduce methods encountered in the manufacture of industrial polymers together with the analysis, quality control, characterization (rheological and chemicals) and processing of such polymers. The course is supplemented with laboratory work.
Prerequisite : Consent of the department.

CHEM 546 Atomic Spectrometry (3-0)3
Fundamentals of atomic spectrometry and signal generation. Novel optical and instrumental designs. Atomic absorption spectrometry, flame, furnace, platinum loop, tungsten wire atomizers, vapour generation techniques, atom trapping systems. Inductively coupled plasma atomic emission spectrometry and mass spectrometry. Electrothermal vaporization techniques. Flow injection and other automated systems in atomic spectrometry.

CHEM 547 Chemical Sensors (3-0)3
Contemporary trends in analytical chemistry. Analytical figures of merit; selectivity, sensitivity and detection limits. Chemical sensors based on fiber optic spectrometry, electrochemistry and acoustic interactions.

CHEM 548 Physical Chemistry of Interfaces (3-0)3
Viscous behaviour of dispersion, diffusion and sedimentation of colloidal particles, surface tension, contact angle and wetting, experimental methods, adsorption from solution, electrical properties of colloids, stability of dispersion, thin films, hydrodynamical effects and colloidal stability.

CHEM 549 Total Synthesis of Natural Compounds (3-0)3
Recent publications about the total synthesis of natural compounds, their backgrounds and biological activities. Synthetic strategies (retrosynthetic analysis), methods, reagents and experimental conditions in the synthesis of these compounds. Introduction of the logic of total synthesis and the rationale for the invention and the use of important synthetic methods used in organic chemistry.

CHEM 550 Organic Electrochemistry (3-0)3
A review of electrochemical principles and advanced techniques, electron transfer mechanisms, oxidation and reduction of organic compounds in electrochemical synthesis. Initiation of polymerization via electrochemical methods; analysis and characterization of electrochemically obtained polymers and copolymers. Chromatographic technique in the computation of reactivity ratios of the copolymers.

CHEM 551 Enzymatic Reaction Mechanisms (3-0)3
A detailed study of the chemical basis of the enzyme action. Discussions of the theories of

enzyme action. Reaction mechanisms of selected groups of enzymatic transformations. The main objective of the course is to open the black box that has presented the enzyme, and then display and study the fascinating organic chemistry at the core of its actions. (F)

CHEM 553 Electronics in Chemistry I (2-2)3

Definition of AC-DC, power, transformers; resistive, capacitive networks; diodes, rectification; power supply, AC-DC conversion; transducers; transistors; amplifiers; OP-AMP's and applications; filters; fault finding.
Prerequisite: Consent of department.

CHEM 554 Electronics in Chemistry II (2-2)3

Basic digital circuits; data handling logic circuits; interfacing of computers to various instruments; machine code programming and assembler language; data acquisition under computer control.

CHEM 555 Molecular Spectroscopy I (3-0)3

A short summary of quantum mechanics, rotational spectra of molecules, rotation-vibration spectra of molecules, absorption and emission of radiation by molecules, molecular symmetry and group theory, electronic spectra of molecules.

CHEM 557 Advanced Chromatography (3-0)3

A brief review of physical separation principles, solvent extraction, distillation. Theory and applications of GLC, HPLC, IC and CZE (The most recent advances in chromatographic sciences with reference to current literature) Ion Chromatography. Contemporary developments in separation techniques; solid-phase extraction and microseparations in LC and CZE.

CHEM 560 Inorganic Reaction Mechanisms (3-0)3

After a brief review of the present theories which account for metal-ligand bonding, the mechanisms of inorganic reactions in solution are studied under the following subtitles, 1) Ligand substitution reactions of square-planar, tetrahedral and octahedral transition metal complexes, 2) Electron transfer reaction, 3) Oxidative addition reactions. 4) Catalysis reactions.

CHEM 562 Inorganic Photochemistry (3-0)3

Introduction to excited states (ES), ES lifetimes and reactions. Techniques in continuous and flash photoloysis. Kinetic of photophysical processes. Charge transfer photochemistry. Substitutional Photochemistry of First Row and Heavier Transition Elements. Photochemistry of Carbonyl Complexes. Type of laser used in TRO and TRIR techniques.

CHEM 564 Structure and Morphology of Macromolecules (3-0)3

Molecular structure of macromolecules. Types of macromolecules with respect to crystal structure. Crystallization of polymeric compounds. Morphology of polymers. Degree of crystallinity in polymers. Optical properties of polymeric materials. Macrostructure from small-angle x-ray scattering. Microstructure from wide-angle x-ray diffraction.

CHEM 565 Fiber Science and Technology (3-0)3

Properties of Polymers used for fiber formation, Properties and classification of fibers, methods of spinning fibres and characterization, Melt spinning technologies are discussed.

CHEM 568 Biomedical Materials (3-0)3

Classification, and characterization of materials which are used in biomedical area. Metals, metal alloys, ceramics, polymers and their structure-property relationships. Tissue and blood response to implants and their tests.

CHEM 571 Block and Graft Copolymers (3-0)3

Preparation of block copolymers by living anionic polymerization, free radical polymerization, cationic polymerization, stepgrowth polymerization and other techniques. Characterization of block copolymers. Mechanical and thermal properties. Synthesis and properties of graft copolymers.

CHEM 574 Inorganic Polymers (3-0)3

Definition and special characteristics of inorganic polymers. Preparation and structure of two, three, three-four and greater than four network polymers. Polyphosphates, ultraphosphates, borophosphate, boron nitride, polymeric sulfur nitride, silicate glasses, borosilicate glasses, glass ceramics. Applications of inorganic polymers in technology.

CHEM 589 Experimental Techniques in Atmospheric Chemistry (3-0)3

Sampling and analysis techniques used in atmospheric research. Overview of natural and polluted environments, experimental kinetics, mechanics and spectroscopic techniques, monitoring techniques for gaseous criteria pollutants, environmental chambers, sampling and collection of gaseous pollutants and atmospheric particulate matter, determination of sizes of particles, determination of chemical composition.
Prerequisite: Consent of the department.

CHEM 591 Advanced Topics in Organic Chemistry (3-0)3
Basic and some advanced topics of organic chemistry, reaction mechanisms and molecular orbital theory.

CHEM 592 Advanced Chemical Perspectives in Biochemistry (3-0)3
Review of selected Biochemistry topics at an advance level with a chemical perspective. Physical interactions that determine the properties of proteins, conformational properties of polypeptide chains, proteins in solution and in membranes. An advanced treatise on the photosynthesis and electron transport chain.

CHEM 593 Advanced Topics in Analytical Chemistry (3-0)3
This is one of the three courses should be taken by first year graduate students working in the area of Analytical Chemistry. Chemical Equilibrium, Statistical methods in Analytical Chemistry, Advance instrumentation one the main subject.

CHEM 595 Advanced Topics in Inorganic Chemistry (3-0)3
Review of undergraduate inorganic topics at advanced level. After a short summary of atomic and molecular structure, MO orbitals of polyatomic molecular, MO theory and band theory of solids, bonding and electronic structure of coordination compounds and structures and synthesis of organometallic compounds will be discussion.

CHEM 597 Advanced Topics in Physical Chemistry (3-0)3
Basic principles of statistical thermodynamics, quantum chemistry, photochemistry and some other advanced topics of physical chemistry.

CHEM 598 Basic Concepts in Physical Chemistry (3-0)3
Basic concepts of Physical Chemistry. The origins of basic principles, universally accepted equations and the assumptions made in text-books. Logical explanations for the observations made in nature by basic laws of Physical Chemistry. Industrial applications of thermodynamics, kinetics, phase diagrams, electrolysis, radioactivity, etc.

CHEM 599 Frontier Molecular Orbital Theory of Organic Chemistry (3-0)3
a) M.O. Theory and frontier molecular orbitals,b) Frontier molecular orbitals and the chemical reactivity, c) HSAB principle, d) Primary and secondary orbital interactions, e) Regioselectivity, periselectivity, stereoselectivity and FMO theory, f) Applications.

CHEM 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their third semester while the research program or write-up of thesis is in progress.

CHEM 601 Seminar in Chemistry III (0-2)NC
This seminar consists of meetings among the department staff, invited guests and graduate students to discuss recent developments in Chemistry.

CHEM 602 Seminar in Chemistry IV (0-2)NC
A continuation of CHEM 601.

CHEM 7XX Special Topics in Chemistry (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include contemporary developments in Analytical, Inorganic, Organic and Physical Chemistry.

CHEM 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member normally his/her advisor.

CHEM 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

DEPARTMENT OF HISTORY

PROFESSORS

BOZTEMUR, Recep: B.A., Ankara University; M.S., METU; Ph.D., University of Utah.
SOYKUT, Mustafa: B.A., M.A., Bilkent University; Ph.D., University of Hamburg.
TURAN, Ömer ***(Department Chair)***: B.A., Ankara University; M.A., Ph.D., Catholic University of Leuven.

ASSOCIATE PROFESSORS

ERGUT, Ferdan: B.S., METU; M.A., Ph.D., New School for Social Research.
ORBAY, Kayhan: B.A., M.A., Ankara University, Ph.D., University of Vienna.
ŞEKER, Nesim: B.A., M.A., Ph.D., METU.

ASSISTANT PROFESSORS

ÇELİK, Birten: B.A., METU; M.A., Ph.D., Dokuz Eylül University.
DURSUN, Selçuk: B.A. METU; M.A., Ph.D., Sabancı University.
GÜRSEL, Bahar: B.A., Hacettepe University; M.A., Ph.D., Bilkent University.
TÜLÜVELİ, Güçlü: B.A., METU; M.A., Boğaziçi University; Ph.D., University of Birmingham.

LECTURERS

DIETRICH, Richard **(*Vice Chair*)**: B.A., University of Colorado-Denver; M.A., Cornell University and Ankara University; Ph.D., Ankara University.
ZORLU, Ş. Akile **(*Vice Chair*)**: B.A., Boğaziçi University; M.A., Bilkent University; Ph.D., University of Wisconsin-Madison

INSTRUCTORS

ÇELEBİOĞLU, Nedret: B.A., Ankara University; M.A., Hacettepe University.
KARAGEDİKLİ, Gürer: B.S. Gazi University; M.A., Bilkent University.
ZORBAY, Taner: B.A. METU; M.A. METU.

GENERAL INFORMATION: The History Department aims to train future historians, teachers, academicians, archivists, or prospective functionaries in the various walks of life. The departmental program is based on four years of study to earn a Bachelor's degree and concentrates on Ottoman Turkish as a strong by-discipline. The curriculum of the Department is designed to enrich the general culture of the students, to increase their intellectual capacity, and to develop their analytical and critical thinking skills. The curriculum, in accordance with university rules, is arranged so that the subjects other than Ottoman-Turkish are taught in English targeting fluency in reading and writing for the students and enabling them to access historical sources in English.

AIMS AND OBJECTIVES OF UNDERGRADUATE PROGRAMS: To train competent academicians and researchers in their respective fields.

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: The post-graduate program in History is primarily directed to fulfill the requirements for career work in education, diplomacy, media, private and public agencies, and of course, in universities. It also promotes scholarly research in Turkish history as well as the exchange of scholars and students of history from different institutions and universities in Turkey and abroad.

CAREER OPPORTUNITIES: The undergraduate program aims at training future scholars in the field. The graduate program aims at training academicians and experts in history for institutions and universities.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

HIST	101	Classical Civilizations of Greece and Rome I	(3-0)3
HIST	107	Ottoman Turkish I	(3-0)3
HIST	151	History of Eastern and Western Civilizations I	(3-0)3
HIST	113	Readings in History I	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
TURK	101	Turkish I	NC

Second Semester

HIST	102	Classical Civilizations of Greece and Rome II	(3-0)3
HIST	108	Ottoman Turkish II	(3-0)3
HIST	152	History of Eastern and Western Civilizations II	(3-0)3
HIST	114	Readings in History II	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	NC
IS	100	Introduction to Information Technologies and Applications	NC

SECOND YEAR

Third Semester

HIST	207	Ottoman Paleography and Diplomatics I	(4-0)4
HIST	231	The Rise of the Ottoman Empire	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
Departmental Elective			
Non-Departmental Elective			
HIST	2201	Principles of Kemal Atatürk I	NC
HIST	2205	History of the Turkish Revolution I	(2-0) NC

Fourth Semester

HIST	208	Ottoman Paleography and Diplomatics II	(4-0)4
HIST	224	Medieval European History	(3-0)3
HIST	232	The Decline of the Ottoman Empire	(3-0)3
Departmental Elective			
Non-Departmental Elective			
HIST	2202	Principles of Kemal Atatürk II	NC
HIST	2206	History of the Turkish Revolution II	(2-0) NC

THIRD YEAR

Fifth Semester

HIST	307	Historical Methodology I	(3-2)4
HIST	321	Modern European History	(3-0)3
HIST	331	Ottoman Modernization I	(3-0)3
Departmental Elective			
Non-Departmental Elective			

Sixth Semester

HIST	308	Historical Methodology II	(3-2)4
HIST	332	Ottoman Modernization II	(3-0)3
ENG	311	Advanced Communication Skills	(3-0)3
Departmental Elective			
Non-Departmental Elective			

FOURTH YEAR

Seventh Semester

HIST	401	Readings in the History of the Turkish Revolution I	(3-0)3
HIST	407	Contemporary World History I	(3-0)3
Departmental Elective			
Non-Departmental Elective			
Non-Departmental Elective			

Eighth Semester

HIST	402	Readings in the History of the Turkish Revolution II	(3-0)3
HIST	408	Contemporary World History II	(3-0)3
Departmental Elective			
Departmental Elective			
Non-Departmental Elective			

MINOR PROGRAM IN HISTORY

This program is designed to broaden students' perspectives on history, and is open for above-average students. The aim of this program is to provide the applicants with current scholarly knowledge on European, Ottoman and Turkish history in order to elevate their cultural level and equip them with an analytic perspective towards daily life in a multi-disciplinary content.

Compulsory courses

HIST	107	Ottoman Turkish I	(3-0)3
HIST	108	Ottoman Turkish II	(3-0)3
HIST	307	Historical Methodology I	(3-2)4
HIST	308	Historical Methodology II	(3-2)4

Two of the following courses

HIST	215	Basic Concepts in Human History I	(3-0)3
HIST	216	Basic Concepts in Human History II	(3-0)3
HIST	217	Byzantine History I	(3-0)3
HIST	218	Byzantine History II	(3-0)3
HIST	219	Balkan History I	(3-0)3
HIST	220	Balkan History II	(3-0)3
HIST	224	Medieval European History	(3-0)3
HIST	227	Religions of the Middle East: An Early History	(3-0)3
HIST	228	History of Religion in Asia	(3-0)3
HIST	231	The Rise of the Ottoman Empire	(3-0)3
HIST	231	The Decline of the Ottoman Empire	(3-0)3
HIST	251	Historical Readings in Greek I	(3-0)3
HIST	252	Historical Readings in Greek II	(3-0)3
HIST	311	The Beginnings: From Paleolithic to Neolithic Societies	(3-0)3
HIST	317	Socio-Political Thought of the Late Ottoman Era I	(3-0)3
HIST	318	Socio-Political Thought of the Late Ottoman Era II	(3-0)3
HIST	321	Modern European History	(3-0)3
HIST	327	Introduction to Military History I	(3-0)3
HIST	328	Introduction to Military History II	(3-0)3
HIST	338	History of the British Empire since 1603	(3-0)3
HIST	341	American Civilization: Themes& Issues I	(3-0)3
HIST	342	American Civilization: Themes& Issues II	(3-0)3
HIST	343	Recent American History since 1945	(3-0)3
HIST	345	History of the Turkish Press	(3-0)3
HIST	347	Revolution in European History	(3-0)3
HIST	355	Ottoman Sources of the 18^{th} and 19^{th} Century	(3-0)3
HIST	357	Turkish Image in Italy and Europe	(3-0)3
HIST	358	Minorities in the Balkans	(3-0)3
HIST	360	Ottoman Labor History (19^{th} Century)	(3-0)3
HIST	401	Readings in the History of the Turkish Revolution I	(3-0)3
HIST	402	Readings in the History of the Turkish Revolution II	(3-0)3
HIST	407	Contemporary World History I	(3-0)3
HIST	408	Contemporary World History II	(3-0)3
HIST	417	Russian History I	(3-0)3
HIST	418	Russian History II	(3-0)3
HIST	420	Main Research Themes in the Early Modern Period	(3-0)3
HIST	427	American Cultural History I	(3-0)3
HIST	428	American Cultural History II	(3-0)3
HIST	443	History of the USSR I	(3-0)3
HIST	444	History of the USSR II	(3-0)3
HIST	449	Cultural and Social Aspects of Ottoman Istanbul	(3-0)3
HIST	451	Historical Perspectives on Social Transformation	(3-0)3
HIST	490	Exploring Environmental History	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

HIST 101 Classical Civilizations of Greece and Rome I (3-0)3
The aim of this course is to offer the political, social and cultural history of Greece and Rome in the antiquity. The period from Minoan Civilization to the end of the Hellenistic Period will be covered in this course.

HIST 102 Classical Civilizations of Greece and Rome II (3-0)3
Continuation of HIST 101, which will focus on the ancient Roman history in a general framework.
Prerequisite: HIST 101

HIST 107 Ottoman Turkish I (3-0)3
A brief introduction to the Ottoman language and the teaching of Arabic letters in the form of book-print with selected materials from the historical and literary texts of the 20th century. (This course is given in Turkish)

HIST 108 Ottoman Turkish II (3-0)3
Teaching how to use the old Ottoman dictionaries with particular emphasis on the Arabic and Persian phrases in the Ottoman language. Drills on the selected texts varying from the 13th to the 19th centuries. (This course is given in Turkish.)
Prerequisite: HIST 107

HIST 111 History of Turks I (3-0)3
The Mongolian Steppes and the social and economic structure of nomadic societies. The Huns, Turkius and Uigurs.

HIST 112 History of Turks II (3-0)3
Turkic-Moslem states in Iran and Transoxiana. Emergence of the Mongols and the legacy of Genkhis Khan's Empire up to the period of Tamerlane.

HIST 113 Readings in History I (3-0)3
An introductory course for freshmen students aiming to acquaint them with historical, geographical, and philosophical concepts and terminologies frequently used in books on history, through selections from various texts. This course is designed to guide history students towards their areas of specialization in the coming years.

HIST 114 Readings in History II (3-0)3
Continuation of HIST 113, concentrating on the readings and comprehension of historical records and treaties belonging to various centuries.
Prerequisite: HIST 113

HIST 150 History of Civilization and Society (3-0)3
The course aims at providing general knowledge on the basic developments in history and the social changes accompanying it. It is offered to students of the social branches of the Faculty of Arts and Sciences. This course will focus on the main dynamics in history that contributed to the formation of the current social, economic and political environment of the present world.

HIST 151 History of Eastern and Western Civilizations I (3-0)3
This course aims at giving the first year students an introductory notion of different geographical notions of development of civilization in historical and thematic perspective.

HIST 152 History of Eastern and Western Civilizations II (3-0)3
This course aims at giving the first year students an introductory knowledge of different geographical notions of development of civilization in a historical and thematic perspective. It is the continuation of History of Eastern and Western Civilizations I where a basic overview about the general world history is given to the student, covering Mesopotamia, ancient Anatolia, Egypt, China, Africa, America, the Indian subcontinent.
Prerequisite: HIST 151

HIST 2201 Principles of Kemal Atatürk I (2-0)NC
A history of the foundation of the Turkish Republic in the light of Kemal Atatürk's principles. A required course for all second-year students.
(This course is given in Turkish)

HIST 2202 Principles of Kemal Atatürk II (2-0)NC
Continuation of HIST 2201.
(This course is given in Turkish)

HIST 2205 History of The Turkish Revolution I (2-0)NC
This course is a must course for students with foreign nationality. It is designed to equip them with a general knowledge on the process of the establishment of the Turkish nation-state in 1923. It covers economic, social, political and cultural developments in Turkey between 1908 and 1938.

HIST 2206 History of the Turkish Revolution II (2-0)NC
It is continuation of HIST 2206. It will explore economic, social, political and cultural issues in Turkey between 1939 and 1980.

HIST 207 Ottoman Paleography and Diplomatics I (4-0)4
Introduction to Ottoman paleography, the particular spellings of Ottoman words, drills on the *sülüs* and *rik'a* scripts with materials selected from Ottoman chronicles and records varying from the 14th to the 20th centuries.
Prerequisite: HIST 108

HIST 208 Ottoman Paleography and Diplomatics II (4-0)4
The format and contents of Ottoman records (*ferman, telhis, arz, hüccet*). Exercises on the calligraphy used in these documents (*divani, ta'lik, kırma*).
Prerequisite: HIST 207

HIST 215 Basic Concepts in Human History I (3-0)3
Introduction to the nature of human existence, community, society, nation, international organization. Basic requirements of human social existence: i. Main mechanisms of symbolic and social interaction; ii. Human cultural achievements: culture and civilization; iii. Role of population in human history; iv. Role of economic factors in human history.

HIST 216 Basic Concepts in Human History II (3-0)3
The role of: i. Political organization (Government); ii. Family organization; iii. Religious organization; iv. Educational organization; v. Communication; and vi. Factors of change in human history.

HIST 217 Byzantine History I (3-0)3
This is an introductory course which examines the origins of the Byzantine Empire, its history, culture and contributions to world civilization. In this course the events from the reign of Diocletian through the Battle of Manzikert in 1071 will be covered.

HIST 218 Byzantine History II (3-0)3
The course is the continuation of HIST 217 *Byzantine History I*, and covers the period between 1071 and 1453. This course is designed to examine, in detail, the Byzantine Empire from the 11th century until its collapse and deals with the political history of the Byzantine Empire, and its relations with Western Europe, the Seljuqs and the Ottomans.

HIST 219 Balkan History I (3-0)3
In history, the Balkans was the crossroads of various races, religions and cultures. Turks, Bulgarians, Albanians, Serbs, Croats, Greeks, Romanians and Slovens have been the main Balkan nationalities. Greece, Rome, Byzantium and the Ottomans governed the peninsula in different periods. The different conditions and characteristics of these empires and the experiences of the nationalities constituted them will be evaluated. From the late 18th century until the mid-nineteenth century, the nationalist movements and ethnic conflicts, their external dimensions and internal dynamics will also be explored.

HIST 220 Balkan History II (3-0)3
Continuation of HIST 219.

HIST 224 Medieval European History (3-0)3
Medieval Europe and religious, political institutional development: A survey of Europe in the middle ages with special emphasis on Christianity and its religious, political and educational institutions (Papacy, Feudalism, Universities) from the dissolution of the Western Roman Empire to the emergence of absolute royal states.

HIST 227 Religions of the Middle East: An Early History (3-0)3
The course is designed to provide a background to religious beliefs of Ancient Egypt and Mesopotamia. A reference will also be made to Zoroastranism. In the light of these aspects, the origins and the development of Judaism, Christianity and Islam will be examined. The course will cover Islamic history from the first four caliphs on.

HIST 228 History of Religion in Asia (3-0)3
The course is an introductory survey of the early history of Hinduism and Buddhism. Regarding Hinduism emphasis will be put on the Rig. Vedic times and the changes that took place with the coming of Argons. The central theme of Buddhism will be scriptures and monastic celibacy. The early impact of Islamic Culture in India and South East Asia will also be part of the course.

HIST 229 Early Anatolian Civilizations (3-0)3
This course includes a survey of the civilizations in Anatolia from the appearance of the human race to the Hellenistic period. Anatolian civilizations from the beginning to the conquest of Anatolia by

Alexander the Great will be covered in detail in this course.

HIST 230 Contemporary Turkey: Historical Perspectives of Politics and Culture (3-0)3

A survey of contemporary Turkish history designed specifically for METU's exchange and visiting students. It covers the historical, political and cultural developments of modern Turkey from the late 19th century Ottoman Empire to the present. The course introduces historical and socio-political reasons for the establishment of the nation state and economic progress in Turkey and deals with issues of cultural exchange, religion, industrialization and education.

HIST 231 The Rise of the Ottoman Empire (3-0)3

The course will start with a brief introduction to the reign of Mehmed II after the fall of Istanbul and continue to the end of the reign of Mehmed III. Emphasis will be put on the social and economic conditions of the reign of Selim I and Süleyman II to implement the rise of the empire.

HIST 232 The Decline of the Ottoman Empire (3-0)3

The course will cover the period from Ahmed I's reign to that of Abdulhamid I. The emphasis will be put on the *Celali* Revolt and rise of *the ayans.*

HIST 233 Nomads, Farmers and Dervishes (3-0)3

Focusing on nomads, farmers and dervishes, the course will explore the Anatolian society before the rise of the Ottomans as an empire. Demographic, cultural as well as political and economic trends in Anatolia in the 12th to 15th centuries will be studied with readings in history, literature and arts.

HIST 241 Anatolian Civilizations in Antiquity I (3-0)3

All the civilizations in Anatolia from the Paleolithic Age up to the Hellenistic Period will be covered in this course. The course will provide information about the socio-political and cultural developments of the ancient settlements of Anatolia covering the period from the appearance of human race to the conquest of Anatolia by Alexander the Great.

HIST 242 Anatolian Civilizations in Antiquity II (3-0)3

Continuation of HIST 241.

HIST 251 Historical Readings in Greek I (3-0)3

This course is the first of a two-semester introduction to the ancient Greek language and historical texts written in it. The course will begin with the alphabet, elements of ancient Greek grammar and syntax and then proceed to increasingly complex readings from historical texts.

HIST 252 Historical Readings in Greek II (3-0)3

This is the second of a two-semester introduction to the ancient Greek language and historical texts written in it. The course will continue to teach elements of ancient Greek grammar and syntax and then proceed to increasingly complex readings from historical texts.

HIST 261 Historical Readings in Persian I (3-0)3

This course attempts at teaching history students to read history texts in Persian alphabets and language.

HIST 262 Historical Readings in Persian II (3-0)3

This course attempts at developing the history students' ability to read history texts in Persian alphabets and language, and teaching them about Persian culture.

HIST 304 Myths, Beliefs and Thoughts from the Ancient World (3-0)3

Intersecting Mythology and History, this course highlights the crucial role of the myths as one of the basic tools in the study of antiquity, revealing eternal truths about the nature of man, relationships between man and man, man and society, and man and divinities. The course attempts to illuminate the religious beliefs, moral values, social customs and early rational thoughts peculiar to the archaic world with special emphasis on Greek mythology. This will be related through a cognitive, analytical and comparative approach under the light of the ancient literary sources.

HIST 305 Advanced Ottoman Paleography and Diplomatics I (4-0)4

i. Studies on critical additions of manuscripts and their transcriptions; ii. Information concerning Ottoman archives; iii. Studies on newspapers and journals for the period between 1860 and 1928; iv. The grammar and spelling of the old Anatolian Turkish; v. Historical development of Turkish written in Arabic script with particular emphasis on its last phase; vi. An overview of *Hat* (manuscript) art.

HIST 306 Advanced Ottoman Paleography and Diplomatics II (4-0)4
Continuation of HIST 305.

HIST 307 Historical Methodology I (3-2)4
Introduction to history writing, historical and imaginative literature, the historian and his time. Discussion on selected readings in which major historians reflect on their work.

HIST 308 Historical Methodology II (3-2)4
Continuation of HIST 307.

HIST 309 Along the Silk Roads (3-0)3
The course analyzes the history of peoples and ideas between Inner Asia and China. The Silk Roads became known due the records of the larger economic and political structures such as the Roman, Persian and the Chinese Empires. However the nomadic empires of inner Asia and the city-states in inner Asia played a crucial role in the trade along these routes. The course aims to explore the history of the people and ideas along these routes through a rich travel literature.

HIST 310 Women and Herstory Along Silk Roads (3-0)3
Focusing on two empires, the Ottoman and Chinese on the two ends of the Silk Roads, the course will explore the changing role and status of women over time. Taking cultural factors into consideration women's role will be examined within the changing patterns of state traditions. To highlight the traditions of these two "sedentary" empires, counter examples will be drawn from Inner Asian nomadic empires and tribal peoples.

HIST 311 The Beginnings: From Paleolithic to Neolithic Societies (3-0)3
This course offers an overview of the development of the very early stages of the life of humans and human society. It draws information from a range of theories as well as actual anthropological and archaeological materials (without insisting on details of their typology). It aims to communicate the information we have about these remote periods and discuss how we arrive to any conclusions about periods for which written sources are not available to the historian.

HIST 317 Socio-Political Thoughts of the Late Ottoman Era I (3-0)3
I. Main trends of socio-political thoughts in Turkey during the late 19th and early 20th centuries: A.Islamism: i. Radical Islamists ii. Moderate Islamists; B. Turkism; C. Westernism or Modernism; II. A comparative analysis of these trends of thoughts and those governing the Turkish Revolution.

HIST 318 Socio-Political Thoughts of the Late Ottoman Era II (3-0)3
Continuation of HIST 317.

HIST 321 Modern European History (3-0)3
A survey of Europe from the end of feudality in the 14th century to the origins of the French Revolution of 1789, studying the changing patterns in social structure, institutions, politics, economics and international relations.

HIST 323 Course in Roman History I (3-0)3
This course in Roman History will cover the Republican period with special emphasis on "Basic Institutions". The course will also cover Latin I/texts for beginners.

HIST 324 Course in Roman History II (3-0)3
Continuation of HIST 323.

HIST 325 Research in History I (2-2)3
The methodology of historical research and report writing will be taught. Students will work on projects concerning their self-chosen research topics.

HIST 326 Research in History II (2-2)3
The primary and secondary historical sources will be taught. The students will be taken to the information centers to see the sources, and will work on projects concerning the sources.

HIST 327 Introduction to Military History I (3-0)3
This course is the first of a two-semester introduction to the field of military history. It will introduce students to the basic terminology, concepts and methodology used to study military events in history, as well as how an understanding of military history can be applied in historical research and other disciplines.

HIST 328 Introduction to Military History II (3-0)3
This course is the second of a two-semester introduction to the field of military history. It will introduce students to the basic terminology, concepts and methodology used to study military events in history, as well as how an understanding

of military history can be applied in historical research and other disciplines.

HIST 331 Ottoman Modernization I (3-0)3

The course analyzes Ottoman history covering the internal and foreign developments in the Empire from the reforms of Selim III to Tanzimat era.

HIST 332 Ottoman Modernization II (3-0)3

Domestic and foreign developments throughout the Tanzimat era with particular emphasis on social reforms are examined through historical events and facts.
Prerequisite: HIST 331

HIST 333 Mathematics for Social Scientists (3-0)3

The course is designed to introduce some basic mathematical concepts and their applications together with certain historical background.

HIST 335 Using Computer in History I (2-4)4

Using computer in history peripheral devices can facilitate and systemize historical research extremely. This course is designed to teach how to use these devices in all aspects of historical research including word processing, data storage, archiving, categorizing in chronological order as well as in publishing history texts.

HIST 336 Using Computer in History II (2-4)4

Continuation of HIST 335.

HIST 338 History of the British Empire since 1603 (3-0)3

The course analyzes the formation, development, and decline of the last great empire in human history, the British Empire, with emphasis on both political and social history of its past. The era covered by the course is between the union of crowns of Scotland and England in 1603 and the parliamentary election for Scottish Parliament and the Welsh and Ulster Assemblies in late 1990s.

HIST 339 Modernity and Nationalism in the Ottoman Empire (1804-1902) (3-0)3

This course attempts at analyzing the history of the Ottoman Empire in the nineteenth and early twentieth centuries through the external and internal dynamics marked by modernity and nationalism.

HIST 341 American Civilization: Themes & Issues I (3-0)3

This course is an introduction to the history of the United States from the earliest European settlement through 1865. It concentrates on the events and figures who played a critical role in the development of American society and culture.

HIST 342 American Civilization: Themes & Issues II (3-0)3

Continuation of HIST 341. This course covers the events in the period from 1865 to 1960 and how they helped to shape the modern United States.

HIST 343 Recent American History since 1945 (3-0)3

The course aims to enable the students to understand the contemporary United States (The Current Reality) by tracing the development of American Society since W.W.2 through politics, economics and culture.

HIST 345 History of the Turkish Press (3-0)3

The aim of the course is to explore the historical development of the periodical press in the Ottoman Empire and the early Republican Turkey.

HIST 347 Revolution in European History (3-0)3

The course attempts to situate the crucial role of the revolutions in Europe's long term political transformations from sixteenth to twentieth century. Rather than analyzing revolutions as discrete cases it tries to incorporate them into a systematic account of changes in states and relations among states.

HIST 351 History of Science in Islam (8^{th}-12^{th} Centuries) (3-0)3

Students will learn (through lectures, readings and videos) scientific activities and the institutions in the Islamic World. Students will be guided to understand the relationship between scientific activities, and cultural and political events, not only between the 8^{th}-12^{th} centuries, but in the following centuries as well. They will also study how Ottoman scientific activities flourished during the following centuries. These will provide those attending with ability to evaluate current cultural events.

HIST 353 Lingua Latina Historiarum I (3-0)3

This course will be an introduction to Latin grammar and language by the study of simple texts, and translation from Latin to Turkish.

HIST 354 Lingua Latina Historiarum II (3-0)3

Continuation of HIST 353.

HIST 355 Ottoman Sources of the 18th and 19th Century (3-0)3

This course provides an introduction to key Ottoman sources from the end of the eighteenth through the first quarter of the 20th century. After covering an outline of these Ottoman sources and Ottoman ways of writing history, chronicles from each period will be studied closely.
Prerequisite: Consent of the Department.

HIST 356 Lingua Latina Historiarum III (3-0)3

This course is designed for those who wish to read the works of the great Latin authors in the original. The Latin course contains ten chapters (from Chapter 17 to 26) in *Latin Made Simple*. Each chapter has two or three sections. The first is devoted to passages in Latin for reading (together with necessary vocabulary), the second contains well-chosen examples to explain new grammar, while the third is both exercises and a Latin passage for additional reading. After every fourth chapter there is a vocabulary revision. The sections give knowledge on the grammatical structure of Latin in a systematic and digestible way. Main topics of grammar involve the forms of words (nouns, pronouns, adjectives, prepositions, adverbs, conjunctions, verbs) and expressions dealing with how these forms are used in phrases and sentences.

HIST 357 The Turkish Image in Italy and Europe (3-0)3

The course is aimed at providing the student of history-as well as any student interested in the area-with:

a) the main historic events which occurred in the relations between the Ottoman Empire and the Italian States from 1453 to 1683, having a chronological consideration for the rest of Europe.
b) Also in the light of the above, giving a picture of the creation of the image of the Turk, as the Ottomans were simply called by the Italians and the rest of Europe.

The course studies the development and variations in the image of the Turk and that of Islam in Italy from 1453 to 1683, from the political, religious, folkloristic, military and iconographic points of view.

HIST 358 Minorities in the Balkans (3-0)3

This course is aimed at analyzing the developments of the Balkans during the late 19th and 20th centuries. Specifically, the peoples of the Balkans, nationalism, the emergence of Balkan national states, their minorities, their policies, minority rights, migrations and assimilations within the Balkanic states will be studied. The course will also concentrate on ethnic, linguistic and religious minorities of the peninsula and their conditions & problems.

HIST 359 Bipolar World: History of the Cold War (3-0)3

The course is aimed at analyzing the development of international blocs and interactions between these blocs. The course analyses the period between 1948 and 1991, from the beginning of the East-West confrontation, covering events from the Berlin blockade to the dismemberment of the USSR, focusing on important events and personalities of the period.

HIST 360 Ottoman Labor History (19th Century) (3-0)3

This course is designed to explore Ottoman labor history with a particular emphasis on the nineteenth century. The goal is to understand the working life, characteristics of the Ottoman working class, and the variations in the formation of the Ottoman working class as well as the various Ottoman labor movements. Main topics of the course will be: political formation, social composition and economic structure, workers, working class formation and working life in the Ottoman Empire.

HIST 361 Historical Readings in Persian III (3-0)3

This course attempts teaching history students to read historical texts in Persian alphabets and language.

HIST 365 19th Century Ottoman European Relations (3-0)3

The evolution of the relations of the Ottoman Empire with the "Great Powers" of the 19th Century; the "Eastern Question" and what this meant to the "Great Powers"; the "Concert of Europe" as the niveau of the "European Union"; the inclusion of the Ottoman Empire into the "European Community" in 1856 and the unacceptable demands of the Western Powers *vis-á-vis* the Ottoman State; the process of partition of the Ottoman Empire at the end of the 19th century.

HIST 366 History of the First World War (3-0)3

European social, economic and political developments and their stand towards the Ottoman Empire, crystallization of the ideas and planning for the partition of the Ottoman Empire, the First World

War, the motives and reasons behind the partition of the Ottoman Empire from the European perspective.

HIST 400 History of the Turkish Revolution I & II (Foreign Students Only) NC
A required course for foreign graduating students, with particular concentration on the War of Independence, the foundation of the Republic, Atatürk's domestic and foreign policies. (This course is taught in English.)

HIST 401 Readings in the History of the Turkish Revolution I (3-0)3
The course analyzes selected readings from English and Turkish sources with particular emphasis on documents in the old script.

HIST 402 Readings in the History of the Turkish Revolution II (3-0)3
Continuation of HIST 401.

HIST 405 Ottoman Statecraft (3-0)3
The course introduces the political mechanisms of the pre-Tanzimat Ottoman Empire describing the role of Ottoman officials and their manner of making political statements.
Prerequisite: Consent of the Department.

HIST 406 Ottoman Socioeconomic History (3-0)3
It is a survey of production and distribution in the pre-Tanzimat Ottoman Empire in comparison with other pre-industrial social systems.
Prerequisite: Consent of the Department.

HIST 407 Contemporary World History I (3-0)3
The course examines struggle for mastery in Europe from the emergence of the French Revolution to the dawn of modern imperialism, studying the alignments and alliances among the great powers.
Prerequisite: Consent of the Department.

HIST 408 Contemporary World History II (3-0)3
Study of the age of *isms*, in other words a survey of struggle for mastery in the world from the late nineteenth Century to the end of World War II, also introducing the USA and Japan as contending powers.

HIST 409 History of Islam (3-0)3
This course will provide a survey of political and religious movements beginning with pre-Islamic Arabia, the birth of Islam, and a brief survey of other contributors to Islamic History such as Buwayhids and Seljuks. The themes of the subject will be religion, culture, social structure and language both before and after the birth of Islam. Particular attention will be given the Umayyad period and the Abbasid periods.

HIST 412 Museology (3-0)3
Museology is recognized as a new branch of art faculties. In this course the different types of world museums will be covered. Museum examples, especially museology in Turkey will be taught. In addition, some information and methods on the conservation of art objects will be given.

HIST 413 History of Modernity in the Middle East (3-0)3
The Ottoman Empire in the 19th century, economic development and political changes, theories of nation, nationalism and the nation-state, the emergence of nation-states in the Middle East, the role of the military in the nation-state formation, politics of religious resurrection will be analyzed in this course.
Prerequisite: Advanced level students with at least one course in history and interest in Near- and Middle Eastern economy politics and international relations.

HIST 414 History of the Contemporary Middle East: 1950-Present (3-0)3
The course aims at helping the students to develop their understanding of such questions in the Middle East in the 20th century as economic development and political changes; the development of nations, nationalism and the nation-states; the emergence of Pan-Arab nationalism; Arab socialism and Islamic fundamentalism; the role of the military in the nation-state formation; the state and the politics of religious resurrection; Arab-Israeli wars and the Arab Cold War; the Middle East and the new world order.

HIST 415 Readings in Ottoman for Researchers I (4-0)4
The students have to work on readings and evaluations of different archival texts in this advance course in Ottoman script.

HIST 416 Readings in Ottoman for Researchers II (4-0)4
Continuation of HIST 415.

HIST 417 Russian History I (3-0)3
This course provides an intensive introduction to the major themes and events in Russian history from the its earliest period to the last years of the Romanov dynasty. It begins by focusing on the earliest

inhabitants of the Rus' lands and the origins of the Rus, and follows all the historical events and developments down to pre-revolutionary Russia.

HIST 418 Russian History II (3-0)3
In this course students will examine the history of Russia from the reign of Peter the Great and his reforms until the Civil War, which concluded the Russian Revolution of 1917. It examines the reigns of the great monarchs and the following events: The Age of Enlightenment, the Pugachev Revolt, the Decembrist Revolt, the Emancipation of the Serfs, the Bloody Sunday, World War I and Abdication.

HIST 419 Undergraduate Historical Research (1-4)3
This course is designed to be an exclusive research course designed to train senior year students for research and writing history. The instructors of different historical epochs will expect the submission of a graduation thesis upon the completion of the course.

HIST 420 Themes in the Early Modern Period (3-0)3
Economic, commercial, monetary, demographic, military and climatic changes and developments on the global scale between 1500-1700, their economic, political, social and military consequences. Introducing different approaches, perspectives and concepts that the current historiography uses in exploring the aforementioned period. Understanding and comparing the global developments in the early modern age.

HIST 422 Central Asia in Modern Ages (3-0)3
A history of Central Asia from the 16th century to the present. The course focuses on Central Asia's relations with the neighboring Chinese, Russian and British Empire. Special emphasis will be given to the recent developments leading to independent central Asian republics.

HIST 425 History of Diplomacy (3-0)3
Diplomacy has always been considered as the antithesis of war. However, in the age of globalization, diplomacy exists side by side with war as has most recently been witnessed at the Lebanese Crisis. For this reason, one should study in depth the institution of diplomacy, its evolution throughout history and its present role and importance in international relations.

HIST 427 American Cultural History I (3-0)3
Familiarization of the students with the cultural history of the United States from America's discovery to the end of the nineteenth century. Definition of cultural history and explanation of the basic features of American cultural history. Similarities and differences between American culture and European culture. Native and European influence on American culture.

HIST 428 American Cultural History II (3-0)3
Familiarization of the students with the cultural history of the United States from the twentieth century to the contemporary period. Thematic and methodological approaches about specific subfields of American cultural history. Remarkable issues in High Culture (i.e. fine arts, architecture, etc.), popular literature and amusements, philosophical and religious trends, visual and material cultures, and social rituals and subgroups in American history.

HIST 431 History of the Book I (3-0)3
A course designed to establish how and why the printed book was one of the most powerful agents of change at the disposal of western civilization in bringing together the great transformation and the role it played as an effective means of mastery over the world. The story of the book in the Ottoman society will also be surveyed in comparison to the western world.

HIST 432 History of the Book II (3-0)3
Continuation of HIST 431.

HIST 434 Major Issues in the History of Contemporary Turkey (3-0)3
This course will focus on major political and economic issues and deals with social and cultural developments which have been crucial in making current Turkey. It will cover the period extending from the early twentieth century until its end.

HIST 436 The Shared and the Particular: Women of Turkey and Central Asia (3-0)3
Women of Turkey and Central Asia share a common historical background. Yet due to the differences in regions they also exhibit traits that are indigenous to their environment. Focusing on the similarities and differences, the course will explore gender history in these regions. Readings will be drawn both from history and literature.

HIST 441 Islam in the Contemporary World (3-0)3
The course analyzes historical developments in Islam, and its institutions in the twentieth century. The focus will be on the politicized form of Islam and Islamic organizations, the conflict and accommodation between radical Islam and the state,

and the change in the Islamic political thought in the Middle East starting from the *Salafiyya* movement to the end of the twentieth century.

HIST 443 History of the USSR I (3-0)3
This course will examine the history of the USSR from the conditions in late 19th and early 20th century Russia that led to the Russian Revolution through the reign of Joseph Stalin. The ideological struggles both pre- and post-revolution, as well as the founders, leading figures and significant events in the formative years of the USSR will be examined, as well as the USSR's rise to superpower status following World War II.

HIST 444 History of the USSR II (3-0)3
This course will examine the history and development of the Soviet Union from the Civil War to its dissolution in 1991. Particular emphasis will be given to studying the leaders, leading figures, and significant events that shaped the USSR, its people and its role in the world in this period.

HIST 445 European Cultural History I (3-0)3
This course highlights three fundamental elements of European identity and the incorporation of each of them into the consciousness of Europeanness, namely that of: Christianity, Renaissance (a re-definition of antiquity), and the Enlightenment (the rational man and post-industrial Europe. The focus of the course will remain on the period between the 15th and 18th centuries, situating the fundamentals of European culture in comparison to the other major cultural spheres of the world, with emphasis on the Middle East.

HIST 446 European Cultural History II (3-0)3
This course presents the students with the main characteristics of the European culture that formed the *sui generis* civilisation of modern Europe after Enlightenment in the 18th century. The special emphasis will be on the interaction of Europe with other cultural spheres of the world in the age of discoveries, travels and colonisation, which ended up in the polarisation of the world cultures, hence the perception of the world in different cultures, from a *Clash of civilizations* point of view.

HIST 447 Readings in American Culture I (3-0)3
This course will focus on current American issues as presented in *Rereading America: Cultural Context for Cultural Thinking and Writing* (Columbo, et al. 3rd edition) and other class handouts. The course will emphasize individual writing assignments, collaborative projects, oral presentations, and experiential learning. Students will think critically and analytically, gaining awareness of the myriad of American myths and the enduring realities of American society.

HIST 448 Readings in American Culture II (3-0)3
Continuation of HIST 447.

HIST 449 Cultural and Social Aspects of Ottoman Istanbul (3-0)3
Being the capital city of two empires, East Roman and Ottoman, Istanbul rightly deserves the attention oriented towards it. In its history, a mixture of cultures including Jewish, Armenian, Greek and Turkish, has shaped its spatial form. This mixture has created a civilization that fascinated everyone visiting the city. This course will explore the cultural and social aspects of everyday life of Istanbul in the early modern period.

HIST 451 Historical Perspectives on Social Transformation (3-0)3
This course explores the theoretical and methodological contributions of major figures in social sciences to historical studies. In critically analyzing the works of these scholars, the focus is on how they bring theoretical concerns and historical evidence to bear upon one another, and on the different aspects of "social change". The issues that are covered range from the processes of state formation to revolutions; from the origins of democracy and totalitarianism to the development of citizenship; from the debates on the origins of capitalism to the transformative role of wars in history.

HIST 461 Historical Readings in Persian IV (3-0)3
This course is designed to provide the students of History Department and Graduate program of Middle East Studies advanced rules of reading and analyzing historical texts in Persian language.
Prerequisite: HIST 361

HIST 471 Social Movements in America: Past and Present I (3-0)3
This course will analyze contemporary American history and culture through social, political, economic, and cultural frameworks. Themes, issues, problems, and ideas will be presented in readings, lectures, and class discussions. These will serve as multiperspective models through which students will react, review, and research using personal voice to demonstrate their increasing awareness of the things American. Students will explore how these events impact their lives as citizens of the world and especially Turkey.

HIST 472 Social Movements in America: Past and Present II (3-0)3
Continuation of HIST 471.

HIST 474 History of Aviation (3-0)3
This course is offered jointly with the Department of Aerospace Engineering). The birth of aviation. Lighter than air vehicles (balloons). Development of powered heavier than air vehicles (airplanes). Aviation as a sporting event. Use of aircraft in armed conflicts and its impact on military thinking. Commercial aviation. Development and advance of aeronautical sciences. Space flight. Impact of aviation on other technologies. Effect of aviation on social an economical life. Humane aspects of aviation.

HIST 476 Chinese History (3-0)3
This course provides a broad knowledge of modernization efforts of a non-western civilization. The course covers Chinese history from the establishment of last Chinese dynasty (1644) to the death of the last Emperor Pu I (1967) and it is a first step for students interested in virtually any topic relating to the Chinese experience of the last three and half centuries.

HIST 480 History of Japan (3-0)3
1. A broad knowledge of modernization efforts of a non-western civilization.
2. Japanese history from ancient times to the post-WWII era.
3. History of the Japanese islands and the basic knowledge necessary to study Japanese society, politics, economics and culture.

HIST 490 Exploring Environmental History (3-0)3
The study of human interactions with the wider natural world in a comparative historical perspective. Historical patterns in human societies caused by environmental changes; the effects of historical geography and anthropology on economic and political institutions; and the consequences of historical processes of various property regimes on economic, social, and environmental change.

GRADUATE PROGRAMS AT THE DEPARTMENT OF HISTORY

M.A. PROGRAM IN HISTORY

Required Courses

HIST	501	Historical Methodology I	(3-0)3
HIST	502	Historical Methodology II	(3-0)3
HIST	550	Seminar in History	NC
HIST	599	Master's Thesis	NC

Elective Courses

HIST	503	European and World History	(3-0)3
HIST	504	Ottoman and Turkish History	(3-0)3
HIST	505	Ottoman Political and Administrative System I	(3-0)3
HIST	506	Ottoman Political and Administrative System II	(3-0)3
HIST	507	Ottoman Advanced Writing Techniques I	(3-0)3
HIST	508	Ottoman Advance Writing Techniques II	(3-0)3
HIST	510	Women's Experience with Hierarchy and the State	(3-0)3
HIST	511	History and Contemporary Affairs in the Indian Sub-Continent	(3-0)3
HIST	513	Social and Economic History of the Middle East	(3-0)3
HIST	514	History of Middle Eastern Nation-States, 1920-1990	(3-0)3
HIST	515	History of the Ottoman Press and Publications	(3-0)3
HIST	516	Looking into the History of Missionary Activities in the Ottoman Empire	(3-0)3
HIST	520	Crisis and Change in Ottoman History (1300-1700)	(3-0)3
HIST	521	Historical Features of the Turkish Revolution I	(3-0)3
HIST	522	Historical Features of the Turkish Revolution II	(3-0)3
HIST	525	Approaches in History: Selected Studies	(3-0)3
HIST	526	Comparative Studies in Historical Sources: Selected Works	(3-0)3
HIST	527	History of the Middle Eastern Beliefs I	(3-0)3
HIST	528	History of the Middle Eastern Beliefs II	(3-0)3
HIST	529	Dawn of Anatolian Civilizations	(3-0)3
HIST	530	Themes in Ottoman Economic History	(3-0)3
HIST	531	Emergence of Ottoman Modernization I	(3-0)3
HIST	532	Emergence of Ottoman Modernization II	(3-0)3
HIST	533	Ottoman Social and Economic History until the 16th Century	(3-0)3
HIST	535	Seminar in the Development of the Concept Nationhood in History	(3-0)3
HIST	536	Cultural Construction of Gender: Women in Central Asia and Turkey	(3-0)3
HIST	537	Institutional Structure of the Republic of Turkey I	(3-0)3
HIST	538	Institutional Structure of the Republic of Turkey II	(3-0)3
HIST	541	Is the New World Order an (Dis)Order I?	(3-0)3
HIST	542	Is the New World Order an (Dis)Order II?	(3-0)3
HIST	553	Lingua Latina I	(3-0)3
HIST	554	Lingua Latina II	(3-0)3
HIST	546	Nationalism in the Balkans	(3-0)3
HIST	547	Readings in American Culture	(3-0)3
HIST	556	The Caucasus: History and Politics	(3-0)3
HIST	562	Patterns of Divergence and Convergence in History: Central Asia in the Last Millennium	(3-0)3
HIST	563	Emergence and Evolution of the Armenian Question	(3-0)3
HIST	565	History of the Ottoman-Italian Relations in Renaissance	(3-0)3
HIST	568	History of India	(3-0)3
HIST	570	Ottoman Urban History	(3-0)3

DESCRIPTION OF GRADUATE COURSES

HIST 501 Historical Methodology I (3-0)3

The course is designed to acquaint students with different historical traditions. The students will be involved in both applied (analytical) and theoretical work. For this purpose, works from different methodological backgrounds will be chosen and studied together with the respective school of thought.

HIST 502 Historical Methodology II (3-0)3

Continuation of HIST 501.

HIST 503 European and World History (3-0)3

The course analyzes Turkish and world history from the Congress of Vienna to the Treaty of Versailles. Turkey and the world before 1939 and World War II and its consequences are also examined in the course.

HIST 504 Ottoman and Turkish History (3-0)3

This course reflects internal developments and foreign relations of the Ottoman Empire during the 17^{th} and 20^{th} centuries. It particularly concentrates on westernization movements, foreign interventions, and reactions displayed by the conservative element of the Empire against reformations.

HIST 505 Ottoman Political and Administrative System I (3-0)3

The focus of the course is on the concept of state, and political and administrative institutions in the pre-Tanzimat Ottoman Empire in comparison with other pre-industrial social systems especially in the Middle East.

HIST 506 Ottoman Political and Administrative System II (3-0)3

Continuation of HIST 505.

HIST 507 Ottoman Advanced Writing Techniques I (3-0)3

The students will work on advanced Ottoman paleography, and writing and reading *sülüs* (decorative writing) and *rik'a* (normal hand writing) from selected Ottoman chronicles. The course also offers a methodical introduction to the special terminology encountered in Ottoman studies.

HIST 508 Ottoman Advanced Writing Techniques II (3-0)3

Continuation of HIST 507.

HIST 510 Women's Experience with Hierarchy and the State (3-0)3

Focusing on two empires, the Ottoman and Chinese, the course will explore the changing role and status of women over time. Taking cultural factors into consideration women's role will be examined within the changing patterns of state traditions of these two "sedentary" empires, counter examples will be drawn from Inner Asian nomadic empires as well as from the tribal peoples of the border areas.

HIST 511 History and Contemporary Affairs of the Indian Sub-Continent (3-0)3

This course is designed to give the graduate students a general perspective on history of the Indian sub-continent in a thematical way in order to understand the profound historical dynamics shaping the minds of the contemporary policy-makers of the sub-continent. The field of the study of the course covers the present-day countries of India, Pakistan, Bangladesh, Nepal, Myanmar and Sri Lanka.

HIST 513 Social and Economic History of the Middle East, 1800-1920 (3-0)3

The course is designed to analyze modern Middle Eastern history and economic developments in the nineteenth and the early twentieth centuries. The first step in the course is to introduce various theoretical approaches to the Middle Eastern social and economic understanding. Next, the course will refer to specific histories of some of the Middle Eastern societies with reference to the socio-economic developments in the Ottoman Empire until the end of the First World War.

HIST 514 History of the Middle Eastern Nation-States, 1920-1990 (3-0)3

The aim of the course is to conduct a comprehensive study of state-making and nation-building processes in the Middle East between World War I and the present. The framework of the course will be drawn by the triumviral relationship between the state, society and social transformation. Theories of nation, nationalism and the nation-state, the role of the military in the nation-state formation and the politics of religious resurrection in the Middle East will be discussed. The course will analyze political, economic and social changes in Turkey, Egypt, Iraq, Syria, Lebanon, Israel and Palestine as the primary areas of study.

HIST 515 History of the Ottoman Press and Publications (3-0)3

The aim of the course is to explore the historical development of the mass media in the Ottoman Empire, vis-à-vis the Western experience. Due emphasis will be given to main lines of socio-political thought in the Empire in the 19th century as they have appeared and been debated in the media

HIST 516 Looking into the History of Missionary Activities in the Ottoman Empire (3-0)3

The course is designed to acquaint the student with the general pattern of the 19th century missionary penetration into the Ottoman Empire. The missionary activities of different powers will be surveyed by concentrating on their educational influences and impacts.

HIST 520 Crisis and Change in Ottoman History (1300-1700) (3-0)3

The main economic, financial, commercial, military, demographic, social and poltical changes and crises in Ottoman history between 1300 and 1700. Understanding the reasons behind the changes and crises, learning the course of developments, the sequence of events and their consequences.

HIST 521 Historical Features of the Turkish Revolution I (3-0)3

Turkish political and economic history starting from the revolution of 1908 to the end of the Second World War is the historical epoch, which this course covers. The course revolves around selected topics in recent Turkish history, which have relevance in shaping Turkish politics and the economy in this period. There are readings written from different viewpoints that try to explain Turkish history for the period between 1908 and 1945.

HIST 522 Historical Features of the Turkish Revolution II (3-0)3

The course revolves around selected topics in recent Turkish history, which have relevance in shaping Turkish politics and the economy from 1945 to 1990. It examines readings written from different viewpoints that try to explain Turkish political, economic and social history for this period. The aim of the course is to discuss and critically evaluate these various comparing explanations that have been provided for Turkish political and economic development.

HIST 525 Approaches in History: Selected Studies (3-0)3

This is a course in applied methodology. Major historical studies in a selected field of work will be discussed according to their approaches to history. The course aims to acquaint students with the complexities of that specific field of study.

HIST 526 Comparative Studies in Historical Sources: Selected Works (3-0)3

Students will familiarize themselves with the sources of their specific field of interest. Historical sources will be introduced within the historical context in which they were prepared. The sources will be introduced through examining the authors, the time period in which they were written, general worldview of that time and how these problems were reflected in the sources. Different sources within the same context will be compared.

HIST 527 History of the Middle Eastern Beliefs I (3-0)3

The course is the survey of Middle Eastern religions with references to ancient beliefs. It is designed to hold a particular concentration on Islamic history and Islamic influences upon Ottoman social and daily life as well as the Ottoman judicial system, dependent on Islamic codes of life.

HIST 528 History of the Middle Eastern Beliefs II (3-0)3

Continuation of HIST 528.

HIST 529 Dawn of Anatolian Civilizations (3-0)3

The course covers the early Anatolian civilizations from the beginning of mankind to the Hellenistic period with reflections of cultural and social transformations through the ages. The beliefs and social behaviors of various civilizations of the area will also be studied during the course.

HIST 530 Themes in Ottoman Economic History (3-0)3

Introduce students of history and social sciences into the basic concepts and problems of Ottoman economic history. Various aspects of Ottoman economy with a special focus on institutions and their implications for the long-run economic growth. Use of historical sources, historical methodologies, economic theory, and quantitative methods to analyze past economic events.

HIST 531 Emergence of Ottoman Modernization (3-0)3

The course covers the phases of Ottoman modernization starting from the mid-18th Century with particular emphasis to social developments.

The course includes the analysis and comparative study of historical developments in various phases of Ottoman modernization.

HIST 532 Emergence of Ottoman Modernization (3-0)3
This course is the continuation of HIST 531. It is designed to analyze the Tanzimat era extending from 1839 to 1876. The Tanzimat reforms constitute the core of this course when the Ottoman modernization surpassed institutional reforms. Ottoman and foreign approaches to modernization are analyzed and discussed throughout the course with references to socio-economic and political factors in order to equip the students with a comparative view of ideological developments in western countries and their socio-economic reflections upon the Ottoman Empire.

HIST 533 Ottoman Social and Economic History until the 16th Century (3-0)3
The course is designed for a detailed analysis of the Ottoman social and economic structure between the 13th and the 16th centuries. The Ottoman statecraft in the classical period will be examined in terms of the production and distribution patterns of the imperial economy. Primary sources of the mentioned period will be extensively employed.

HIST 535 Seminar in the Development of Nationhood in History (3-0)3
The course is designed to present the development of nationhood in the historical setting with due attention to the change in the concept of nationality in the late nineteenth-century Ottoman Empire. The relations between the development of nationalism and the notion of nation among the non-Muslim communities, and the development of nationhood in the Turkish community of the Empire will be examined interactively.

HIST 536 Cultural Construction of Gender: Women in Central Asia and Turkey (3-0)3
This is a graduate level course designed for students interested in problems of comparative women's history. This course will explore gender history in Turkey and Central Asia. Both regions have a common Turkish-Muslim past and yet another one preceding that. The pre-Turkish past will be taken as different starting points. The Turkish-Muslim past, on the other hand, will be examined in terms of cultural constructs of gender. The focus will be on converges and divergences in gender history. Both historical and literary works will be used.

HIST 537 Institutional Structure of the Republic of Turkey I (3-0)3
This course is an in-depth study of the institutional structure created by the Turkish Revolution with its impacts upon the rural and urban populations in modern Turkey.

HIST 538 Institutional Structure of the Republic of Turkey II (3-0)3
Continuation of HIST 537.

HIST 541 Is the New World Order an (Dis)Order I? (3-0)3
This course deals with contemporary world history and the new world order, the frame of which was drawn by the policies of the US, the UN, the EU and European Organization for Security and Cooperation, the European Council and North Atlantic Treaty Organization. The course analyzes how the Republic of Turkey pursues its "national interests" and materializes them in the world order.

HIST 542 Is the New World Order an (Dis)Order II? (3-0)3
Continuation of HIST 541.

HIST 546 Nationalism in the Balkans until the First World War (3-0)3
This course aims to analyze, at the advanced level, the emergence of nationalism and nationalist movements in the Balkans, their external and domestic roots, and establishment of national states in the peninsula during the nineteenth and twentieth centuries.

HIST 547 Readings in American Culture (3-0)3
The focus of the course is on current American issues within a cultural context. The course will emphasize individual writing assignments, collaborative projects, oral presentations and experiential learning about American society and culture. Students will learn to think critically and analytically, gaining awareness of the myriad of American myths and the enduring realities of American society.

HIST 550 Seminar in History NC

HIST 553 Lingua Latina I (3-0)3
This course will be an introduction to Latin grammar and language (simple texts, translation from Latin to Turkish).

HIST 554 Lingua Latina II (3-0)3
Continuation of HIST 553.

HIST 556 The Caucasus: History and Politics (3-0)3

This graduate-level course will examine the history of the north and south Caucasus from its early history to the present. The course will cover the origins of the peoples; the conquest of the North and the South Caucasus by the Russian Empire; the incorporation of these regions into the Empire and the subsequent social, cultural, economic, and political changes; the Bolshevik Revolution and the radical transformation of all aspects of life; the collapse of the Soviet Union and the significant problems of the post-Soviet period, resistance, developments, social conflicts and cooperation, and liberalization and democratization to the present day.

HIST 562 Patterns of Divergence and Convergence in History: Central Asia in the Last Millennium (3-0)3

During the last millennium Central Asia went through different stages politically, socially and economically. This course aims to contextualize these changes in terms of Asian and world history and to discuss the patterns that emerge as unifying and separating factors. For this purpose, the students will be exposed to the most recent failure.

HIST 563 Emergence and Evolution of the Armenian Question (3-0)3

The Armenian Question became a major problem for the Ottoman Empire and found a temporary resolution with the relocation of the Armenians during World War I. Half a century later it became a major issue of Turkish foreign policy. A comprehensive study of the Armenian Question requires not only analysis of its political/historical development, but also its international implications as well as legal and psychological aspects.

HIST 565 History of the Ottoman-Italian Relations in Renaissance (3-0)3

This course aims at giving the student basic facts about the dynamics that constructed Italian-Ottoman relations in the age of the Renaissance through primary and secondary literature of political history of the time. The course includes a wide range of unpublished primary sources as well as other literature on the matter.

HIST 568 History of India (3-0)3

This course gives the students the basic tenets of the history of the Indian subcontinent from the perspective of political, civilizational and especially, religious history.

HIST 570 Ottoman Urban History (3-0)3

This Course is designed for a detailed analysis of the Ottoman urban history in early modern era. The course will consentrate on Anatolian and Arab cities in Ottoman period. The course will focus on three interrelated issues. The first one is the state of current paradigms concerning Middle Eastern cities. The second is the nature of social and economic networks that enabled harmonious relations between various ethnoreligious groups living in Ottoman cities. For this end, special attention will be given to social and economic life from a communal perpective. The third issue is the family networks that from the second tier in communal bonds. Published primary sources concerning Ottoman urban history will be extensively employed for a deeper understanding of the urban fabric. The main aim of the course will be an analysis of private and communal networks that could provide a basis for a critical re-evaluation of contemporary literature on Middle Eastern cities.

HIST 599 Master's Thesis NC

Ph.D. PROGRAM IN HISTORY

Required Courses

HIST	640	Analysis of Historical Sources		HIST	699	Ph.D. Dissertation	NC
HIST	641	Current Approaches in Historical Research	(3-0)3	HIST	800-899	Special Studies	(4-2)NC

Elective Courses

HIST	503	European and World History	(3-0)3	HIST	535	Seminar in the Development of the Concept Nationhood in History	(3-0)3
HIST	504	Ottoman and Turkish History	(3-0)3	HIST	536	Cultural Construction of Gender: Women in Central Asia and Turkey	(3-0)3
HIST	505	Ottoman Political and Administrative System I	(3-0)3	HIST	537	Institutional Structure of the Republic of Turkey I	(3-0)3
HIST	506	Ottoman Political and Administrative System II	(3-0)3	HIST	538	Institutional Structure of the Republic of Turkey II	(3-0)3
HIST	507	Ottoman Advanced Writing Techniques I	(3-0)3	HIST	541	Is the New World Order an (Dis)Order I?	(3-0)3
HIST	508	Ottoman Advanced Writing Techniques II	(3-0)3	HIST	542	Is the New World Order an (Dis)Order II?	(3-0)3
HIST	510	Women's Experience with Hierarchy along the Silk Road	(3-0)3	HIST	553	Lingua Latina I	(3-0)3
HIST	513	Social and Economic History of the Middle East	(3-0)3	HIST	554	Lingua Latina II	(3-0)3
HIST	514	History of the Middle Eastern Nation-States, 1920-1990	(3-0)3	HIST	546	Nationalism in the Balkans	(3-0)3
HIST	515	History of the Ottoman Press and Publications	(3-0)3	HIST	547	Readings in American Culture	(3-0)3
HIST	516	Looking into the History of Missionary Activities in the Ottoman Empire	(3-0)3	HIST	560	Ottoman Urban History	(3-0)3
HIST	520	Crisis and Change in Ottoman History (1300-1700)	(3-0)3	HIST	610	History of the Book and the Press	(3-0)3
HIST	521	Historical Features of the Turkish Revolution I	(3-0)3	HIST	615	Scholars and Authorship in Ottoman Historiography	(3-0)3
HIST	522	Historical Features of the Turkish Revolution II	(3-0)3	HIST	620	Graduate Seminar on Contemporary Turkish History	(3-0)3
HIST	525	Approaches in History: Selected Studies	(3-0)3	HIST	623	Graduate Seminar on Ottoman Social and Economic History	(3-0)3
HIST	526	Comparative Studies in Historical Sources: Selected Works	(3-0)3	HIST	625	Readings in Ottoman Archival Material	(3-0)3
HIST	529	Dawn of Anatolian Civilizations	(3-0)3	HIST	643	History and Philology: Readings in Central Asian Texts	(3-0)3
HIST	531	Emergence of Ottoman Modernization I	(3-0)3	HIST	653	Latin for Social Sciences	(3-0)3
HIST	532	Emergence of Ottoman Modernization II	(3-0)3	HIST	650-690	Independent Studies in History	(3-0)3
				HIST	699	Ph.D. Dissertation	NC
				HIST	800-899	Special Studies	(4-2)NC

HIST 610 History of the Book and the Press (3-0)3

This course aims to achieve two complementary goals. One is to acquaint the Ph.D. students with the history of the printing press as an agent of change both in European and Turkish contexts with due emphasis on its similar and dissimilar development trends and functions. The second goal is to survey the development of the Turkish periodical press *vis-à-vis* the European experience as an instrument of socio-cultural change with special emphasis on its utilization as source material in contemporary historical research.

HIST 615 Scholars and Authorship in Ottoman Historiography (3-0)3

This course is designed to acquaint graduate students with the issues and problems of Ottoman scholarship and authorship. Special attention will be given to the process of socialization and education of Ottoman scholars and scientists. Readings will focus on life stories of scholars and scientists in Ottoman sources. The social, political, and intellectual milieu of the respective time period will also be examined, leading to a contextualization of the sources as well as the authors.

HIST 620 Graduate Seminar on Contemporary Turkish History (3-0)3

This is a detailed study of political and socio-economic history of Turkey in the twentieth century. The course intends to provide the students with a critical analysis for the historical developments of the period as well as various approaches to the study of contemporary Turkish history.

HIST 623 Graduate Seminar on Ottoman Social and Economic History (3-0)3

This seminar is designed to train Ph.D. students in reading and analyzing Ottoman sources on social and economic life. Special documents will be chosen to illustrate aspects of urban life such as the organization of urban space, guilds and markets and urban-rural networks. Students will also focus on Ottoman court registers that illustrate "urban mentality."

HIST 625 Readings in Ottoman Archival Material (3-0)3

There are more than a million documents in the Ottoman Archives that are indispensable for a thorough study in Ottoman socio-economic history. The course will aim to familiarize students with the vast range of documents, and train them in using these documents for specific purposes and research.

HIST 640 Analysis of Historical Sources (3-0)3

The course is designed to train Ph.D. students in the analysis of sources ranging from Anatolia to Central Asia and from medieval to modern times. Special attention will be given to the intellectual environment in which the given political culture of a certain time period came into emergence. For pre-modern periods, readings will concentrate on "mirror of princes" literature, early Ottoman chronicles, the universalist historical literature of the 13th-14th centuries, and on the histories of the regional empires after the 16th century. Aspects of history in the modern age will be tackled through the eyes of foreigners by means of a wide range of travel literature.

HIST 641 Current Approaches in Historical Research (3-0)3

This course is an overview of the various theoretical approaches to the study of history. The emphasis will be given to recent and novel ways of understanding, interpreting and explaining both the past and the present. Selected material, preferably essays which build their analyses on comparative historical explanations, will be used to illustrate new theoretical approaches. An assessment of the utility, i.e., strengths and/or weaknesses, of these contemporary approaches will conclude the requirements of the course.

HIST 643 History and Philology: Readings in Central Asian Texts (3-0)3

This course aims at familiarizing the student with tools and methods of Central and Inner Asian texts of the past and the present. The sources of this region are in diverse languages. Readings will be geared towards the area of specialization of the student. One other language in addition to Ottoman Turkish will be useful. Texts will be both in original languages and/or in the form of translations. As an outcome the student is expected to acquire a contextualization of history on the basis of philological analysis.

HIST 653 Latin for Social Sciences (3-0)3

This course will provide the students with Latin especially for Social Sciences. The knowledge of basic Latin will be required since this course will cover readings of texts.

DEPARTMENT OF MATHEMATICS

PROFESSORS

AKHMET, Marat: B.S., Aktyubinak Pedagogical Ins.; Ph.D., Kiev University.
AKYILDIZ, Ersan ***(Dean of the Faculty of Arts and Sciences)***: B.S., METU; Ph.D., University of British Columbia.
ALPAY, Şafak: B.S., METU; M.S., Ph.D., University of London.
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EMEL'YANOV, Eduard: B.S., Khar'kov State University; M.S., Ph.D., Novosibirsk State University.
FINASHIN, Sergey: B.S., Ph.D. Leningrad State University.
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ÖZBUDAK, Ferruh: B.S., M.S., Ph.D., Bilkent University.
TAŞELİ, Hasan: B.S., M.S., Ph.D., İ.T.Ü.
TEZER, Cem: B.A., University of Cambridge; Ph.D., Heidelberg University.
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YURDAKUL, Murat: B.S., M.S., Ph.D., METU.
ZAFER, Ağacık: B.S., İ.T.Ü; M.S., Ph.D., Iowa State University.

ASSOCIATE PROFESSORS

BHUPAL, Mohan Lal: B.S., M.S., Ph.D., University of Warwick.
KAPTANOĞLU, Semra: B.S., M.S., METU; Ph.D., University of Wisconsin-Madison.
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MERDAN KAYA, Songül: B.S., M.S., Ankara University; Ph.D., Pittsburgh University.
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ASSISTANT PROFESSORS

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INSTRUCTORS

DOĞANAKSOY, Ali: B.S., İ.T.Ü.; M.S., Ph.D., METU.
TALU, Yasemin: B.S., M.S., Hacettepe University; Ph.D., Univ. of Aberdeen.
UĞUZ, Muhiddin ***(Vice Chair)***: B.S., METU; M.S., Michigan State University; Ph.D., METU.

GENERAL INFORMATION: Mathematics, apart from being an indispensable tool in many branches of science and technology, is a branch of science in itself which is also studied for its own sake to do research and to make new discoveries.

Besides giving service courses to almost all departments of the University, the Department of Mathematics offers undergraduate and graduate programs leading to B.S., M.S. and Ph.D. degrees. In view of the increasing importance of mathematics in many fields of science and technology, the Department also offers a double major program to students from other departments, which enables them to obtain a B.S. degree in mathematics in addition to the degree offered by their own departments.

One of the main objectives in the undergraduate program is to offer a well-balanced education in mathematics. With the purpose of maximizing flexibility and the number of options for a well-rounded development of students, the undergraduate curriculum contains a large number of electives. To complete the program leading to a B.S. degree, a student should complete courses summing up to 128 credit hours, 86 credit hours of which form the core program and are compulsory for all students. The remaining 42 credit hours must be elective courses, which are categorized as departmental and non-departmental. The departmental electives should sum up to 24 credit hours of which 12 credit hours should be selected from courses coded 400 or higher. A student should take 6 credit hours of non-departmental electives. The remaining 12 credit hours of electives are left to the student's interests.

Students from departments other than mathematics can enroll in the "Double Major Program in Mathematics". This program is designed for students of high standing and aims to give them a sufficient background in mathematics for their future studies and research. Upon the completion of the requirements, in addition to the degree offered by their own departments, the students receive "B.S in Mathematics".

The main objective of the graduate programs is to train highly qualified researchers in pure and applied mathematics. To complete the graduate programs leading to M.S. and Ph.D. degrees, students should fulfill the general requirements of the University for these degrees. Graduate courses in the following areas are offered in our department: Algebra, Analysis, Differentiable Manifolds, Theory of Functions of a Complex Variable, Numerical Analysis, Ordinary Differential Equations, Partial Differential Equations and Topology.

RESEARCH INTERESTS AND FACILITIES: Modern mathematics is not only the language of science but it also contains an enormous variety of subbranches and fascinating areas of research. In accordance with this, in the Department of Mathematics, research activities are conducted in a broad variety of areas, from the most theoretical branches to the highly computational and applied ones. The general areas of current research interests in the department include Algebra, Functional and Real Analysis, Analysis, Complex Analysis, Geometry, Topology, Ordinary Differential Equations, Partial Differential Equations, and Numerical Analysis. There are contacts and connections with several important scientific centers in the world, and there is a considerable amount of collaboration in addition to individual research.

In the department there is a computer laboratory for the students consisting of 40 PC's. There is a PC in each office. Also, printers and scanners are available for faculty use.

Computers in the department carry a subscription to the American Mathematical Society, so that faculty members have access to AMS archives.

Faculty members of the Department have access to various mathematical packages (MATHEMATICA, MATLAB, REDUCE, DERIVE, UNPACK, GAP, NAG, etc.) to supplement education and research

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
MATH	111	Fundamentals of Mathematics	(3-0)3	MATH	112	Introductory Discrete Math.	(3-0)3
MATH	115	Analytic Geometry	(3-0)3	MATH	116	Basic Algebraic Structures	(3-0)3
MATH	153	Calculus for Mathematics Students I	(4-2)5	MATH	154	Calculus for Mathematics Students II	(4-2)5
PHYS	111	Physics I (Mechanics)	(4-2)5	PHYS	112	Physics II (Electricity and Magnetism)	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4	ENG	102	English for Academic Purposes II	(4-0)4
				IS	100	Introduction to Information Technologies and Application	

SECOND YEAR

Third Semester				Fourth Semester			
MATH	251	Advanced Calculus I	(4-0)4	MATH	252	Advanced Calculus II	(3-2)4
MATH	261	Linear Algebra I	(4-0)4	MATH	254	Differential Equations	(4-0)4
CENG	230	Introduction to C Programming	(2-2)3	MATH	262	Linear Algebra II	(4-0)4
ENG	211	Academic Oral Presentation Skills	(3-0)3	HIST	2202	Principles of Kemal Atatürk II	NC
HIST	2201	Principles of Kemal Atatürk I	NC	A non-departmental elective			(3-0)3

THIRD YEAR

Fifth Semester				Sixth Semester			
MATH	349	Int. to Math. Analysis	(4-0)4	MATH	358	Partial Diff. Equations	(4-0)4
MATH	353	Complex Calculus	(4-0)4	MATH	371	Differential Geometry	(4-0)4
MATH	367	Abstract Algebra	(4-0)4	A departmental elective			(3-0)3
A departmental elective			(3-0)3	A free elective			(3-0)3
TURK	303	Turkish I	NC	TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester		Eighth Semester	
A departmental elective	(3-0)3	A departmental elective	(3-0)3
A departmental elective	(3-0)3	A departmental elective	(3-0)3
A departmental elective	(3-0)3	A departmental elective	(3-0)3
A free elective	(3-0)3	A free elective	(3-0)3
A non-departmental elective	(3-0)3	A free elective	(3-0)3

Departmental Elective: Courses offered by the mathematics department except MATH 223, MATH 321, MATH 387, MATH 388, MATH 395, MATH 396, MATH 470, MATH 486 are defined as departmental electives

DESCRIPTION OF UNDERGRADUATE COURSES

MATH 111 Fundamentals of Mathematics (3-0)3

Symbolic logic. Set theory. Cartesian product. Relations. Functions. Injective, surjective and bijective functions. Composition of functions. Equipotent sets. Countability of sets. More about relations: equivalence relations, equivalence classes and partitions. Quotient sets. Order relations: partial order, total order, well ordering. Mathematical induction and recursive definitions of functions.

MATH 112 Introductory Discrete Mathematics (3-0)3

Basic counting: the sum and product rules, the pigeonhole principle, generalized permutations and combinations. The binomial theorem. Discrete probability. Inclusion-exclusion. Recurrence relations. Introduction to graphs and trees.

MATH 115 Analytic Geometry (3-0)3

Fundamental principles of Analytic Geometry. Cartesian coordinates in plane and space. Lines in the plane. Review of trigonometry and polar coordinates. Rotation and translation in the plane. Vectors in plane and space. Lines and planes in 3-space. Basics about conics. Basic surfaces in space, cylinders, surfaces of revolution, quadric surfaces. Cylindrical and spherical coordinates.

MATH 116 Basic Algebraic Structures (3-0)3

Binary operations. Groups. The symmetric group. Subgroups. The order of an element. Cyclic groups. Rings. Integral domains. Subrings. Ideals. Fields: $\mathbf{Q}$, $\mathbf{R}$, $\mathbf{C}$, $\mathbf{Z}_p$. The concept of an isomorphism. The ring of integers and the ring of polynomials over a field: Division and Euclidean algorithms. GCD and LCM. Prime factorization. Quotient structures.

MATH 117 Calculus I (4-2)5

Functions and their graphs. Limits and continuity. Tangent lines and derivative. Chain rule. Implicit differentiation. Inverse functions. Related rates. Linear approximation. Extreme values. Mean Value Theorem and its applications. Sketching graphs. L'Hospital's rules. Exponential growth and decay. Definite integral. Fundamental Theorem of Calculus. Substitution and areas between curves. Formal definition of natural logarithm function.

MATH 118 Calculus II (4-2)5

Indefinite integral. Techniques of integration. Arc length. Volumes and surface areas of solids of revolution. Improper integrals. Sequences and infinite series. Power series. Taylor series. Vectors and analytic geometry in 3-space. Functions of several variables: Limits, continuity. Partial derivatives, chain rule, directional derivatives, tangent plane and linear approximations. Extreme values. Lagrange multipliers. Double integrals.
Prerequisite: MATH 117

MATH 119 Calculus with Analytic Geometry (4-2)5

Functions, limits, continuity and derivatives. Applications. Extreme values, the Mean Value Theorem and its aplications. Graphing. The definite integral. Area and volume as integrals. Indefinite integral. Transcendental functions and their derivatives. L`Hopital`s rule. Techniques of integration. Improper integrals. Applications. Arc length. Parametric curves. Polar coordinates.

MATH 120 Calculus of Functions of Several Variables (4-2)5

Sequences, infinite series, power series, Taylor series. Vectors, lines and planes in space. Functions of several variables: limit, continuity, partial derivatives, the chain rule, directional derivatives, tangent plane approximation and differentials, extreme values, Lagrange multipliers. Double and triple integrals with applications. The line integral. Green's Theorem.
Prerequisite: MATH 119

MATH 125 Basic Mathematics I (3-2)4

Logic. Relations and Functions. Matrices and determinants. Inverse of a matrix, matrix polynomials, Cayley-Hamilton Theorem. Systems of linear equations, parametric solutions. Counting: principle of inclusion exclusion, pigeonhole principle. Mathematical induction, recursive relations. Permutations, combinations. Discrete probability. Graphs.

MATH 126 Basic Mathematics II (3-2)4

Analytic Geometry in $\mathbf{R}^2$, $\mathbf{R}^3$. Functions of one and several variables: Limit, continuity and differentiation. Chain rule, implicit differentiation. Differential calculus, optimization, Lagrange multipliers. The definite integral. The indefinite integral. Logarithmic and exponential functions. Techniques of integration: integration by substitution, integration by parts, integration by partial fractions.

MATH 153 Calculus for Mathematics Students I (4-2)5

Functions, limit and derivative of a function of a single variable. A thorough discussion of the basic theorems of differential calculus: Intermediate

Value, Extreme Value, and the Mean Value Theorem. Applications: graph sketching and problems of extrema.

MATH 154 Calculus for Mathematics Students II (4-2)5
The Riemann Integral. Mean Value Theorem for integrals. Fundamental Theorem of Calculus. Techniques to evaluate anti-derivative families, various geometric and physical applications. Sequences, improper integrals, infinite series of constants, power series and Taylor series with applications.
Prerequisite: MATH 153

MATH 201 Elementary Geometry (3-0)3
Introduction to the axiomatic structures in geometry; finite geometries, Euclidean and non-Euclidean geometries. Studies in geometry and trigonometry including polygons, similar figures, geometric solids, properties of circles, constructions, right triangles, angle measurement in radians and degrees, trigonometric functions and their applications to right triangles, Pythagorean Theorem, laws of sine and cosine, graphing trigonometric functions, trigonometric identities, vectors and coordinate conversions.

MATH 219 Introduction to Differential Equations (4-0)4
First order equations and various applications. Higher order linear differential equations. Power series solutions. The Laplace transform; solution of initial value problems. Systems of linear differential equations. Introduction to partial differential equations.
Prerequisite: MATH 120

MATH 223 Introduction to Object Oriented Programming and C++ (3-0)3
Programming paradigms, object orientation from C to C^{++}, reference variables, iostream methods, default function arguments, function overloadings and template, dynamic memory allocation, classes, constructors, destructors and manipulators, operator overloading, single and multiple inheritance advanced I/O.
Prerequisite: CENG 230

MATH 250 Advanced Calculus in Statistics (4-2)5
Review of multidimensional calculus. Derivatives of multivariable functions, continuity of multivariable functions. Fundamental Lemma for differentiability. Chain rule and Taylor's Theorem for multivariable functions. Jacobian. Inverse and Implicit Function Theorems. Topology of $\mathbf{R}^2$ and $\mathbf{R}^3$. Riemann-Stieltjes integral, integrability. Integrability of continuous functions, sequences of integrable functions. Bounded convergence and Riesz representation theorems. Theorems of integral calculus: Integration in cartesian spaces. Improper and infinite integrals. Series of functions.
Prerequisite: MATH 120

MATH 251 Advanced Calculus I (4-0)4
Topology of $\mathbf{R}$, $\mathbf{R}^2$ and $\mathbf{R}^3$. Functions of several variables; limits and continuity. Partial derivatives, directional derivatives, gradients. Differentials and the tangent plane: the Fundamental Lemma, approximations. The Mean Value, Implicit and Inverse Function Theorems. Extreme values. Introduction to vector differential calculus: the gradient, divergence and curl. Curvilinear coordinates.
Prerequisite: MATH 154

MATH 252 Advanced Calculus II (3-2)4
Double integrals, polar coordinates. Improper double integrals. Change of variables in double integrals. Triple integrals: Cylindrical and spherical coordinates. Applications. Line integrals: Parametrisation of curves, Green's Theorem. Independence of path, exact differentials. Parametrisation and orientation of surfaces. Surface integrals. Divergence and Stokes' Theorems, applications.
Prerequisite: MATH 251

MATH 254 Differential Equations (4-0)4
Existence and uniqueness theorems. First order equations. Trajectories. Higher order linear equations; undetermined coefficients, variation of parameters and operator methods. Power series solutions. Laplace transform solutions of IVP's. Theory of linear systems. Solutions by operator, Laplace and linear algebra methods. Partial differential equations, separation of variables and Fourier series.
Prerequisites: MATH 154 and MATH 261

MATH 260 Basic Linear Algebra (3-0)3
Matrices, determinants and systems of linear equations. Vector spaces, the Euclidean space, inner product spaces, linear transformations. Eigenvalues, diagonalization.

MATH 261 Linear Algebra I (4-0)4
Matrices and systems of linear equations. Vector spaces; subspaces, sums and direct sums of subspaces. Linear dependence, bases, dimension, quotient spaces. Linear transformations, kernel, range, isomorphism. Spaces of linear transformations, Hom (V,W),V^*, V^{**} transpose. Representations of linear transformations by matrices, similarity. Determinants.

MATH 262 Linear Algebra II (4-0)4
Characteristic and minimal polynomials of an operator, eigenvalues, diagonalizability, canonical forms, Smith normal form, Jordan and rational forms of matrices. Inner product spaces, norm and orthogonality, projections. Linear operators on inner product spaces, adjoint of an operator, normal, self adjoint, unitary and positive operators. Bilinear and quadratic forms.
Prerequisite: MATH 261

MATH 301 Introduction to Probability Theory (3-0)3
Events and probability. Combinatorial problems. Independence and conditional probability. Measure theoretical approach to probability. Random variables and distribution functions. Marginal distributions and conditional distributions. Moments and characteristic functions. Convergence of random variables. Law of large numbers.
Prerequisite: MATH 252 or Math 120.

MATH 303 History of Mathematical Concepts I (3-0)3
Mathematics in Egypt and Mesopotamia, Ionia and Pythagoreans, paradoxes of Zeno and the heroic age. Mathematical works of Plato, Aristotle, Euclid of Alexandria, Archimedes, Appolonius and Diophantus. Mathematics in China and India.
Prerequisite: Consent of the instructor.

MATH 304 History of Mathematical Concepts II (3-0)3
Mathematics of the Renaissance, Islamic contributions. Solution of the cubic equation and consequences. Invention of logarithms. Time of Fermat and Descartes. Development of the limit concept. Newton and Leibniz. The age of Euler. Contributions of Gauss and Cauchy. Non-Euclidean geometries. The arithmetization of analysis. The rise of abstract algebra. Aspects of the twentieth century.
Prerequisite: Consent of the instructor.

MATH 319 Lebesgue Integral (3-0)3
Review of Riemann integration. Sets of (Lebesgue) measure zero in $\mathbf{R}^n$ and characterization of Riemann integrable functions. Lebesgue integrable functions and the Lebesgue integral in $\mathbf{R}^n$. Convergence theorems, theorems of Lusin and Egorov. Fubini's Theorem. Selected applications.
Prerequisite: MATH 252

MATH 320 Set Theory (3-0)3
Language and axioms of set theory. Ordered pairs, relations and functions. Order relation and well ordered sets. Ordinal numbers, transfinite induction, arithmetic of ordinal numbers. Cardinality and arithmetic of cardinal numbers. Axiom of choice, generalized continuum hypothesis.
Prerequisite: Consent of the instructor.

MATH 321 Automata and Languages (3-0)3
Automata, finite state automata. Minimal and reduced automatas, transformation monoid. Languages, phrase structure grammars, regular and rational languages, context free languages. Varieties, *F*-varieties, star free languages and aperiodic monoids.
Prerequisite: Consent of the instructor.

MATH 341 Graph Theory (3-0)3
Graphs, varieties of graphs, connectedness, extremal graphs, blocks, trees, partitions, line graphs, planarity, Kuratowsky's Theorem, colorability, chromatice numbers, Five Color Theorem, Four Color Conjecture.
Prerequisite: Consent of the instructor.

MATH 344 Introduction to Universal Algebra (3-0)3
Lattices: distributive and modular lattices, complete and algebraic lattices, Boolean lattices. Semigroups: Green's equivalence, semilattice decomposition, completely simple semigroups. Universal algebra: algebraic lattices and subinverse, congruence and quotients algebras, free algebras.
Prerequisite: Consent of the instructor.

MATH 349 Introduction to Mathematical Analysis (4-0)4
LUB Property of real numbers. Metric spaces, limit and continuity of functions between metric spaces. Completeness, compactness, connectedness, Banach's Fixed Point Thm, Baire's Category Thm, Arzela-Ascoli Thm. Sequences and series of functions, uniform convergence, applications.
Prerequisite: MATH 252

MATH 350 Differential Equations II (3-0)3
Existence and uniqueness theorems for IVP; first order equations, systems and higher order equations. Structure of linear problems. Boundary value problems and eigenvalue problems. Oscillation and comparison theorems.
Prerequisite: MATH 254 or Math 219

MATH 353 Complex Calculus (4-0)4
Algebra of complex numbers. Polar representation. Analyticity. Cauchy-Riemann equations. Power series. Elementary functions. Mapping by elementary functions. Linear fractional transformations. Line integral. Cauchy Theorem. Cauchy integral formula. Taylor series. Laurent series. Residues. Residue theorem. Improper integrals.
Prerequisite: MATH 252

MATH 355 Operational Calculus (3-0)3
Fourier series. The Fourier transform, inverse Fourier transform. The Laplace transform. The inversion integral for the Laplace transform (complex contour integration). Applications of Laplace transform to linear ordinary, partial differential and integral equations. The *z*-transform. The inversion integral for the *z*-transform. Applications of *z*-transform to difference equations and linear networks.
Prerequisite: Consent of the instructor.

MATH 358 Partial Differential Equations (4-0)4
First order equations; linear, quasilinear and nonlinear equations. Classification of second order linear partial differential equations, canonical forms. The Cauchy problem for the wave equation. Dirichlet and Neumann problems for the Laplace equation, maximum principle. Heat equation on the strip.
Prerequisites: MATH 252 and, MATH 254 or Math 219

MATH 365 Elementary Number Theory I (3-0)3
Divisibility, congruences, Euler, Chinese Remainder and Wilson's Theorems. Arithmetical functions. Primitive roots. Quadratic residues and quadratic reciprocity. Diophantine equations.
Prerequisite: Consent of the instructor.

MATH 366 Elementary Number Theory II (3-0)3
Arithmetic in quadratic fields. Factorization theory. Continued fractions, periodicity. Transcendental numbers.
Prerequisite: Consent of the instructor.

MATH 367 Abstract Algebra (3-2)4
Groups. Isomorphism theorems, direct products. Groups acting on sets. Class equation. Statements of Sylow Theorems and the F.T. on finite abelian groups. Rings, isomorphism theorems. Prime and maximal ideals. Integral domains, field of fractions. Euclidean domains, PIDs, UFDs. Polynomials, polynomials in several variables. Field extensions. Impossibility of certain geometric constructions. Finite fields.
Prerequisite: MATH 116 or consent of the Department.

MATH 368 Field Extensions and Galois Theory (3-0)3
Field extensions, splitting field of a polynomial, multiple roots, Galois group, criteria for solvability by radicals, Galois group as permutation groups of the roots of polynomials of degree n, constructible n-gons, transcendence of *e*, finite fields.
Prerequisite: MATH 367 or consent of the instructor.

MATH 371 Differential Geometry (4-0)4
Curves in $\mathbf{R}^3$: Frenet formulas and Fundamental Theorem. Regular surfaces. Inverse image of regular values. Differentiable functions on surfaces. Tangent plane; the differential of a map, vector fields, the first fundamental form. Gauss map, second fundamental form, normal, principal curvatures, principal and asymptotic directions. Gauss map in local coordinates. Covariant derivative, geodesics.
Prerequisites: MATH 251 and MATH 261

MATH 373 Geometries I (3-0)3
Foundations: The parallel axiom, models, Hilbert's Theorem. Triangles: Theorems of Menelaus and Ceva, classical remarkable points. Circles: Power of a point with respect to a circle, coaxal systems of circles, inversive geometry. Conic sections: Focus and directrix, reflection property, theorems of Poncelet.
Prerequisite: Consent of the instructor.

MATH 374 Geometries II (3-0)3
Projective spaces over division rings. Theorems of Desargues and Pappus. Harmonic ranges and pencils, collineations, correlations, involutions, polarities. Affine geometry via "the line at infinity". Euclidean geometry with "circular points at infinity". Conic sections and quadric surfaces.
Prerequisite: MATH 373

MATH 375 Periodic Distributions and Fourier Series (3-0)3
Properties of periodic functions, convolution, approximation, Weierstrass Approximation Theorem. Periodic distributions, operations on periodic distributions. Hilbert spaces, L^2, orthogonal expansions, Fourier series. Applications of Fourier series.
Prerequisite: MATH 349

MATH 381 Numerical Analysis I (3-0)3
Convergence, stability, error analysis and conditioning. Solving systems of linear equations: The LU and Cholesky factorization, pivoting, error analysis in Gaussian elimination. Matrix eigenvalue problem, power method, orthogonal factorizations and least squares problems. Solutions of nonlinear equations. Bisection, Newton's, secant and fixed point iteration methods.
Prerequisites: CENG 230 and MATH 262/ CENG 230 and MATH 260

MATH 382 Numerical Analysis II (3-0)3
Approximating functions: polynomial interpolation, divided differences, Hermite interpolation, spline interpolation, the *B*-splines, Taylor Series, least square approximation. Numerical differentiation and integration based on interpolation. Richardson extrapolation, Gaussian quadrature, Romberg integration, adaptive quadrature, Bernoulli polynomials and Euler-Maclaurin formula.
Prerequisite: MATH 381

MATH 385 Special Functions of Applied Mathematics I (3-0)3
Gamma and Beta functions. Pochhammer's symbol. Hypergeometric series. Hypergeometric differential equation; ordinary and confluent hypergeometric functions. Generalized hypergeometric functions; the contiguous function relations. Bessel function; the functional relationships, Bessel's differential equation. Orthogonality of Bessel functions.
Prerequisite: MATH 254 or MATH 219 or consent of the instructor.

MATH 386 Special Functions of Applied Mathematics II (3-0)3
Legendre functions: Generating Function of Legendre polynomials. Recurrence relations, series of Legendre polynomials. Legendre differential equation. Associated Legendre functions. Hermite polynomials. Recurrence relations. Hermite's differential equations. Laguerre functions, Laguerre differential equations, associated Laguerre polynomials.
Prerequisite: Consent of the instructor.

MATH 387 Advanced Object Oriented Programming (3-0)3
Further features of the C^{++} Language and principles of object oriented programming, including dynamic data-structures, stream input and output, encapsulation, inheritance, polymorphism, and further C^{++} language constructs. Some object-oriented design and analysis models and methodology. Covers, case studies of OOP in mathematics.
Prerequisite: MATH 223

MATH 388 Data Structures (3-0)3
Review of stacks, queues, linked lists. Algorithms for searching and sorting. More complicated data structures such as multi-linked lists, trees, graphs.
Prerequisite: MATH 387 or the consent of the instructor.

MATH 390 Computer Algebra (3-0)3
Introductory information about reduce. Structure of programs, built in prefix operators. Procedures. A computer algebra system. How to use a computer algebra systems. Representations of polynomials, rational functions, algebraic functions, matrices and series. Advanced algorithms. g.c.d. in several variables. Other applications of modular methods. P-adic methods. Formal integration and differential equations.
Prerequisite: Consent of the instructor.

MATH 395 Symbolic Programming Languages (Prolog) (3-0)3
An overview of Prolog. Syntax and meaning of Prolog programs. Lists, operators and arithmetic structures. Controlling, backtracking, unification. Input and output. More built-in procedures. Programming style and techniques. Recursion. Operators on data structures. Advanced tree representations.
Prerequisite: CENG 230

MATH 396 Artificial Intelligence and Applications (3-0)3
Basic problem-solving strategies. A heuristic search principle. Problem reduction and AND/OR graphs. Expert systems and knowledge representation. An expert system shell. Planning. Language processing with grammar rules. Machine learning. Game playing. Logic and uncertainty. Meta programming.
Prerequisite: Consent of the instructor.

MATH 400 Basic Distribution Theory (3-0)3
Test functions. Spaces *E, D, S* and their duals. Differentiation, localization, convolution. Fourier transform. Supports and singular supports. Kernels and tensor products. Homogeneous distributions. Fundamental solutions of differential operators. Outline of distribution theory on manifolds.
Prerequisite: MATH 319

MATH 401 Probability Theory (3-0)3
Events and probability. Combinatorial problems and equally likely events. Probability spaces. Independence and finite product spaces. Random variables and distribution functions. Integration of random variables. L_p - spaces. Convergence of random variables. Conditional expectation. Canonical space of a stochastic process. Markov chains. Martingales.
Prerequisite: Consent of the instructor.

MATH 402 Introduction to Optimization (3-0)3
The importance of optimization, basic definition and facts on convex analysis. Theory of linear programming and convex programming, simplex method and its applications, nonlinear programming, search methods, basic ideas of classical variational calculus, optimal control

theory. Pontryagin's maximum principle and dynamic programming, linear theory of optimal control.
Prerequisite: Consent of the instructor.

MATH 403 Foundations of Mathematics (3-0)3
Apriosits program, mathematical empiricism, scientific and mathematical change, formalists, intuitionists, constructivist and logicist views.
Prerequisite: Consent of the instructor.

MATH 404 Introduction to Vector Lattices and Applications (3-0)3
Riesz spaces (vector lattices). Riesz subspaces, ideals and bands. Normed Riesz spaces. Order convergence, relatively uniform convergence and norm convergence. Operators on Riesz spaces.
Prerequisite: Consent of the instructor.

MATH 405 Combinatorics (3-0)3
Basic counting: permutations, r-permutations, combinations, multinomial coefficients, occupancy problems, good algorithms,. Generating functions: power series, operating on generating functions, applications to counting, binomial theorem, exponential generating functions, probability generating functions. Recurrence relations: simple recurrences, linear recurrence relations, characteristic equations, solving recurrences using generating functions, simultaneous equations, recurrences involving convolutions. Divide and conquer algorithms. Experimental design: Blockdesign, balanced incomplete blockdesign. Applications: coding theory, Hadamard designs.
Prerequisite: Consent of the instructor.

MATH 406 Introduction to Mathematical Logic and Model Theory (3-0)3
First order language, structures and satisfaction. Completeness and compactness theorems. Isomorphism, elementary equivalence and elementary imbedding. Löwenheim-Skolem Theorem. Interpolation and definability. Atomic, universal and saturated models and their characterisation. Extensions of first order logic.
Prerequisite: Consent of the instructor.

MATH 407 Introduction to Game Theory (3-0)3
Strategic games, Nash equilibrium, Bayesian games, mixed, correlated, evolutionary equilibrium, extensive games with perfect information, bargaining games, extensive games with imperfect information, sequential equilibrium, coalition games, core, stable sets, bargaining sets, shapley value, market games.

MATH 410 Modeling Mathematical Methods and Scientific Computing (2-2)3
Introduction to numerical and symbolical computational tools. Balance equations, continuos system models and partial differential equations. Introduction to numerical methods for ordinary and partial differential equations. Case studies from mechanics, fluid dynamics, heat and mass transfer, electrical engineering. Introduction to stochastic process and differential equations. Models from mathematical finance.

*Prerequisite: Consent of the Department***.**

MATH 420 Elementary Point Set Topology (3-0)3
Topological Spaces; basis, subbasis, subspaces. Closed sets, limit points. Hausdorff spaces. Continuous functions, homeomorphisms. Product topology. Connected spaces, components, path connectedness, path components. Compactness, sequential compactness, compactness in metric spaces. Definition of regular and normal spaces. Urysohn's Lemma, Tietsze Extension Theorem.
Prerequisite: MATH 251

MATH 422 Elementary Geometric Topology (3-0)3
Topology of subsets of Euclidean space. Topological surfaces. Surfaces in $\mathbf{R}^n$. Surfaces via gluing, connected sum and the classification of compact connected surfaces. Simplicial complexes and simplicial surfaces (simplicial complexes with underlying spaces that are topological surfaces). Euler characteristic.
Prerequisite: MATH 252 or consent of the instructor.

MATH 441 Mechanics I (3-0)3
Statics of rigid bodies, statics of suspended strings and cables. Kinematics of a particle. Translation, rotation of rigid body about an axis and about a fixed point, relative motion. Dynamics of a particle, harmonic oscillators, motion of a simple pendulum, flight of a projectile, motion under the action of central forces. Dynamics of a system of particles, motion of a body with varying mass.
Prerequisite: Consent of the Department.

MATH 442 Mechanics II (3-0)3
Analytical statics; principle of virtual work; Lagrange's equation of first and second-kind; Hamilton's canonical equations; variational principles of mechanics; Poisson brackets, canonical transformations and generating functions; the Hamilton-Jacobi equation; Completely integrable systems; canonical perturbation theory; Kolmo-

gorov-Moser-Arnolds Theorems. Fundamentals of continuum mechanics.
Prerequisite: Consent of the Department.

MATH 444 Topics in Universal Algebra (3-0)3
Primal Algebras: Maltsev Conditions. Characterisation of finite primal algebras. Term conditions and commutator. Characterisation of abelian algebras. Generalized term conditions. Finite Algebras (Tame congruence theory): Minimal algebras. Induced algebras. α-minimal sets. Trace algebras. Tame congruences. Types of minimal algebras.
Prerequisite: Consent of the instructor.

MATH 450 Potential Theory in The Complex Plane (3-0)3
Harmonic functions, subharmonic functions. Potential Theory. The Dirichlet problem. Capacity. Some applications.
Prerequisite: MATH 353

MATH 452 Introduction to Functional Analysis (3-0)3
Normed linear spaces, Banach spaces. Hahn-Banach Theorem and consequences. Baire Category Theorem. Uniform boundedness principle. Open Mapping and Closed Graph Theorems. Selected topics and applications.
Prerequisite: Consent of the instructor.

MATH 453 Introduction to Complex Analysis (3-0)3
Riemann Mapping Theorem and Schwarz-Christofel transformations z^n, $z^{1/n}$. Elementary Riemann surfaces. Applications of conformal mapping: (flows, heat conduction, electrostatistics,...) Analytic continuation. Argument principle, Rouche's Theorem. Mapping properties of analytic functions (Inverse Function Theorem, Open MappingTheorem).
Prerequisite: MATH 353.

MATH 454 Geometric Complex Analysis (3-0)3
Cauchy Theorem; maximum and argument principle; normal families; Riemann Mapping Theorem; isolated singularities. Riemannian metrics; Poincare metric; Curvature; Liouville Theorem; spherical metric; Montel, Picard Theorems. Caratheodory; Kobayashi metric; automorphisms of domains; hyperbolicity. Functions of several variables; ball and polydisc; their inequivalence.
Prerequisite: MATH 353

MATH 456 Fourier Analysis and Wavelets (3-0)3
Orthogonality and modes of convergence. Fourier series, convergence of Fourier series, Fourier transform, Fourier inversion, discrete Fourier transform. Haar and Daubechies wavelets, decomposition and reconstruction, multiresolution analysis. Applications.
Prerequisite: MATH 349 or consent of the instructor.

MATH 457 Calculus on Manifolds (3-0)3
Review of differentiation, Inverse and Implicit Function Theorems, integration on subsets of Euclidean space, tensors, differential forms, integration on chains, integration on manifolds. Stokes' Theorem.
Prerequisites: MATH 252 and MATH 262

MATH 461 Rings and Modules (3-0)3
Classical theory of rings, ideal theory, isomorphism theorems. The group ring. Localization. Submodules, direct products, direct sums, factor modules and factor rings. Homomorphisms. Classical isomorphism theorem. The endomorphism ring of a module. Free modules, free and divisible abelian groups. Tensor product of modules. Finitely generated modules over principal ideal domains.
Prerequisite: MATH 367 or consent of the instructor.

MATH 463 Introduction to Group Theory (3-0)3
Group, subgroup, normal subgroup, cyclic subgroup, coset, quotient group. Commutator subgroup, center, homomorphism and isomorphism theorems (invariant subgroup, wreath products), Abelian groups. Free abelian group, rank of an abelian group. Divisible abelian group, periodic Abelian group. Sylow Theorems and their applications, solvable groups, nilpotent groups.
Prerequisite: MATH 367 or consent of the instructor.

MATH 464 Introduction to Representation Theory (3-0)3
Group representations, *FG*-Modules, Machke Theorem, irreducible modules and group algebras, characters, inner products of characters, the number of irreducible characters, character table, induced modules and characters, algebraic integers and real representations.
Prerequisite: MATH 367 or consent of the instructor.

MATH 466 Groups and Geometry (3-0)3
Symmetry. Isometrics of $\mathbf{R}^n$, the Euclidean group, symmetry groups of regular polygons and

polyhedra, classification of finite subgroups of the three dimensional rotation group. Frieze groups, crystals, wallpaper groups, groups of acting on trees. Reflection groups, root systems, classification of finite reflection groups, crystallographic root systems and Weyl groups.
Prerequisite: MATH 367

MATH 470 File Structures (3-0)3
Update, merge and sort algorithms for sequential files. Direct access files with hashing. Indexed sequential files. Multikey organization. Operations involving data from several files.
Prerequisite: MATH 387 or consent of the instructor.

MATH 471 Hyperbolic Geometry (3-0)3
Parallel postulate and the need for non-Euclidean geometry, models of the hyperbolic plane, Möbius group, classification of Möbius transformations, classical geometric notions such as length, distance, isometry, parallelism, convexity, area, trigonometry in the hyperbolic plane, groups acting on the hyperbolic plane, fundamental domains.
Prerequisite: MATH 252

MATH 473 Ideals, Varieties and Algorithms (3-0)3
Affine varieties. Groebner bases, monomial ideals and Dickson's Lemma, Hilbert Basis Theorem. Buchberger's algorithm. Ideal membership problem. The problem of elimination theory. Unique factorization and resultants. Resultant and extension theorem.
Prerequisite: MATH 367

MATH 474 Introduction to Computational Algebraic Geometry (3-0)3
Hilbert's Nullstellensatz, the ideal-variety correspondence. Zariski closure, irreducible varieties and prime ideals, projective varieties. The projective closure of an affine variety, projective elimination theory. The geometry of quadric hypersurfaces. The dimension of a variety; the variety of a monomial ideal, the complement of a monomial ideal. The Hilbert function. Nonsingularity, the tangent cone.
Prerequisite: MATH 473 or consent of the Instructor.

MATH 476 Algebraic Curves (3-0)3
Affine and projective plane curves, local properties of plane curves, multiple points, intersection numbers, Bezout's Theorem, Noether's Fundamental Theorem. Applications to some enumerative geometry problems.
Prerequisites: MATH 367 and MATH 353

MATH 478 Mathematical Aspects of Cryptography (3-0)3
Time estimates for doing arithmetic, some simple cryptosystems, the idea of public key cryptosystems, RSA, discrete log, knapsack, primality and factoring, the rho method, Fermat factorization, the continued fraction method.
Prerequisite: MATH 365 or consent of the instructor.

MATH 480 Numerical Methods for Differential Equations (3-0)3
Initial value problems for ordinary differential equations. Convergence, stability, stiffness, predictor-corrector methods, boundary value problems, hyperbolic and elliptic differential equations. Iterative methods.
Prerequisite: Consent of the instructor.

MATH 484 Complexity of Algorithms (3-0)3
Recursive algorithms: Quicksort, recursive graph algorithms, fast matrix multiplication, the discrete Fourier transform. *NP*-complete problems: Turing machines, network flow problems. Information based complexity: complexity of numerical algorithms (Newton's method, interpolation, integration, solution of linear equations).
Prerequisite: Consent of the instructor.

MATH 486 Fundamentals of Database Systems (2-2)3
Database concepts. Database Management Systems (DBMS). Relational data model and relational DBMS. Use of ER-diagrams in database design. Normalizing relations. Relational algebra and query languages. Structured query language (SQL). Oracle and/or access will be introduced in a laboratory environment.
Prerequisite: Consent of the instructor.

MATH 487 Applied Mathematics I (3-0)3
Mathematical modelling of boundary value problems of partial differential equations. Formulation of Dirichlet and Neumann problems. Green's function. Asymptotic analysis of solutions. Perturbation techniques.
Prerequisite: MATH 358 or consent of the instructor.

MATH 488 Applied Mathematics II (3-0)3
Introduction to integral equations. Volterra and Fredholm equations. Solutions by Neumann series. Connection with eigenvalue problems. Essentials of calculus of variations, Euler-Lagrange equations, canonical form of the Euler equation, applications to mechanics and mathematical physics.
Prerequisite: MATH 358

MATH 489 Dynamical Systems (3-0)3
Second order differential equations in phase plane. Linear systems and exponential operators, canonical forms. Stability of equilibria. Lyapunov functions. The existence of periodic solutions. Applications to various fields.
Prerequisite: MATH 261 or consent of the Department.

MATH 490 Difference Equations (3-0)3
The Difference calculus. Linear difference equations: First order equations, high order equations. Systems of difference equations. Basic theory. Linear periodic systems. Stability theory. Linear approximation. Lyapunov's second method. The *z*-transform. Asymptotic behaviour of difference equations. Sturmian theory. Oscillation.
Prerequisite: Consent of the instructor.

MATH 492 Numerical Optimization (3-0)3
Unconstrained optimization: Optimality conditions, convexity and geometric programming, gradient descent, Newton's method, quasi-Newton and conjugate gradient methods. Constrained optimization: Karucsh-Kuhn-Tucker theory, second-order conditions, equality and inequality constrains. Linear programming: Optimality and quality, basics of the simplex method and interior-point methods.
Prerequisite: MATH 261 or consent of the instructor.

MATH 493 Philosophy of Mathematics (3-0)3
Philosophical problems about mathematics, Euclidean and non-Euclidean geometries. The existence of mathematical objects, mathematical truth, Wittgenstein and Lakatos on mathematics.
Prerequisite: Consent of the instructor.

MATH 494 The Design of Mathematical Software (3-0)3
The principals of software engineering with special emphasis on mathematical software. (By way of class examples, laboratories and/or term projects students will see two or three small software packages evolve through the stages of specification, design, implementation and testing.)
Prerequisite: MATH 387 or consent of the instructor.

MATH 496 Supervised Independent Study and Research (2-0)2
Individualized reading, and study/research in mathematics for students of high intellectual promise.
Prerequisite: Consent of the department and the instructor.

MATH 497 Hilbert Space Techniques (3-0)3
Inner product spaces. Examples of inner product spaces; Hilbert spaces (definition and examples); convergence in Hilbert spaces; orthogonal complements and the projection theorem; linear functionals and the Riesz Representation Theorem; compact operators and elementary spectral analysis applications to various branches of Mathematics.
Prerequisite: MATH 349

GRADUATE PROGRAMS AT THE DEPARTMENT OF MATHEMATICS

GRADUATE CURRICULUM

M.S. in Mathematics Department with Thesis

MATH	500	M.S. Thesis	NC
MATH	591	Graduate Seminar in Mathematics I	(0-2)NC
or			
MATH	592	Graduate Seminar in Mathematics II	(0-2)NC

7 elective courses
Total minimum credit: 21
Number of courses with credit (min): 7

M.S. in Mathematics Department without Thesis

MATH	591	Graduate Seminar in Mathematics I	(0-2)NC
or			
MATH	592	Graduate Seminar in Mathematics II	(0-2) NC
MATH	599	Term Project	(0-2) NC

10 elective courses
Total minimum credits: 30
Number of courses with credit (min): 10

Ph.D. in Mathematics

If admitted by M.S. degree:

MATH	506	Comprehensive Studies	(0-4)NC
MATH	600	Ph.D. Thesis	NC

7 elective courses
Total minimum credit: 21
Number of courses with credit (min): 7

If admitted by B.S. degree:

MATH	506	Comprehensive Studies	(0-4)NC
MATH	600	Ph.D. Thesis	NC
MATH	591	Graduate Seminar in Mathematics I	(0-2)NC
or			
MATH	592	Graduate Seminar in Mathematics II	(0-2)NC

14 elective courses
Total minimum credit: 42
Number of courses with credit (min): 14

GRADUATE COURSES

MATH	500	M.S. Thesis	NC
MATH	501	Analysis	(3-0)3
MATH	502	Spectral Theory of Linear Operators	(3-0)3
MATH	503	Algebra I	(3-0)3
MATH	504	Algebra II	(3-0)3
MATH	505	Differentiable Manifolds	(3-0)3
MATH	506	Comprehensive Studies	(0-4)NC
MATH	511	Group Theory I	(3-0)3
MATH	512	Group Theory II	(3-0)3
MATH	513	Representation Theory of Finite Groups	(3-0)3
MATH	514	Basic Model Theory	(3-0)3
MATH	515	Commutative Algebra	(3-0)3
MATH	521	Finite Fields and Applications	(3-0)3
MATH	522	Coding Theory	(3-0)3
MATH	523	Algebraic Number Theory	(3-0)3
MATH	524	Theory of Function Fields	(3-0)3
MATH	525	Analytic Number Theory	(3-0)3
MATH	526	Modular Functions	(3-0)3
MATH	535	Topology	(3-0)3
MATH	537	Algebraic Topology I	(3-0)3
MATH	538	Algebraic Topology II	(3-0)3
MATH	541	Differential Topology	(3-0)3
MATH	543	Low Dimensional Topology	(3-0)3
MATH	545	Differential Geometry I	(3-0)3
MATH	546	Differential Geometry II	(3-0)3
MATH	551	Algebraic Geometry	(3-0)3
MATH	552	Algebraic Geometry II	(3-0)3
MATH	555	Theory of Functions of a Complex Variable	(3-0)3
MATH	558	Introduction to Functions of Several Complex Variables	(3-0)3
MATH	566	Positive Operators and Banach Lattices	(3-0)3
MATH	570	Functional Analysis	(3-0)3
MATH	571	Topological Vector Spaces	(3-0)3
MATH	580	Applied Functional Analysis	(3-0)3
MATH	581	Numerical Analysis I	(3-0)3
MATH	582	Numerical Analysis II	(3-0)3
MATH	583	Partial Differential Equations I	

			(3-0)3
MATH	584	Partial Differential Equations II	(3-0)3
MATH	585	Nonlinear Problems of Applied Mathematics	(3-0)3
MATH	586	Introduction to Delay Differential Equations	(3-0)3
MATH	587	Ordinary Differential Equations I	(3-0)3
MATH	588	Ordinary Differential Equations II	(3-0)3
MATH	589	Impulsive Differential Equations	(3-0)3
MATH	591	Graduate Seminar in Mathematics I	(0-2)NC
MATH	592	Graduate Seminar in Mathematics II	(0-2)NC
MATH	593	Numerical Solutions of Partial Differential Equations	(3-0)3
MATH	594	Theory of Special Functions	(3-0)3
MATH	595	The Boundary Element Method and Applications	(3-0)3
MATH	596	Computational Basis of Fluid Dynamics Equations	(3-0)3
MATH	598	Fundamentals of Solution Theory	(3-0)3
MATH	599	Term Project	NC
MATH	600	Ph.D. Thesis	NC
MATH	606	The Theory of Algebras	(3-0)3
MATH	608	Geometric Algebra	(3-0)3
MATH	615	Lie Algebras	(3-0)3
MATH	658	Elliptic Boundary Value Problems	(3-0)3
MATH	677	Numerical Methods in Ordinary Differential Equations	(3-0)3
MATH	688	Finite Element Solution of Differential Equations	(3-0)3
MATH	693	Directed Study in Mathematics I	(1-0)1
MATH	694	Directed Study in Mathematics II	(1-0)1
MATH	7xx	Special Topics in Mathematics	(3-0)3
MATH	8xx	Special Studies	(4-2)NC
MATH	9xx	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

MATH 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

MATH 501 Analysis (3-0)3
General measure and integration theory. General convergence theorems. Decomposition of measures. Radon-Nikodym theorems. Outer measure. Caratheodory Extension Theorem. Product measures. Fubini's Theorem. Riesz Representation Theorem.
Prerequisite: Consent of the Department.

MATH 502 Spectral Theory of Linear Operators (3-0)3
Compact operators, compact operators in Hilbert spaces. Banach algebras. The spectral theorem for normal operators. Unbounded operators between Hilbert spaces. The spectral theorem for unbounded self-adjoint operators. Self-adjoint operators. Self-adjoint extensions.
Prerequisite: Consent of the Department.

MATH 503 Algebra I (3-0)3
Groups; quotient groups, isomorphism theorems, alternating and dihedral groups, direct products, free groups, generators and relations, free abelian groups, actions. Sylow theorems, nilpotent and solvable groups, normal and subnormal series. Rings, ring homomorphisms, ideals, factorization in commutative rings, rings of quotients, localization, principle ideal domains, Euclidean domains, unique factorization domains, polynomials and formal power series, factorization in polynomial rings.
Prerequisite: Consent of the Department.

MATH 504 Algebra II (3-0)3
Modules; homomorphisms, exact sequences, projective and injective modules, free modules, vector spaces, tensor products, modules over a PID. Fields, field extensions, the Fundamental Theorem of Galois Theory, splitting fields, algebraic closure and normality, the Galois group of a polynomial, finite fields.
Prerequisite: Consent of the Department.

MATH 505 Differentiable Manifolds (3-0)3
Differentiable manifolds, smooth mappings, tangent, cotangent bundles, differential of a map, submanifolds, immersions, imbeddings, vector fields, tensor fields, differential forms, orientation on manifolds, integration on manifolds, Stoke's Theorem.
Prerequisite: Consent of the Department.

MATH 506 Comprehensive Studies (0-4)NC
The aim of this course is to test the knowledge of the student in the basic areas of mathematics. For this purpose, a written exam is given in the following topics and subtopics: Algebra (A. Groups and Rings B. Modules and Fields), Analysis (A. Real Analysis B. Complex Analysis), Differential Equations (A. Ordinary DE B. Partial DE), Geometry-Topology (A. Geometry B. Topology), Numerical Analysis (A. Numerical Analysis I B. Numerical Analysis II). Each student is required to take the exam in 4 subtopics chosen from 3 distinct topics.
Prerequisite: Consent of the Department.

MATH 511 Group Theory I (3-0)3
Abelian groups; torsion, divisible, torsion-free groups, pure subgroups, finitely generated abelian groups. Solvable and nilpotent groups, Hall π-subgroups. Permutation groups. Representations. Fixed-point free automorphisms. Locally nilpotent groups, locally solvable groups. Finiteness properties. Infinite solvable groups.
Prerequisite: Consent of the Department.

MATH 512 Group Theory II (3-0)3
Locally finite groups. Maximal and minimal condition on subgroups, Cernikov groups and automorphisms of Cernikov groups, direct limit inverse limit of groups, linear groups, locally finite simple groups, Hall universal group, centralizers of elements in simple locally finite groups.
Prerequisite: Consent of the Department.

MATH 513 Representation Theory of Finite Groups (3-0)3
Ring theoretic preliminaries. Group representations and their characters. Characters, integrality and application to the structure theory of finite groups. Product of characters. Induced characters. Reduction and extension of characters. Brauer's theorem on characterization of characters.
Prerequisite: Consent of the Department.

MATH 514 Basic Model Theory (3-0)3
Mathematical structures and their study by means of first-order logic. Emphasis on familiar structures such as groups, rings, fields, linear orders. The Compactness Theorem and its corollaries. Model-completeness and quantifier-elimination. Prime, universal, and saturated structures; Vaught's theorem on numbers of countable models.
Prerequisite: Consent of the Department.

MATH 515 Commutative Algebra (3-0)3
Rings and ideals. Modules. Rings and modules of fractions. Primary decomposition. Integral dependence.
Prerequisite: Consent of the Department.

MATH 521 Finite Fields and Applications (3-0)3
Introduction to finite fields. Traces, norms and bases. Factoring polynomials over finite fields. Construction of irreducible polynomials. Normal bases, optimal normal bases.
Prerequisite: Consent of the Department.

MATH 522 Coding Theory (3-0)3
Basic concepts and examples. Linear codes (Hamming, Golay, reed-Muller codes). Bounds on codes. Cyclic codes (BCH, RS; Quadratic Residue Codes). Goppa codes.
Prerequisite: Consent of the Department.

MATH 523 Algebraic Number Theory (3-0)3
Ring of integers of an algebraic number field. Integral bases. Norms and traces. The discriminant. Factorization into irreducibles. Euclidean domains. Dedekind domains. Prime factorization of ideals. Minkowski's Theorem. Class-group and class number.
Prerequisite: Consent of the Department.

MATH 524 Theory of Function Fields (3-0)3
Valuations. Divisors, repartitions, differentials. Riemann-Roch Theorem. Rational function fields, elliptic and hyperelliptic function fields. Congruence zeta function, the functional equation for the L-functions.
Prerequisite: Consent of the Department.

MATH 525 Analytic Number Theory (3-0)3
Dirichlet series, Dirichlet *L*-functions, Chebychev's *y* and *q* functions, Prime Number Theorem, distribution of primes, functional equations.
Prerequisite: Consent of the Department.

MATH 526 Modular Functions (3-0)3
Elliptic functions, modular functions, Dedekind eta function, congruencies for the coefficients of the modular function *j*, Rademacher's series for the partition function, modular forms with multiplicative coefficients, Kronecker's Theorem, general Dirichlet series and Bohr's Equivalence Theorem.
Prerequisite: Consent of the Department.

MATH 535 Topology (3-0)3
Topological spaces. Neighborhoods. Basis. Subspaces, product and quotient topologies. Compactness. Tychonoff's Theorem. Heine-Borel Theorem. Separation properties. Urysohn's Lemma and Tietze Extension Theorem. Stone-Cech compactification. Alexandroff one point compactification. Convergence of sequences and nets. Connectedness. Metrizability. Complete metric spaces. Baire's Theorem.
Prerequisite: Consent of the Department.

MATH 537 Algebraic Topology I (3-0)3
Fundamental group, Van Kampen's Theorem, covering spaces. Singular homology. Homotopy invariance, long exact sequence of homology groups. Mayer-Vietoris sequence, excision. Cellular homology. Homology with coefficients. Simplicial homology and the equivalence of simplicial and singular homology. Axioms of homology. Homology and fundamental groups. Simplicial approximation. Applications of homology.
Prerequisite: Consent of the Department.

MATH 538 Algebraic Topology II (3-0)3
Cohomology groups, universal coefficient theorem, cohomology of spaces. Products in cohomology, Künneth formula. Poincare duality. Universal coefficient theorem for homology. Homotopy groups.
Prerequisite: Consent of the Department.

MATH 541 Differential Topology (3-0)3
Manifolds and differentiable structures. Tangent space. Vector bundles. Immersions, submersions, embeddings. Transversality. Sard's Theorem. Whitney Embedding Theorem. The exponential map and tubular neighborhoods. Manifolds with boundary. Thom's Tranversality Theorem.
Prerequisite: Consent of the Department.

MATH 543 Low Dimensional Topology (3-0)3
4-manifolds, surfaces in 4-manifolds, complex surfaces, complex curves and their desingularizations. Elliptic surfaces; classification of complex surfaces and logarithmic transform. Handle decomposition, Heegard splitting and Kirby diagrams. Linking numbers and framings. Kirby calculus, handle moves and Dehn surgery. Spin structures, plumbings and related constructions. Embedded surfaces and branched covers.
Prerequisites: MATH 537, MATH 538, MATH 505 or MATH 541 or Consent of the Department.

MATH 545 Differential Geometry I (3-0)3
Review of differentiable manifolds and tensor fields. Riemannian metrics, the Levi-Civita connection. Geodesics and exponential map. Curvature tensor, sectional curvature. Ricci tensor, scalar curvature. Riemannian submanifolds. Gauss and Codazzi equations.
Prerequisite: Consent of the Department.

MATH 546 Differential Geometry II (3-0)3
Lie groups. Principal fibre bundles. Almost complex and complex manifolds Hermitian and Kaehlerian geometry. Symmetric spaces.
Prerequisite: MATH 545

MATH 551 Algebraic Geometry (3-0)3
Theory of algebraic varieties: Affine and projective varieties, dimension, singular points, divisors, differentials, Bezout's Theorem.
Prerequisite: Consent of the Department.

MATH 552 Algebraic Geometry II (3-0)3
Review of sheaves; quasi-coherent and coherent sheaves, direct and inverse images. Proper morphisms, quasi-coherent sheaves on projective schemes, projective morphisms. Cohomology of sheaves, cohomology of a projective scheme, higher direct images. Geometric applications.
Prerequisite: Consent of the Department.

MATH 555 Theory of Functions of a Complex Variable (3-0)3
Analytic functions. Singular points and zeros. The argument principle. Conformal mappings. Riemann Mapping Theorem. Mittag-Lefler Theorem. Infinite products. Canonical products. Analytical continuation. Elementary Riemann surfaces.
Prerequisite: Consent of the Department.

MATH 558 Introduction to Functions of Several Complex Variables (3-0)3
Holomorphic functions, comparison of one and several variables, domains of holomorphy, subharmonicity, pseudoconvexity, invariant metrics, holomorphic maps, Stein and *CR*-manifolds, integral formulas, equation.
Prerequisite: Consent of the Department.

MATH 566 Positive Operators and Banach Lattices (3-0)3
Vector lattices. Positive operators and extension of positive operators. Order projections, order continuous operators, lattice homomorphisms and orthomorphism on vector lattices. Banach lattices and Banach lattices with order continuous norm,

compactness and weak compactness in Banach lattices. Embedding Banach spaces. Banach lattices of operators. Compact and weakly compact operators on Banach lattices.
Prerequisite: Consent of the Department.

MATH 570 Functional Analysis (3-0)3
Review of metric spaces, normed linear spaces, dual spaces and Hahn-Banach Theorem, bidual and reflexivity, Baire's Theorem, dual maps, projections, Hilbert Spaces, the spaces $L_p(X, m)$, $C(X)$, locally convex vector spaces, duality theory of lcs., projective and inductive topologies.
Prerequisite: Consent of the Department.

MATH 571 Topological Vector Spaces (3-0)3
Introduction to topological vector spaces, locally convex topological vector spaces. Inductive and projective limits. Frechet spaces. Montel, Schwartz, nuclear spaces. Bases in Frechet spaces and the quasi-equivalence property. Köthe sequence spaces. Linear topological invariants.
Prerequisite: Consent of the Department.

MATH 580 Applied Functional Analysis (3-0)3
Distributions. Review of Banach and Hilbert spaces. Sobolev spaces, semigroups, some techniques from nonlinear analysis.
Prerequisite: Consent of the Department.

MATH 581 Numerical Analysis I (3-0)3
Error analysis. Solutions of linear systems: LU factorization and Gaussian elimination, QR factorization, condition numbers and numerical stability, computational cost. Least squares problems: The singular value decomposition (SVD), QR algorithm, numerical stability. Eigenvalue problems: Jordan canonical form and conditioning, Schur factorization, the power method, QR algorithm for eigenvalues. Iterative methods: Construction of Krylov subspace, the conjugate gradient and GMRES methods for linear systems, the Arnoldi and Lanczos method for eigenvalue problems.
Prerequisite: Consent of the Department.

MATH 582 Numerical Analysis II (3-0)3
Interpolation and approximation: Lagrange and Newton interpolation, Hermite interpolation, trigonometric interpolation and Fourier series. Spline interpolation B-splines and recursive algorithms. Numerical differentation and quadrature: Newton-Cotes formulas, Gaussian integration rules. Extrapolation and Romberg integration, adaptive quadrature. Hierarchal and recursive quadrature formulas: Archimedes integration formula. Root finding methods.
Prerequisite: Consent of the Department.

MATH 583 Partial Differential Equations I (3-0)3
Cauchy-Kowalevski Theorem. Linear and quasilinear first order equations. Existence and uniqueness theorems for second order elliptic, parabolic and hyperbolic equations. Correctly posed problems, Green's functions.
Prerequisite: Consent of the Department.

MATH 584 Partial Differential Equations II (3-0)3
Sobolev spaces: Weak derivatives, approximation by smooth functions, extensions, traces, Sobolev inequalities, the space H^{-1}. Second-order elliptic equations: Weak solutions, Lax-Milgram Theorem. Energy estimates, Fredholm alternative, regularity, maximum principles, eigenvalues and eigenfunctions. Linear evolution equations: Second-order parabolic equations, (weak solutions, regularity, maximum principle), second-order hyperbolic equations (weak solutions, regularity, propagation of disturbances), hyperbolic systems of first-order equations, semigroup theory.
Prerequisite: Consent of the Department.

MATH 585 Nonlinear Problems of Applied Mathematics (3-0)3
Initial and initial-boundary value problems for the first order nonlinear PDEs. Continuous solutions. Conservation laws and weak solutions. Burgers' equation. Quasi-linear hyperbolic systems. Riemann invariants. Nonlinear waves in gases and deformable solids. One parameter group transformation and similarity solutions of nonlinear problems for PDEs. Nonlinear waves in strings under transverse impact.
Prerequisite: Consent of the Department.

MATH 586 Introduction to Delay Differential Equations (3-0)3
General description of delay differential equations. Statement of the initial value problem. Classification. The method of steps. Existence and uniqueness theorems. Continuation of solutions. Integrable systems. Elements of functional differential equations. Linear systems. Stability theory: Direct Lyapunov's method; Razumikhin's theory. Periodic solutions. Special topics: Oscillations; impulsive delay differential equations.
Prerequisite: Consent of the Department.

MATH 587 Ordinary Differential Equations I (3-0)3

Initial Value Problem: Existence and uniqueness of solutions; continuation of solutions; continuous and differential dependence of solutions. Linear systems: Linear homogeneous and nonhomogeneous systems with constant and variable coefficients; structure of solutions of systems with constant and periodic coefficients; higher order linear differential equations; Sturmian theory, stability: Lyapunov stability and instability. Lyapunov functions; Lyapunov's second method; quasilinear systems; linearization; stability of an equilibrium and stable manifold for nonautonomous differential equations.

Prerequisite: Consent of the Department.

MATH 588 Ordinary Differential Equations II (3-0)3

Nonlinear periodic systems: limit sets; Poincare-Bendixon Theorem. Linearization near periodic orbits; method of small parameters in noncritical case; orbital stability. Bifurcation: Bifurcation of fixed points; the saddle-node bifurcation; the transcritical bifurcation; the pitchfork bifurcation; Hopf bifurcation; branching of periodic solutions for nonautonomous systems. Boundary value problems: Linear differential operators; boundary conditions; existence of solutions of BVPs; adjoint problems; eigenvalues and eigenfunctions for linear differential operators; Green's function of a linear differential operator.

Prerequisite: Consent of the Department.

MATH 589 Impulsive Differential Equations (3-0)3

General description of impulsive differential equations: Systems with fixed moments of impulses; systems with variable moments of impulses; discontinuous dynamical systems. Linear systems: General properties of solutions; periodic solutions; Floquet theory; adjoint systems. Stability: Stability criterion based on linearization of systems; direct Lyapunov method; B-equivalence; stability of systems with variable time of impulses. Quasilinear systems: Bounded solutions; periodic solutions; quasiperiodic and almost periodic solutions; integral manifolds. Discontinuous dynamical systems and applications.

MATH 591 Graduate Seminar in Mathematics I (0-2)NC

Presentation involving current research given by graduate students and invited speakers.

Prerequisite: Consent of the Department.

MATH 592 Graduate Seminar in Mathematics II (0-2)NC

Presentation involving current research given by graduate students and invited speakers.

Prerequisite: Consent of the Department.

MATH 593 Numerical Solutions of Partial Differential Equations (3-0)3

Finite difference method, stability, convergence and error analysis. Initial and boundary conditions, irregular boundaries. Parabolic equations; explicit and implicit methods, stability analysis, error reduction, variable coefficients, derivative boundary conditions, solution of tridiagonal systems. Elliptic equations, iterative methods, rate of convergence. Hyperbolic equations. The Lax-Wendroff method, variable coefficients, systems of conservation laws, stability. Finite volume method.

Prerequisite: Consent of the Department.

MATH 594 Theory of Special Functions (3-0)3

Appell's symbol and hypergeometric series. The gamma function. The beta function. Dirichlet averages. Jacobi polynomials. Elliptic integrals.

Prerequisite: Consent of the Department.

MATH 595 The Boundary Element Method and Application (3-0)3

Weighted residual methods, the boundary element method for Laplace and Poisson equations. The dual reciprocity method, computer implementation.

Prerequisite: Consent of the Department

MATH 596 Computational Basis of Fluid Dynamics Equations (3-0)3

Introduction to fluid behavior. Derivation of continuity, momentum and energy equations. Navier-Stokes equations. Stream function, vorticity. Solutions of creeping, potential, laminar, boundary layer, turbulent flows. Solution of Navier-Stokes equations using finite difference methods in velocity-pressure, stream function-vorticity and stream function forms. Example solutions. Stability, convergence and error analysis.

Prerequisite: Consent of the Department.

MATH 598 Fundamentals of Soliton Theory (3-0)3

Solution of the Korteweg-de Vries equation. Multi-soliton solution as Bergmann potentials for Sturm-Liouville equation. Topics in one-dimensional scattering theory. Associated Sturm-Liouville equations. Inverse scattering problems. Evolution equations related to a linear system. A general class of solvable nonlinear evolution equations.

Prerequisite: Consent of the Department.

MATH 599 Term Project (0-2)NC
Project carried out under the supervision of a faculty member in a specific area of mathematics. A written report is expected from students about their work.
Prerequisite: Consent of the Department.

MATH 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

MATH 606 The Theory of Algebras (3-0)3
Generalities on algebras over commutative rings. Group algebras. Morita duality and quasi-Frobenius algebras, Frobenius algebras. Polynomial identity algebras, Artin-Procesi Theorem.
Prerequisite: Consent of the Department.

MATH 608 Geometric Algebra (3-0)3
Rings with involution, sesquilinear and Hermitian forms, products of Hermitian forms, Morita Theory for Hermitian modules. Construction of Clifford algebras, structure of Clifford algebras, the discriminant and the Arf invariant, the special orthogonal group and classical examples.
Prerequisite: Consent of the Department.

MATH 615 Lie Algebras (3-0)3
Basic concepts, semi-simple Lie algebras, root systems, isomorphism and conjugacy theorems, existence theorem.
Prerequisite: Consent of the Department.

MATH 658 Elliptic Boundary Value Problems (3-0)3
Calculus of L_2 derivatives, some inequalities. Elliptic operators, local existence and regularity of solutions of elliptic systems. Garding's inequality, global existence and regularity of solutions of strongly elliptic equations. Coerciveness results of Aroszajn and Smith, eigenvalue problems for elliptic equations.
Prerequisite: Consent of the Department.

MATH 677 Numerical Methods in Ordinary Differential Equations (3-0)3
Introduction to numerical methods, Linear multistep methods. Runge-Kutta methods, stiffness and theory of stability. Numerical methods for Hamiltonian systems, iteration and differential equations.
Prerequisite: Consent of the Department.

MATH 688 Finite Element Solutions of Differential Equations (3-0)3
Calculus of variations. Weighted residual methods. Theory and derivation of interpolation functions. Higher order elements. Assembly procedure, insertion of boundary conditions. Finite element formulation of ordinary differential equations, some applications. Error and convergence analysis. Finite element formulation of non-linear differential equations. Time dependent problems. Convergence and error analysis. Solution of the resulting algebraic system of equations. Applications on steady and time dependent problems in applied continuum mechanics.
Prerequisite: Consent of the Department.

MATH 693 Directed Study in Mathematics I (1-0)1
Directed study in a selected area of mathematics. Term paper is required (The instructor, not to be the student's thesis supervisor writes a brief proposal for each topic which must be approved by the department head).
Prerequisite: Consent of the Department.

MATH 694 Directed Study in Mathematics II (1-0)1
Directed study in a selected area of mathematics. Term paper is required (The instructor, not to be the student's thesis supervisor writes a brief proposal for each topic which must be approved by the department head).
Prerequisite: Consent of the Department.

MATH 7XX Special Topics in Mathematics (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include contemporary developments in Algebra, Analysis, Geometry, Topology, Applied Mathematics.

MATH 8XX Special Studies (4-2)NC
M.S students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

MATH 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor**.**

DEPARTMENT OF PHILOSOPHY

PROFESSORS

CEYLAN, Yasin: B.A., Atatürk University; Ph.D., University of Edinburgh.
GRÜNBERG, David: B.S., M.A., Ph.D., METU.
GRÜNBERG Teo: B.A., M.A., Ph.D., İstanbul University.
İNAM, Ahmet ***(Department Chair)***: B.S., METU; Ph.D., İstanbul University.
SOL, Ayhan: B.S., ITU; M.S., Florida State University; Ph.D., METU.
TURAN, Ş. Halil ***(Vice Chair)***: B.S., M.A., Ph.D., METU.
SAYAN, Erdinç: B.S., M.A., METU; M.A., Ph.D., Ohio State University.

ASSOCIATE PROFESSORS

BAĞÇE, Samet: B.A., İstanbul University; M.S., Ph.D., London School of Economics.
ÇIRAKMAN, Elif: B.A., METU; M.A., University of Warwick; Ph. D., METU.
PARKAN, Barış ***(Vice Chair)***: B.A., Bennington College; M.A., University of Wisconsin – Milwaukee; Ph.D., The University of Texas at Austin.
REHBERG, Andrea: B.A., North London University; M.A., Essex University; Ph.D., Warwick University.

ASSISTANT PROFESSORS

DEMİRCİOĞLU, Erhan: B.A., İstanbul Technical University; M.A., Boğaziçi University; Ph.D., University of Pittsburgh.
ZAMBAK, Aziz Fevzi: B.A., METU; M.A. METU; Ph.D. Katholieke Universiteit Leuven.
KARADEMİR, Aret; B.A., Abant İzzet Baysal Üniversity; M.A., METU, M.A/Ph.D: University of South Florida.

INSTRUCTOR

KOCAYİĞİT, Tahir: B.A., Ankara University; M.A. METU.

GENERAL INFORMATION: The Department of Philosophy offers programs leading to the Bachelor, Master, and Ph.D. degrees. The Department also offers to students of all departments of METU various courses in Philosophy, Logic, Philosophy of Science and History of Science.

The BA program in philosophy is intended to acquaint students with some of the classic texts in the history of philosophy and with the different areas of inquiry, as well as to train students in argumentation techniques. The aims of the Department are to train: (a) teachers and academics specializing in Philosophy; (b) professionals and intellectuals with broad interest and an analytical thinking capacity.

A relatively large amount of unrestricted elective time is available so that students can devise programs suited to individual needs and interests. Our undergraduate program currently allows students to take about 20 elective courses, some of which may be taken from other departments. Up to one third of the student's coursework may consist of graduate courses in disciplines other than philosophy, subject to the approval of the departmental graduate advisor.

We not only invite applications for "academic" research projects in areas which reflect staff research interest; we also encourage graduate students of other disciplines to do research projects in interdisciplinary areas incorporating philosophy. The program is also well-suited for students who were not undergraduate philosophy majors and therefore need additional preparation or credentials before pursuing work at the doctoral level.

OBJECTIVES OF THE GRAUDATE PROGRAMS: We aim to train philosophers, philosophers of science and logicians with high teaching and research skills as well as a first-rate thesis.

MAJOR GRADUATE-LEVEL RESEARCH ACTIVITIES: The members of the Department of Philosophy have a variety of specialties in philosophy and represent diverse philosophical perspectives.

Philosophical issues addressed graduate courses include both traditional topics from areas such as epistemology, ethics, metaphysics, political philosophy, and the philosophy of science, and also the most recent contemporary concerns such as neurophilosophy, ecophilosophy, philosophy of artificial intelligence and formal ontology. The department cooperates with the Informatics Institute in a graduate program in cognitive science and formal ontology.

Laboratory for Computational Ontology is the research center of the Department of Philosophy. The members of Laboratory for Computational Ontology are graduate students in philosophy, with different specializations, ranging from logic, philosophy of language, philosophy of computation, and philosophy of mind.

LABORATORIES AND EQUIPMENT: All faculty members and assistants have personal computers connected to the Internet, giving them on-line access from their offices to the METU library resources which include various databases and the online version of the *Philosopher's Index*. The staff has also access to other equipments, such as laser printers, a color-scanner, a photocopier, a slide projector etc., for their research and teaching activities.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

PHIL	101	Introduction to Philosophy I	(3-0)3
PHIL	103	Introduction to Symbolic Logic	(4-0)4
PHIL	145	History of Ancient Philosophy I	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
TURK	101	Turkish I	NC
Departmental Elective			

Second Semester

PHIL	108	Introduction to Philosophy II	(3-0)3
PHIL	146	History of Ancient Philosophy II	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	NC
IS	100	Introduction to Information Technologies and Applications	NC
Departmental Elective			
Free Elective			

SECOND YEAR

Third Semester

PHIL	201	Ethics I	(4-0)4
PHIL	203	Modern Logic I	(4-0)4
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC
Departmental Elective			
Non-Departmental Elective			

Fourth Semester

PHIL	248	Medieval and Renaissance Philosophy	(4-0)4
PHIL	282	History of Science	(4-0)4
HIST	2202	Principles of Kemal Atatürk II	NC
Departmental Elective			
Non-Departmental Elective			
Non-Departmental Elective			

THIRD YEAR

Fifth Semester

PHIL	341	History of 17th and 18th Century Philosophy I	(3-0)3
PHIL	381	Scientific Method I	(3-0)3
Free Elective			
Free Elective			
Non-Departmental Elective			

Sixth Semester

PHIL	342	History of 17th and 18th Century Philosophy II	(3-0)3
PHIL	382	Scientific Method II	(3-0)3
Free elective			
Free Elective			
Non-Departmental Elective			

FOURTH YEAR

Seventh Semester

PHIL	405	Philosophy of Language	(4-0)4
PHIL	441	Contemporary Philosophy I	(3-0)3
PHIL	491	Computer Use in Philosophy I	(3-0)3
Departmental Elective			
Non-Departmental Elective			

Eighth Semester

PHIL	442	Contemporary Philosophy II	(4-0)4
Departmental Elective			
Departmental Elective			
Departmental Elective			
Free Elective			

MINOR PROGRAM IN LOGIC AND PHILOSOPHY OF SCIENCE

The Logic and Philosophy of Science Minor aims at developing philosophical skills and efficiency in problem solving of undergraduate students in the Natural Sciences, Mathematics, Computer Science, and Engineering disciplines by teaching them philosophical and logical techniques of correct reasoning. This Minor is designed also to contribute, on the one hand, to the broadening of these students' understanding of the conceptual foundations of science in general and of specific natural sciences in particular and, on the other hand, to the students' understanding of the conceptual foundations of formal disciplines such as Mathematics and Computer Science.

Required courses

PHIL	103	Introduction to Symbolic Logic	(4-0)4
PHIL	203	Modern Logic I	(4-0)4
PHIL	381	Scientific Method I	(3-0)3
PHIL	382	Scientific Method II	(3-0)3
Departmental Elective			
Departmental Elective			

MINOR PROGRAM IN HISTORY OF PHILOSOPHY

The objective of the History of Philosophy Minor is to provide philosophico-historical perspective especially to Human and Social Science majors in their professional studies. The need for such a background arises from the fact that a deep understanding of the basic concepts of Human and Social Sciences, such as Psychology, Sociology, Education, Politics, Economics, Literature and the Fine Arts, requires philosophical scrutiny of these concepts. The reason for demanding a historical perspective is that knowledge of development and change of these concepts through time is important for a better understanding of these notions at present. Nevertheless the History of Philosophy Minor could also be recommended to students from all departments of the University, because a historico-philosophical perspective is likely to develop in them a deeper appreciation of scientific and mathematical concepts as well.

Required Courses

PHIL	145	History of Ancient Philosophy I	(3-0)3
PHIL	341	History of 17th and 18th Cent. Philosophy I	(3-0)3
PHIL	342	History of 17th and 18th Cent. Philosophy II	(3-0)3
Departmental Elective			
Departmental Elective			
Departmental Elective			

DOUBLE MAJOR PROGRAM IN PHILOSOPHY

The double major program in philosophy aims at developing philosophical skills of successful students of other departments in order to enhance interdisciplinary studies. Required courses provide students with basic knowledge of history of philosophy which is essential for any philosophical study, techniques of correct reasoning, which is indispensable for any discipline, and fundamentals of philosophy of science. In addition, elective courses in the program allow students to focus on a field that is directly related to their own major program so that the students' understanding of that field will be broadened. Therefore, the double major program in philosophy could be recommended to all students with interest in interdisciplinary studies involving philosophy.

The double major program consists of all the courses of the major program of Philosophy Department.

Compulsory Courses

Course Code	Course Name	METU Credit	Contact (h/w)	Lab (h/w)	ECTS
HIST2201	PRINCIPLES OF KEMAL ATATÜRK I	0	2	0	1.0
HIST2202	PRINCIPLES OF KEMAL ATATÜRK II	0	2	0	1.0
PHIL101	INTRODUCTION TO PHILOSOPHY	3	3	0	5.0
PHIL103	INTRODUCTION TO SYMBOLIC LOGIC	4	4	0	7.0
PHIL108	INTRODUCTION TO PHILOSOPHY II	3	3	0	5.0
PHIL145	HISTORY OF ANCIENT PHILOSOPHY I	3	3	0	7.0
PHIL146	HISTORY OF ANCIENT PHILOSOPHY II	3	3	0	7.0
PHIL201	ETHICS I	4	4	0	7.0
PHIL203	MODERN LOGIC I	4	4	0	8.0
PHIL248	MEDIEVAL AND RENAISSANCE PHILOSOPHY	4	4	0	8.0
PHIL282	HISTORY OF SCIENCE	4	4	0	7.0
PHIL341	HISTORY OF 17TH & 18TH CENTURY PHIL. I	3	3	0	7.0
PHIL342	HISTORY OF 17TH& 18TH CENTURY PHIL. II	3	3	0	7.0
PHIL381	SCIENTIFIC METHOD I	3	3	0	7.0
PHIL382	SCIENTIFIC METHOD II	3	3	0	7.0
PHIL405	PHILOSOPHY OF LANGUAGE	4	4	0	8.0
PHIL441	CONTEMPORARY PHILOSOPHY I	3	3	0	7.0
PHIL442	CONTEMPORARY PHILOSOPHY II	4	4	0	8.0
PHIL491	COMPUTER USE IN PHILOSOPHY I	3	3	0	5.0
ENG101	ENGLISH FOR ACADEMIC PURPOSES I	4	4	0	6.0
ENG102	ENGLISH FOR ACADEMIC PURPOSES II	4	4	0	6.0
ENG211	ACADEMIC ORAL PRESENTATION SKILLS	3	3	0	4.0
IS100	INTRODUCTION TO INFORMATION TECHNOLOGIES AND APPLICATIONS	0	2	0	1.0

Any 1 of the following set

TURK101	TURKISH I	0	2	0	1.0
TURK102	TURKISH II	0	2	0	1.0
TURK105	TURKISH I	0	2	0	1.0
TURK106	TURKISH II	0	2	0	1.0
TURK201	ELEMENTARY TURKISH	0	0	0	1.0
TURK202	INTERMEDIATE TURKISH				
TURK 303	TURKISH I	0	0	0	1.0
TURK304	TURKISH II	0	0	0	1.0

8 departmental elective course(s) approved by the Department of Philosophy.
6 nondepartmental elective course(s) approved by the Department of Philosophy.
6 free elective course(s) approved by the Department of Philosophy.

DESCRIPTION OF UNDERGRADUATE COURSES

PHIL 101 Introduction to Philosophy I (3-0)3
An introductory survey of the main problems of philosophy.

PHIL 103 Introduction to Symbolic Logic (4-0)4
Sentential and quantificational logic. Symbolization and tableau method of proof. Modalities.

PHIL 104 Traditional Logic (4-0)4
A survey of basic concepts in Aristotelian, Stoic and Medieval Islamic Logic.

PHIL 106 Theory of Knowledge I (4-0)4
Logico-philosophical analysis of knowledge and belief.

PHIL 108 Introduction to Philosophy II (3-0)3
Continuation of PHIL 101.

PHIL 110 Introduction to Philosophical Concepts (3-0)3
This course aims to introduce students to the most important concepts and problems of the main branches of philosophy from a systematical-rather than a historical- point of view. It starts with the question of what philosophy is. The answer to this question lies in finding a criterion by means of which philosophy can be differentiated from science and various other human activities. The rest of the course discusses the following basic topics. Validity of arguments (logic), the nature of truth and knowledge (epistemology), the fundamental categories of being (ontology), the meaning of linguistic expressions (philosophy of language), scientific concepts and theories (philosophy of science), the distinction between morally good and bad (ethics), and, finally beauty in nature and value of artworks (aesthetics).

PHIL 111 Introduction to Contemporary Civilization I (3-0)3
A study of the major intellectual contributions to contemporary civilization. A combination of primary and secondary texts will be read. The emphasis is on the value theory, but there is substantial discussion of science (e.g., Galileo) insofar as it has influenced value theory by changing how humanity perceives itself.

PHIL 112 Introduction to Contemporary Civilization II (3-0)3
A study of the major intellectual contributions to contemporary civilization. A combination of primary and secondary texts will be read. The emphasis is on value theory, but there is substantial discussion of science (e.g., Darwin) insofar as it has influenced value theory by changing how humanity perceives itself.

PHIL 115 Introduction to the History of Philosophy (3-0)3
This course purports to introduce students to the views of the most important figures in the history of western philosophy. It starts with the ancient period including basically the most important ideas of Socrates, Plato, and Aristotle. After a short overview of the medieval philosophy, the course continues with the modern period. This period includes continental rationalists, such as Descartes, Spinoza, and Leibniz on the one hand, and British empiricists like Locke, Berkeley, and Hume on the other. It ends with expounding the most basic views of Kant who is supposed to have synthesized

rationalism and empiricism. The last part of the course is devoted to the contemporary period including figures from the continental Europe such as Husserl and Heidegger as well as those belonging to the analytic school such as Russell, Wittgenstein, and Quine.

PHIL 145 History of Ancient Philosophy I (3-0)3
Survey of the Western Philosophy from Thales to the Sophists.

PHIL 146 History of Ancient Philosophy II (3-0)3
Study of Western Philosophy from Socrates to Neoplatonism.

PHIL 182 Introduction to History of Science (4-0)4
Historical study in the development of science.

PHIL 201 Ethics I (4-0)4
Problems of moral conduct. Theories of ethics.

PHIL 202 Aesthetics (4-0)4
Study of the nature of beauty, art and creativity, artistic appreciation and criticism.

PHIL 203 Modern Logic I (4-0)4
First-order logic with identity and modal logic.

PHIL 204 Theory of Knowledge II (3-0)3
Common-sense knowledge and scientific knowledge. The growth of knowledge; rationality and progress.

PHIL 205 Basic Philosophy of Science (4-0)4
Scientific concepts, measurement, prediction, explanation, laws, theories.

PHIL 206 Philosophy of Natural Science (4-0)4
Introduction to the philosophical problems of natural science.

PHIL 208 Environmental Ethics (3-0)3
Environmental ethics is a crucial as well as a controversial area of applied ethics that approaches normative issues and principles related with human intervention with the natural environment. It is crucial for the guidance of individuals, corporations, and governments in determining the principles affecting their policies, lifestyles, and actions across the entire range of environmental issues. It is controversial for the complexity of environment, conflict of interest in environment, and human centered ethical traditions, concepts and theories neglecting non-human environment. So while uncertainty and conflict of interest increase the demands on ethical principles, the basic assumptions of traditional ethics are difficult to extend to the non-human environment. Environmental ethics must also be a theoretical field of ethics to deal, for example, with the following problems. People have rights, but do other (higher) animals? Do plants even have interests? Can only individuals deserve to be subject for moral considerations or can group of individuals, such as species and ecosystem also? These and similar questions are treated by both anthropocentrists and ecocentrists.

PHIL 209 Ethics in Engineering (3-0)3
Engineering ethics is the activity and area of study the purpose of which is the understanding of the moral values that have guidance for engineers in resolving moral dilemmas arising as a result of engineering practice, and justifying ethical decisions related with engineering. Engineering ethics is concerned with those moral problems and issues that are related strictly to engineering. In this sense, engineering ethics with its own problems is the currently accepted codes and standards of conduct endorsed by various groups of engineers and engineering societies.
In short, engineering ethics is the study of the moral issues and decisions confronting individuals and organizations engaged in engineering and the study of related questions about the moral ideals, character, policies, and relationships of people and corporations involved in technological activity.

PHIL 211 Philosophy of Emotions (3-0)3
This course is an inquiry into the role of emotion in a rational life. As an introductory course, it requires no pre-knowledge of philosophy. It tries to explore the role that emotion plays in the acquisition of beliefs and desires, the relation between them, and their transformation into actions and policies. It studies also emotions considered as a component of life and experience and investigate whether they may themselves be subject to rational assessment. For this purpose it goes to the historical roots of the problem of emotions, e.g. what role does it play in our life? What is an emotion? These questions are important in the philosophy of mind and ethics. Philosophers have not always despised the importance of emotions. Hume, for example, claimed that reason is and ought to be, the slave of passion. Nietzsche, on the other hand, insisted that emotion and reason are not really opposite but complementary to each other. In this course, the claims of important philosophers are discussed and

moral, aesthetic political implications of their view of emotion are criticized.

PHIL 212 Philosophy and Literature (3-0)3

This course is an introduction to the philosophy of literature. The fundamental question discussed in this course is how philosophy, ordinary life and literature are related. How can we draw boundary line between philosophy and literature? How are literary works structured? With these questions the course addresses the philosophical question about the role of art in human life. The continuity of everyday life and the coherence of artistic literature are distinct though closely related. In ancient Greece, Literature was crucial for philosophy´ s own self definition. Subsequent philosophy of literature has been denoted to overcoming Plato´s condemnatory theory. The vast majorities of theories follow Plato in treating literature as a distinct domain, separate from and subordinate to philosophy. But since Romanticism, some have argued for the essential unity of these two enterprises. The course studies the relation between life, literature and philosophy within historical context as well as in contemporary culture.

PHIL 214 Philosophy and Evolution (3-0)3

The Darwinian theory of evolution by natural selection is one of the greatest scientific breakthroughs of the modern era. Although it is a theory of biology with its revolutionary consequences in all life sciences it has also had an enormous impact on science in general, philosophy, religion, and politics the last 150 years. This course traces the teleological notions of design and purpose through 17th century to early 19th century (with a special emphasis on the early 19th century) to prepare the intellectual background for the Darwinian theory of evolution and then investigates the Darwinian response to this background. The recent scientific developments and the related philosophical problems are also examined in detail.

PHIL 215 Philosophical Practice (3-0)3

Many of the philosophical schools of antiquity saw philosophy as the "art of living" rather than merely teaching abstract theory or the exegesis of texts. Philosophical practice is an attempt by philosophers to return philosophy to its ancient and practical roots. The course, therefore, is an inquiry into the role of philosophy in our daily life. For this purpose ideas of great philosophers from Pythagoras to Postmodernism are discussed and moral, aesthetic and political implications of their views of philosophy and practice are studied and criticized.

PHIL 216 Philosophy of Love (3-0)3

The place of love in human life; contemporary human condition and love; the possible reasons of the need to love, philosophical treatment of love; epistemological, ontological, ethical, aesthetic as well as psychological, social, political, cultural dimensions of love. Readings from the philosophy as well as classic texts of love.

PHIL 235 Introduction to Deductive Logic (3-0)3

Logic as a formal science; inference, implication, validity and truth; syllogism.
Prerequisite: Consent of the Department.

PHIL 241 Philosophical Texts I (3-0)3

Study of major texts in philosophy.

PHIL 242 Philosophical Texts II (3-0)3

Study of major texts in philosophy.

PHIL 245 Medieval Philosophy (4-0)4

An introductory survey of major problems in medieval philosophy.

PHIL 248 Medieval and Renaissance Philosophy (4-0)4

Survey of post-Aristotelian and medieval philosophies. Philosophy in the Renaissance; Humanism; controversy between the Platonists and the Aristotelians; scepticism, and Reformation.

PHIL 251 Ethical Awareness (3-0)3

The course will begin with various arguments encountered in everyday life and work situations on ethical or moral issues. After developing some skill in identifying ethical and moral problems and arguments, major competing ethical theories will be applied to these moral problems. In order to fulfill this aim, several concrete and pressing moral problems will be chosen from various fields of applied ethics such as environmental ethics, engineering ethics, work ethics. The student will be encouraged to write and think clearly about these problems, weighing alternative solutions and criticizing those which are weak and untenable.

PHIL 282 History of Science (4-0)4

Problems of the development of science through history.

PHIL 291 History of Science I (3-0)3

A general survey of the development of science from Greeks to Newton.

PHIL 292 History of Science II (3-0)3

Science in the 20th Century.

PHIL 301 Modern Logic II (4-0)4
Application of logic to axiomatic set theory.

PHIL 302 Systematic Philosophy (4-0)4
Metaphilosophical analysis of philosophical problems and solutions. The methods of logical analysis and logical reconstruction.

PHIL 304 Ethics II (4-0)4
Study of ethical and metaethical theories.

PHIL 306 Readings in Aesthetics (3-0)3
This course is about the relations between aesthetics, ethics and political philosophy. It covers the following topics: Modern and contemporary issues in aesthetics, the standard of taste in art, beauty and nature, history and art, intuition and expression, art and the individual, ethics and aesthetics, transcendence of aesthetics, aesthetics and politics, art and the society.

PHIL 324 Logic and Philosophy of Decision Making (3-0)3
We frequently find ourselves in situations in which we need to make a decision. In such situations, we have a set of alternative courses of action that we can take, but typically some or all of these actions involve uncertainties as to their consequences. The problem is which action is the most rational one to undertake relative to the information available. Decision theory is the formal, mathematically oriented study of conditions of rational decision-making. This course addresses the logical and philosophical, as well as mathematical, aspects of decision-making by rational individuals and groups.

PHIL 341 History of 17th and 18th Century Philosophy I (3-0)3
A study of Continental Philosophy in the 17th and 18th centuries with special emphasis on Rationalism; Descartes, Spinoza and Leibniz.

PHIL 342 History of 17th and 18th Century Philosophy II (3-0)3
Anglo-Saxon philosophy in the 17th and 18th centuries. Locke, Berkeley and Hume.

PHIL 343 Philosophy of Plato (3-0)3
The course will be concerned with the selected dialogues of Plato. After a brief introduction to Plato's conception of Socratic philosophizing (in *Apology, Crito, Euthyphro*), we will trace the development of Plato's ethical theory from the Socratic ethics of the *Protagoras* to the Platonic ethics of the *Republic;* and Plato's metaphysical theory from the *Meno* and *Phaedo* to the *Republic* and *Timaeus*. Finally, some attention will be given to his theory of knowledge in the later dialogues, especially the *Theaetetus*, the *Parmenides*, and the *Sophist.*

PHIL 344 Philosophy of Aristotle (4-0)4
The course will be concerned with Aristotle's most famous and influential work *Metaphysics*. After a brief introduction to Aristotle's philosophy and its place in the history of ancient philosophy, we will pay particular attention to Aristotle's conception of "first philosophy" as the most valuable and comprehensive of all sciences, the so-called "metaphysics". We will trace how Aristotle explores the science that is devoted to the investigation of first causes, of Being as such and of the form of knowledge that deserves the title "wisdom". Finally, we will consider Aristotle's formulation of the fundamental metaphysical problems: the questions concerning the substance, the particular and the universal, form and matter, potentiality and actuality, and finally, the mover and the moved.

PHIL 345 Philosophical Texts III (3-0)3
Study of major texts in philosophy.

PHIL 346 Philosophical Texts IV (4-0)4
Study of major texts in philosophy.

PHIL 348 Existential Philosophy (3-0)3
Background information on existentialism and discussion of its key concepts. Focus on the philosophies of four thinkers in the 19th and 20th centuries; Nietzsche, Heidegger, Sartre and Camus.

PHIL 350 Rhetoric and Argumentation in Philosophy (3-0)3
Studies on the relationship between rhetoric and logical reasoning.

PHIL 351 Applied Ethics (3-0)3
The course will begin with consideration of various arguments encountered in everyday life of ethical or moral issues: Is the death penalty a morally acceptable type of punishment? Is the censorship of pornography ethically justified? What are our moral obligations with respect to the environment and what is the appropriate moral foundation for those obligations? After developing some skill in identifying ethical and moral arguments and disagreement on such issues, major ethical theories such as utilitarianism, Kantianism, egoism, etc., will be applied to these moral problems. In order to fulfill this aim, several concrete and pressing moral problems will be chosen. The student will be encouraged to write and think clearly about these problems, weighing alternative solutions and criticising those which are weak and untenable. The main focus will be to give the student the skill

necessary to identify a moral problem and to introduce her to critical thinking over moral issues.

PHIL 353 Philosophy of Marx (3-0)3
A close philosophical analysis of Karl Marxs writings; Marxs critique of capitalism as a system of exploitation and alienation; the development of Marxs ideas in light of his relation to Hegel and the Young Hegelians; Marxs views on human nature, communism and the labor theory of value.

PHIL 373 Islamic Philosophy I (3-0)3
Study of basic topics in the Islamic philosophy.

PHIL 381 Scientific Method I (3-0)3
Observation and experimentation. Induction, deduction and the hypothetico-deductive method. Scientific hypotheses, laws and theories.

PHIL 382 Scientific Method II (3-0)3
Continuation of PHIL 301.

PHIL 383 History of Science II (4-0)4
Development of science in Middle Ages.

PHIL 390 Rationality Theories of Science (3-0)3
Historical and epistemological evaluation of some rationality theories, e.g., Popper's Falsificationism, Kuhn's Scientific Revolutions, Feyerabend's Liberalism, Lakatos's MSRP and Structural Realism

PHIL 391 Philosophical Foundations of Physics (3-0)3
Developing a historical-cum-methodological approach towards philosophical foundations of physics.

PHIL 392 History and Methodology of Geometry (3-0)3
History of the discovery of non-Euclidean geometries; historical and methodological problems of geometrical progress.

PHIL 393 Basic History of Science I (3-0)3
Special topics in history of science.

PHIL 394 Basic History of Science II (3-0)3
Continuation of PHIL 393.

PHIL 395 History of Biology (3-0)3
Development of biology from the 12th century until the 19th century.

PHIL 397 History of Physics (3-0)3
Development of physics from the 13th century until the 17th century.

PHIL 401 Modern Logic III (4-0)4
Philosophical logic: Modal, epistemic, and deontic logics.

PHIL 402 Philosophy of Logic and Mathematics (3-0)3
The nature of logic and mathematics. Necessary truths and existence in logic and mathematics. Logicism, intuitionism, and formalism.

PHIL 404 Philosophy of State and Society (4-0)4
Problems in the philosophy of social science and in political philosophy.

PHIL 405 Philosophy of Language (4-0)4
Ordinary language and formal languages. Syntax, semantics, pragmatics. Extension and intension. Naming and predication. Theory of reference and theory of meaning.

PHIL 407 Philosophy of Mind I (3-0)3
Study of the mind-body problem and the problems of free will and determinism. Survey of the main theories of mind and human action.

PHIL 408 Philosophy of Mind II (3-0)3
Continuation of PHIL 407.

PHIL 410 Philosophical Psychology (3-0)3
A study of philosophical puzzles raised by psychological research and theory. Topics include whether there are innate ideas, whether perception is inferential, whether mental representations are more like sentences or images, and what it is to have a concept.

PHIL 411 Continental Rationalism (3-0)3
This course examines the philosophies of the three leading thinkers of the 17th century: Descartes, Spinoza and Leibniz. The emphasis is on the central theses associated with rationalism: (i) that at least some of our concepts are not gained from experience but are innate; and (ii) that reason alone can provide us with knowledge of the external world through "intuition" of self-evident propositions and through "deduction" from those propositions. Selections from the most important works of these philosophers will be read. Epistemological, metaphysical, ontological, and ethical issues of the Continental Rationalism will be investigated with reference to these central theses. Relations between Continental Rationalism and British Empiricism will be brought into view.

PHIL 412 British Empiricism (3-0)3
This course concentrates on the philosophies of three leading thinkers of the 17th and 18th centuries:

Locke, Berkeley and Hume. The emphasis is on the central thesis of empiricism that "all knowledge is ultimately based on experience". Selections from the most important works of these philosophers will be read. Epistemological, metaphysical, ontological and ethical issues of British Empiricism will be investigated with reference to central thesis. Relations between Continental Rationalism and British Empiricism will be brought into view.

PHIL 414 Philosophical Perspectives In Anthropology (3-0)3

There has been a great deal of speculation recently on how the evolution of language may explain the dramatic cognitive changes which occurred during the Upper Paleolithic resulting in the emergence of religion, art, long-distance trade, elaborate burial rituals, and complex social structures. Philosophy of language and philosophy of cognition are relevant to understanding the evolution of language and hence to understanding these cognitive changes. The course explores some of these connections.

PHIL 415 Philosophy of Art (3-0)3

Plato's vision of an ideal *polis*, his arguments against art as a valuable contribution to the life of an ideal society; Nietzsche's overcoming of Platonistic perspectives via an examination into the relative value of truth and art for life; Heidegger's thinking about art from the perspective of his ontological project, Merleau-Ponty's phenomenology of the embodied experience of the work of art.

PHIL 419 Problems in Contemporary Philosophy I (3-0)3

An introductory course to the main themes in analytic metaphysics such as causation, freedom and determinism, laws of nature, mental states, and time.

PHIL 421 Philosophy of Kant (4-0)4

This course will be concerned with Immanuel Kant's most famous and influential work *Critique of Pure Reason*. After a brief introduction to Kant's philosophy and its relation to empiricist and rationalist philosophies, we will pay particular attention to Kant's conception of "critique". We will trace how Kant explores the possibility of *a priori* knowledge and of transcendental subjectivity. Finally, we will discuss the problem of the unity of reason, i.e., the unity of reason in its theoretical and practical employment. In this respect, we will bring the first *Critique* into dialogue with the second *Critique.*

PHIL 422 Philosophy of Hegel (4-0)4

This course will be concerned with G.W.F. Hegel's most famous and influential work *Phenomenology of Spirit*. After a brief introduction to Hegel's philosophy and its relation to Kantian philosophy, we will pay particular attention to Hegel's conception of "phenomenological method". We will trace how Hegel explores the development of consciousness from its most ordinary form as "spirit". Finally, we will bring Hegel's thought into dialogue with contemporary continental philosophies.

PHIL 423 The Philosophy of Morality and Beyond (3-0)3

Kant's analysis of the principles underlying morality leads him to the statement of the categorical imperative, an idea that has been tremendously influential in the history of moral philosophy, yet also widely misunderstood. In this course we will first of all study the various formulations of the categorical imperative in Kant's *Groundwork of the Metaphysics of Morals.* But in order to be able to assess the status of Kant's moral philosophy in the history of philosophy, we will also look at a number of influential figures who – in their different ways – can be seen to have gone beyond Kant in their understanding of the role, status and functioning of morality.

PHIL 424 Moral Philosophy of Kant (3-0)3

Intensive study of Immanuel Kant's moral philosophy by reading and analyzing the texts on this subject. Examination of Kant's concepts of 'freedom', 'good will', 'duty', 'categorical imperative' and 'autonomy' in the *Groundwork of the Metaphysics of Morals.* Discussion of the possibility of grounding moral judgments and the principles of pure practical reason in *Critique of Practical Reason.*

PHIL 430 Philosophy of Work and Business Ethics (4-0)4

A philosophical analysis of and exploration into 'the workplace'. Discussion of some of the main social and ethical problems arising in the workplace, such as corporate responsibility, regulation of business, and employer/employee relations will be preceded by a more philosophical grounding in the concept of work, social and economic justice, and analysis of production.

PHIL 441 Contemporary Philosophy I (3-0)3

The Kantian influence. Positivism, naturalism, pragmatism, neo-positivism.

PHIL 442 Contemporary Philosophy II (4-0)4

Phenomenological analysis and the existential perspective. Analytic philosophy. Hermeneutic philosophy.

PHIL 443 Islamic Philosophers (3-0)3
Text-oriented study of some major Islamic philosophers.

PHIL 444 The 19th Century Philosophy (4-0)4
A survey of Anglo-Saxon and Continental philosophies of the 19th Century.

PHIL 451 Problems of Metaphysics (3-0)3
A survey of the main problems of metaphysics.

PHIL 481 History of Science III (4-0)4
Development of science in the 18th, 19th and 20th centuries.

PHIL 491 Computer Use in Philosophy I (3-0)3
Familiarizing philosophy students with the information technologies, basic computer skills and computer applications. Preparing students in using these skills during their undergraduate studies as well as in their professional lives. Philosophical discussion of the ethical problems introduced by internet & computer and discussion of secure use of information technologies.

GRADUATE PROGRAMS AT THE DEPARTMENT OF PHILOSOPHY

M.A. PROGRAM IN PHILOSOPHY

Required Courses

PHIL	504	Prothesis Seminar	NC
PHIL	551	Advanced Logic I	(3-0)3
PHIL	599	Master's Thesis	NC
PHIL	800-899	Special Studies	NC

6 electives

Elective Courses

PHIL	501	Research Methods	(3-0)3
PHIL	505	Confirmation of Scientific Theories I	(3-0)3
PHIL	506	Confirmation of Scientific Theories II	(3-0)3
PHIL	507	Philosophical Logic I	(3-0)3
PHIL	508	Philosophical Logic II	(3-0)3
PHIL	510	Topics in Epistemology	(3-0)3
PHIL	511	Graduate Readings in Philosophy I	(3-0)3
PHIL	512	Graduate Readings in Philosophy II	(3-0)3
PHIL	513	Graduate Readings in Philosophy III	(3-0)3
PHIL	514	Graduate Readings in Philosophy IV	(3-0)3
PHIL	515	Philosophy of Technology I	(3-0)3
PHIL	516	Philosophy of Technology II	(3-0)3
PHIL	517	Philosophy of Communication I	(3-0)3
PHIL	518	Philosophy of Communication II	(3-0)3
PHIL	521	Studies in the History of Science I	(3-0)3
PHIL	522	Studies in the History of Science II	(3-0)3
PHIL	523	Studies in Philosophy of Science I	(3-0)3
PHIL	524	Studies in Philosophy of Science II	(3-0)3
PHIL	525	Measurement and Evaluation	(3-0)3
PHIL	527	Philosophy in Science	(3-0)3
PHIL	528	Contemporary Naturalistic Philosophies of Human Nature	(3-0)3
PHIL	529	Philosophy of Biology	(3-0)3
PHIL	530	Studies in Greek Philosophy: Hellenistic Philosophers	(3-0)3
PHIL	531	Studies in Greek Philosophy: Artistotle	(3-0)3
PHIL	532	Studies in Greek Philosophy: Plato	(3-0)3
PHIL	533	Introduction to Phenomenology	(3-0)3
PHIL	534	Introduction to the Thought of Heidegger	(3-0)3
PHIL	535	Introduction to the Thought of Nietzsche	(3-0)3
PHIL	536	Twentieth-Century Philosophy of Art	(3-0)3
PHIL	537	Kant’s Philosophy of art and Nature	(3-0)3
PHIL	538	Twentieth-Century Continental Philosophy and Technology	(3-0)3
PHIL	539	Subjectivity in Crisis	(3-0)3
PHIL	540	Special Issues in Philosophy I	(3-0)3
PHIL	541	Special Issues in Islamic Philosophy I	(3-0)3
PHIL	542	Special Issues in Islamic Philosophy II	(3-0)3
PHIL	544	Special Issues in Philosophy II	(3-0)3
PHIL	545	Graduate Readings in Turkish-Islamic Philosophy I	(3-0)3
PHIL	546	Graduate Readings in Turkish-Islamic Philosophy II	(3-0)3
PHIL	548	Twentieth Century Philosophy and Literature	(3-0)3
PHIL	550	Major Philosophers I	(3-0)3
PHIL	552	Advanced Logic II	(3-0)3
PHIL	553	Scientific Explanation	(3-0)3
PHIL	554	Scientific Concepts and Theories	(3-0)3
PHIL	555	Analytic Philosophy and the Analytic Tradition	(3-0)3
PHIL	560	Studies in Political Philosophy and Ethics: Contractarianism	(3-0)3
PHIL	571	Eco-Philosophy: Philosophy of Environment I	(3-0)3
PHIL	572	Eco-Philosophy: Philosophy of Environment II	(3-0)3
PHIL	580	Bioethics and Biopolitics	(3-0)3

DESCRIPTION OF COURSES IN M.A. PROGRAM

PHIL 501 Research Methods (3-0)3
An advanced paper-writing workshop aiming to teach students methods and techniques of research and publication in philosophy.

PHIL 504 Prothesis Seminar NC
A seminar to be given by each Master's degree candidate related to her/his thesis topic.

PHIL 505 Confirmation of Scientific Theories I (3-0)3
The hypothetico-deductive, Bayesian, and "boot strapping" models of theory confirmation. Idealizations and approximations for confirmation in science.

PHIL 506 Confirmation of Scientific Theories II (3-0)3
A continuation of PHIL 505.

PHIL 507 Philosophical Logic I (3-0)3
Modal and intentional logics. Tense Logic, Epistemic Logic, Deontic Logic.

PHIL 508 Philosophical Logic II (3-0)3
A continuation of PHIL 507.

PHIL 510 Topics in Epistemology (3-0)3
Study of selected topics is epistemology.

PHIL 511 Graduate Readings in Philosophy I (3-0)3
Examination of major philosophical

PHIL 512 Graduate Readings in Philosophy II (3-0)3
Examination of major philosophical

PHIL 513 Graduate Readings in Philosophy III (3-0)3 Examination of major philosophical

PHIL 514 Graduate Readings in Philosophy IV (3-0)3
Examination of major philosophical

PHIL 515 Philosophy of Technology I (3-0)3
Technology assessment, technoaxiology, responsibility brought by increased technological power, historical, epistemological and metaphysical problems regarding technology, information and computers, the problems of philosophy of technology as a recently emerged philosophical discipline.

PHIL 516 Philosophy of Technology II (3-0)3
A continuation of PHIL 515.

PHIL 517 Philosophy of Communication I (3-0)3
The course aims at: 1) Improving the student's understanding of the problems of communication stemming from the relationship between language, truth, rationality and intentionality of human action; 2) to increase his knowledge of the theory and use of argumentative discourse in philosophical and practical problems. To this end, this course will proportionally focus on traditional (ancient, medieval, modern) and contemporary approaches to philosophy of communication and their solutions to various communication problems.

PHIL 518 Philosophy of Communication II (3-0)3
A continuation of PHIL 517.

PHIL 521 Studies in the History of Science I (3-0)3
Studies in change of scientific theories in historical perspective.

PHIL 522 Studies in the History of Science II (3-0)3
Continuation of PHIL 521.

PHIL 523 Studies in Philosophy of Science I (3-0)3
Discussion of various problems in contemporary philosophy of science. Critical assessment of recent philosophical views on these issues.

PHIL 524 Studies in Philosophy of Science II (3-0)3
A continuation of PHIL 523.

PHIL 525 Measurement and Evaluation (3-0)3
Continuous and discrete variables. Intensive and extensive qualities. Scales of measurement. The logic of evaluation.

PHIL 527 Philosophy in Science (3-0)3
The Logical Empiricist philosophy of science. The origins of Logical Empiricism. Confirmation. Theoretical terms. Explanation. Falsification. The new image of science. Perception and theory.

Presuppositions in science. Scientific revolutions. Context of discovery and context of justification. Some basic epistemological and metaphysical problems in science. Rationality. Scientific knowledge and scientific truth.

PHIL 528 Contemporary Naturalistic Philosophies of Human Nature (3-0)3

This course offers a critical examination of some of the modern philosophies that either denies human nature (for instance, the blank-slate view of modern empiricism and their twentieth century versions) or accounts of human nature in terms of immaterial/transcendent soul with certain intellectual and moral imprints from a naturalistic perspective that proposes naturalistic theories of human nature. The course starts with a survey of the above-mentioned non-naturalistic theories and naturalism in philosophy and then continues with a critical defense of contemporary naturalistic theories of human nature based on advances in biology and cognitive sciences. In relation to the human nature problem several other issues are also examined, such as ethics, politics, gender, violence, education, arts.

PHIL 529 Philosophy of Biology (3-0)3

This course offers a survey and critical examination of basic issues in the philosophy of biology: a brief history and philosophy of biology; the structure of evolutionary theory, with a special emphasis on the status of natural selection; the rise of genetics; biological teleology; the implications of biology for human kind; the problem of reduction; the significance of Human Genome Project; challenges to the adaptationist programme; ethical and social issues, including the status of neo-creationism (Intelligent Design).

PHIL 530 Studies in Greek Philosophy: Hellenistic Philosophers (3-0)3

A study of writings by the Hellenistic philosophers. Topics of special interest are the problem of criteria of truth and questions concerning ethics.

PHIL 531 Studies in Greek Philosophy: Aristotle (3-0)3

Study of the main ethical texts of Aristotle.

PHIL 532 Studies in Greek Philosophy: Plato (3-0)3

Study of the main ethical texts of Plato.

PHIL 533 Introduction to Phenomenology (3-0)3

Husserl, Heidegger, Merleau-Ponty; introduction to their major concepts, methods and texts; how to practice phenomenological seeing; twentieth-century developments following on from phenomenology.

PHIL 534 Introduction to the Thought of (3-0)3

Introduction to some of the major concepts, methods and texts of Heidegger; his early phenomenological work; his late thought on technology, language, poetry; later developments – in deconstruction, architecture, cognitive science – following on from his philosophy.

PHIL 535 Introduction to the Thought of Nietzsche (3-0)3

Nietzsche; introduction to his major concepts, methods and some of his most important texts; how to read Nietzsche effectively; Nietzsche's Kantian heritage; Nietzsche and post-modernism; critiques of the subject after Nietzsche.

PHIL 536 Twentieth-Century Philosophy of Art (3-0) 3

Truth and art; phenomenology; the role of the work of art in phenomenology; key reflections on art by Heidegger, Merleau-Ponty, and Nancy; discussions of specific artworks; the status of different artistic genres.

PHIL 537 Kant's Philosophy of Art and Nature (3-0) 3

Kant's *Critique of the Power of Judgement*; judgements on the beautiful and on the sublime; the role of genius in the production of art; art and morality; the completion of the critical project; purposiveness without purpose; regulative judgements about nature; biology vs. physics.

PHIL 538 Twentieth-Century Continental Philosophy and Technology (3-0)3

Conceptions of and responses to the provocation of technology in twentieth-century Continental thought; human beings and technology – mutual effects; the changing self-understanding of human being amidst modern technology; influential understandings of twentieth-century technology in the work of Heidegger, Canguilhem, Deleuze and Guattari, and De Landa.

PHIL 539 Subjectivity in Crisis (3-0)3

Introduction to the modern notion of subjectivity and its critiques; study of some of the key texts in this area, both primary and secondary; consideration of the implications of subjectivity`s crisis for contemporary continental philosophy.

PHIL 540 Special Issues in Philosophy I (3-0)3
Studies in a particular philosophical system or problem.

PHIL 541 Special Issues in Islamic Philosophy I (3-0)3
Immanent issues in Islamic philosophy with solutions by important philosophers such as Al Farabi, Ibn Sina, Ghazzali, Sadra and Ibn Arabi.

PHIL 542 Special Issues in Islamic Philosophy II (3-0)3
A continuation of PHIL 541.

PHIL 544 Special Issues in Philosophy II (3-0)3
A continuation of PHIL 540.

PHIL 545 Graduate Readings in Turkish-Islamic Philosophy I (3-0)3
Selected readings from the works of Turkish and Islamic philosophers such as Farabi, Ibn Sina, Ibn Rushd, Mevlana, Sadr ald-Din, al Quarawi and Kemal Pashazade.

PHIL 546 Graduate Readings in Turkish-Islamic Philosophy II (3-0)3
A continuation of PHIL 545.

PHIL 548 Twentieth-Century Philosophy and Literature (3-0)3

How can we understand language in general? What is distinctive about the language of literature? Some major statements on language and literature in twentieth-century thought; the central role of Kafka for that thought; thought expressed in philosophy and in literature; the influential concept of a 'minor' literature; philosophical writers, e.g. Rilke, Beckett.

PHIL 550 Major Philosophers I (3-0)3
Intensive study of the works of a major philosopher.

PHIL 551 Advanced Logic I (3-0)3
Proof theory and model theory of formal systems. Recursion theory.

PHIL 552 Advanced Logic II (3-0)3
A continuation of PHIL 551.

PHIL 553 Scientific Explanation (3-0)3
The nature and methods of science. Scientific laws and lawlike statements. The principle of causality. Logical analysis of scientific explanation. Kinds of explanation. Critical appraisal of current views on scientific explanation. Explanation and prediction.

PHIL 554 Scientific Concepts and Theories (3-0)3
Concept formation and definition in science, classificatory, comparative and quantitative concepts. Observation language, theoretical language, and correspondence rules. The problem of theoretical terms. The nature of scientific theories and models.

PHIL 555 Analytic Philosophy and the Analytic Tradition (3-0)3
The forerunners and the founders of the Analytic Tradition. The Logical Empiricists. The ordinary-language and the formal-language philosophy. Definition of analytic philosophy; philosophy and science; philosophical analysis of metaphysical knowledge claims; the empiricist criterion of meaning.

PHIL 556 Major Philosophers II (3-0)3
A continuation of PHIL 550.

PHIL 560 Studies in Political Philosophy and Ethics: Contractarianism (3-0)3
A study of the philosophical issues of the theories of "social contract". The main topic of discussions is the concept of "agreement" (contract, compact and covenant) as one of the principal explanatory tools for political theory and ethics. The texts from which selections will be read are the writings of Thomas Hobbes, John Locke, David Hume, Jean Jacques Rousseau, Immanuel Kant and John Rawls.

PHIL 571 Eco-Philosophy: Philosophy of Environment I (3-0)3
Philosophical discussions of environmental problems.

PHIL 572 Eco-Philosophy: Philosophy of Environment II (3-0)3
A continuation of PHIL 571.

PHIL 580 Bioethics and Biopolitics: (3-0)3
New moral issues involved in the transformation of Ethics in our time. Inquiry in value problems in different settings such as biomedical activity and man-nature relationship. Biopolitics as ethical study of environmental (ecological) issues with man's impact on the biosphere as the origin.

PHIL 599 Master's Thesis NC

PHIL 800-899 Special Studies NC

EVENING M.A. PROGRAM IN APPLIED ETHICS
(Without Thesis)

Required:

AET	581	Research Methods in Applied Ethics	(3-0)3
AET	582	Ethics and Value I: Theoretical	(3-0)3
AET	583	Ethics and Value II: Applied	(3-0)3
AET	584	Ethics of Argument and Persuasion	(3-0)3
AET	585	Ethics and Decision Making	(3-0)3
AET	589	Term Project	(3-0)3

5 electives

Elective Courses:

AET	586	Ethics and Computer Technology	(3-0)3
AET	587	Ethics of Discourse	(3-0)3
AET	588	Environmental Ethics	(3-0)3
AET	590	Ethics and Self-Awareness	(3-0)3
AET	591	Media Ethics I: Theoretical	(3-0)3
AET	592	Media Ethics II: Applied	(3-0)3
AET	593	Media Ethics III: Research on Case Studies	(3-0)3
AET	594	Ethics in Organizations I: Theoretical	(3-0)3
AET	595	Ethics in Organizations II: Applied	(3-0)3
AET	596	Ethics in Organizations III: Research on Case Studies	(3-0)3
AET	597	Business Ethics	(3-0)3

DESCRIPTION OF COURSES IN M.A. IN APPLIED ETHICS

Core Courses:

AET 581 Research Methods in Applied Ethics (3-0)3

This course starts with an assumption: Research Method in Applied Ethics is qualitative and is based upon rules perspective. The reason for this assumption is that in ethics, both descriptive and prescriptive (normative) methods are inadequate. The former reduces ideas to law-like generalizations of behaviour, while the latter gives a fixed catalogue of recipe-like collection of norms. As a third alternative, rules approach assumes that at the rule-governed level of ethical conduct, rules provide form for the ethical behaviour, while reducing neither ideas nor action to secondary status. Any and every field of applied ethics may be considered as a field of consensus over some rules. A code of ethics, in this sense carries properties unique to rules, and not to law-like generalizations. A code of ethics as a "rule" first of all, has *normative power*, i.e., it tells us *how* to "correct" our behavior once we deviate from it. A rule in this sense is a criterion of making a choice. Secondly, a rule must have *generality*. It must be simple enough to apply to a wide range of cases. Thirdly, a rule must have *necessity*, i.e., must invoke, in the parties involved, a *sense* of obligation. The subject's "feeling of obligation" or of "normative necessity" plus his performative act of obedience to "rules" is nothing but the "closure" of the structure called a "code of ethics". Collection of a particular group of such structures for a particular field (such as media, business, environment, etc.) will constitute a part of the *grammar of applied ethics.* The first part of this course examines the concept of *rule* and related concepts such as "rule governed behavior", "normative power", "constitutive-regulative rules" and answers to such questions as "What are the analytic (a priori) and empirical aspects of a rule?" "What is the logical make up of a rule?" "What are the relationships between rules and performative actions?" etc.

The second part of the course aims at making explicit the connections between a code of ethic and a rule. Two major attempts at taxonomy of constitutive-regulative rules (Searle and Habermas) will be given as illustration. The students are expected to develop similar taxonomies for the concrete cases when they take Research on Case Studies (PHIL 593 and 596).

This course is the regulative back-bone for the other courses whose contents are about theoretical or practical aspects of the *grammar* of applied ethics.

AET 582 Ethics and Value: Theoretical (3-0)3

The very continuity of the social order suggests that there is some degree of agreement about values, or at least some conformity to common principles of

action. If so, the problem of philosophical reflection becomes one of deciding what our value commitments are and whether they can be defended as rational. The aim of this introductory course will be to pursue such reflection in conjunction with a reading and discussion of texts by major thinkers of the past (e.g., Aristotle, Plato, Kant, Mill, Nietzsche). The course will thus categorize, classify and summarize some of the major ethical theories such as subjectivism, objectivism, conventionalism, utilitarianism, the appeal to nature, the appeal to the golden rule, Kantianism, egoism, etc. The main focus will be to identify the criterion of rationality that these theories imply.

AET 583 Ethics and Value II: Applied (3-0)3

The course will begin with consideration of various arguments encountered in everyday life on ethical or moral issues. After developing some skill in identifying ethical and moral arguments and disagreements, major competing ethical theories that the students studied in PHIL 582 will be applied to these moral problems. In order to fulfill this aim, several concrete and pressing contemporary moral problems will be chosen such as birth control, abortion, capital punishment, etc. The students will be encouraged to write and think clearly about these problems, weighing alternative solutions and criticizing those which are weak or untenable. The main focus will be to provide the student with the skills necessary to identify a moral problem and to introduce her/him to critical philosophical thinking over moral issues.

AET 584 Ethics of Argument and Persuasion (3-0)3

The connection between argument and ethics is an old one: Aristotle in his *Rhetorics* wrote that rhetoric was an offshoot of ethical studies. Modern persuasive techniques such as advertising methods, mass media, Internet, etc., make this connection between ethics and argument more problematic than the ancient time of Aristotle. Some people take the position that all persuasion is unethical. This school of thought finds intellectual support in the writings of Plato. Other people, coming from the tradition of Aristotle make a distinction between ethical and unethical persuasion. The first part of this course will review these theoretical views on persuasive arguments. The thinkers, whom this course examines, include ancients (Plato, Aristotle, Cicero) as well as moderns (Weaver, Toulmin, Habermas....) ones.

The second part of this course takes a closer look at the questions “When is it ethical to persuade?” and “How are such arguments constructed?” The students will be encouraged to write and think clearly on some ordinary life examples of ethical and unethical arguments and to apply certain models of constructing arguments to these examples.

AET 585 Ethics and Decision Making (3-0)3

Most of us find ourselves facing ethical dilemmas and conflicts on a daily basis, and we need to make decisions to resolve them. Resolution of those conflicts would often be easier if we knew the methods of how to make rational decisions under insufficient information or under risk. Decision theory studies ways of decision-making by rational individuals and groups of individuals. This course, which assumes no sophistication in mathematics beyond high-school algebra, provides an introduction to the fundamentals of decision theory, paying attention to matters of ethical and social choice.

AET 589 Term Project (3-0)3

Each student will be asked to pursue an individual MA Term Project on applied ethics by using all the conceptual tools so far acquired.

Elective Courses:

ET 586 Ethics and Computer Technology (3-0)3

This course examines central ethical issues involved in the production and use of computer and computer based communication and information technologies. We will begin by introducing certain philosophical problems related to the peculiarities of computer use and communication through the Web and proceed to case discussions on ethical topics like privacy, right to access to information, property rights, hacking, professional ethical codes, reliability and security.

AET 587 Ethics of Discourse (3-0)3

Ethics of Discourse is an important movement in twentieth century philosophy. Philosophers like Apel and Habermas regard discourse ethics as a basis for establishing norms. Norms are a matter of consensus of the equal participants of discourse and not a question of a privileged subject. This course examines discourse theory of ethics and its practical applications.

AET 588 Environmental Ethics (3-0)3

Environmental ethics is a controversial area in applied ethics in at least three respects: complexity of environment, conflict of interest in environment, and human centered ethical traditions, concepts and theories neglecting the non-human environment. So, while uncertainty and conflict of interest increase the demands on ethical principles, the basic assumptions of traditional ethics are difficult to extend to the non-human environment. For example, people have rights, but do other (higher) animals? Do even plants have an interest? Can only individuals deserve to be subjects of moral considerations or can groups of individuals, such as species and ecosystems also be included into moral consideration? What is our fair share of the atmosphere? These and similar questions are treated by both anthropocentrists and ecocentrists.

AET 590 Ethics and Self-Awareness (3-0)3

Contemporary ethics either examines the language of morality or argue about the comparative merits of pragmatic ethics, Kantian ethics and utilitarianism. All of these ethical positions presuppose that human beings are free to direct their own lives and take full responsibility for both the values they hold and actions they perform. They assume that humans can become fully aware of the forces motivating them, determine which of these forces are ethically superior to others and act on the basis of this awareness. This creates an important gap in ethics. The failure of ethicists to respond to the discovery of the unconscious and the relevance of psychotherapy to question fully the values of ethics has meant that we have lived with two isolated discourses concerning human agency in our culture. In this course, by rethinking and reformulating the primary concepts and categories of ethics, the gap between traditional ethics and psychology of the unconscious will be bridged.

AET 591 Media Ethics I: Theoretical (3-0)3

Existing global attempts to develop a *grammar* of media ethics.

The first part of this course will be a theoretical overview of world literature in media ethics. The nature of ethical problems in mass media and journalism will be examined. Code of ethics concerning accountability of the media, fabrication, plagiarism, veiled attribution, conflict of interests, individual privacy vs. public interest, etc., will be critically assessed. The three criteria developed in the Research Methods (PHIL 581), namely, generality, necessity, and power will be used in this evaluation. The second part of this course will examine the ethical aspects of information technology, media imperialism and the question of "Global Conversation". The final part of this course will review the international efforts (by UNESCO, European Community, etc.) to develop supra-national codes of ethics in the above-mentioned areas of moral problems in media. The three criteria mentioned above (generality, necessity, power) will be used to evaluate these codes of ethics. This course constitutes the basis of the applied courses (PHIL 592-593) in media ethics.

AET 592 Media Ethics II: Applied (3-0)3

The existing situation of the *grammar* of media ethics in Turkey.

This course is continuation of PHIL 591. Added to the student's prior knowledge, a series of bi-weekly seminars will enable her/him to see the ethical problems in media in concrete setting and from the angle of its practitioners. To this aim, guest speakers from both media, universities and other media-related organizations will be invited to these seminars. The instructor of this course has the task of organizing and monitoring these seminars and getting the students actively participate into them. The seminar reports written by the students will be discussed and critically evaluated by the class during the week following each seminar, and will constitute the basis for her/his performance evaluation.

Prerequisite: PHIL 591

AET 593 Media Ethics III: Research on Case Studies (3-0)3

Each student's individual attempt to contribute to *grammar* of media ethics.

Each student taking this course will choose, at the beginning of the semester, a case study in a field of media ethics (developed in detail in PHIL 591). Case studies may be chosen from both national and international events such as "Susurluk", "Watergate", "Zippergate", "Marmara Earthquake", etc. Students will present weekly papers towards reconstruction and evaluation of the pro and con arguments in relation to moral problems involved in the *reflection* of these events on media. Based on her/his knowledge of research methods (PHIL 581), each student, in the end, will attempt to develop a taxonomy of codes of ethics concerning her/his choice of particular case.

Prerequisite: PHIL 581

AET 594 Ethics in Organizations I: Theoretical (3-0)3

Existing global attempts to develop a *grammar* of organizational ethics.

In the first part of this course, theories and concepts upon which organizational ethics are based will be reviewed. The nature of ethical problems, the types of ethical dilemmas which people may face in various organizational contexts will be examined. Codes of ethics concerning moral issues such as individual and corporate responsibilities, prevention of fraud and corruption, public trust will be critically addressed. The three criteria developed in the Research Methods (PHIL 581), namely, generality, necessity, and power will be used in this evaluation.

In the second part, ethical issues emanating from cross-cultural and international business transactions, such as the imposition of differing (or conflicting) ethical standards and requirements, in the areas of human rights, environmental issues, pollution, bribes and kick-backs will be examined.

In the final part of the course OECD guidelines and other attempts to develop global standards for organizational and business ethics will be critically assessed. The same criteria mentioned above (generality, necessity, power) will be used in this evaluation.

AET 595 Ethics in Organizations II: Applied (3-0)3

The existing situation of the *grammar* of organizational ethics in Turkey.

This course is a continuation of PHIL 594. Added to the student's prior knowledge, a series of bi-weekly seminars will enable her/him to see the ethical problems in concrete setting and from the angle of business practitioners. To this aim, guest speakers from both public and private organizations will be invited to these seminars. The instructor of this course has the task of organizing and monitoring these seminars and getting the students actively participate into them. The seminar reports written by the students will be discussed and critically assessed by all the class during the week following each seminar, and will constitute the basis for her/his performance evaluation.

Prerequisite: PHIL 594

AET 596 Ethics in Organizations III: Research on Case Studies (3-0)3

Each student's individual attempt to contribute to *grammar* of organizational ethics.

Each student taking this course will choose, at the beginning of the semester, a case study in the field of organizational ethics (developed in detail in PHIL 594). Case studies may be chosen from both national and international events and efforts. Students will present weekly papers towards reconstruction and evaluation of the pro and con arguments in relation to moral problems involved in these events. Guided by her/his knowledge of research methods (PHIL 581), each student, in the end, will attempt to develop a taxonomy of codes of ethics for her case.

Prerequisite: PHIL 581

AET 597 Business Ethics (3-0)3

The course aims to increase ethical awareness and to provide students with a better basis upon which to build their own repertoire of behaviors as managers, now or in the future. The purpose will be to enhance students' understanding of potential ethical issues facing managers in modern organizations, the ethical dilemma which can present themselves and to suggest ways in which these dilemmas might be more effectively dealt with in the practical situation. The issue of corporate responsibility, what it means in the modern world will be explored examining various corporate violations. The course also aims to impart the reasoning and analytical skills needed to use ethical concepts in business decisions with a view of critical thinking and moral reasoning.

Ph.D. PROGRAM IN PHILOSOPHY

Required Courses

PHIL	600	Ph.D. Seminar	(3-0)3
PHIL	604	Prothesis Seminar	NC
PHIL	655	Research Problems in Philosophy of Science	(3-0)3
PHIL	699	Ph.D. Dissertation	NC
PHIL	900-999	Special Topics	NC

6 electives

Elective Courses

PHIL	601	Special Issues in Epistemology I	(3-0)3
PHIL	602	Special Issues in Epistemology II	(3-0)3
PHIL	603	Special Issues in Philosophical Logic I	(3-0)3
PHIL	605	Studies in German Idealism	(3-0)3
PHIL	610	Issues in the History of Turkish-Islamic Philosophy	(3-0)3
PHIL	621	Ontology and Philosophy of Mind I	(3-0)3
PHIL	622	Ontology and Philosophy of Mind II	(3-0)3
PHIL	623	Discourse Analysis of Philosophical Texts I	(3-0)3
PHIL	624	Discourse Analysis of Philosophical Texts II	(3-0)3
PHIL	627	Special Issues in Ontology I	(3-0)3
PHIL	628	Special Issues in Ontology II	(3-0)3
PHIL	630	Special Topics in History of Science	(3-0)3
PHIL	631	Axiomatization of Scientific Theories	(3-0)3
PHIL	632	Dynamics of Scientific Theories	(3-0)3
PHIL	633	Foundations of Logic I	(3-0)3
PHIL	634	Foundations of Logic II	(3-0)3
PHIL	635	Studies in Ethics	(3-0)3
PHIL	636	Studies in Political Philosophy	(3-0)3
PHIL	637	Studies in the Philosophy of Wittgenstein I	(3-0)3
PHIL	638	Studies in the Philosophy of Wittgenstein II	(3-0)3
PHIL	640	Logical Foundations of Statistical Inference	(3-0)3
PHIL	643	Basic Issues in Philosophy	(3-0)3
PHIL	644	Current Problems in Philosophy	(3-0)3
PHIL	647	Studies in the History of Philosophy I	(3-0)3
PHIL	648	Studies in the History of Philosophy II	(3-0)3
PHIL	650	Great Philosophers	(3-0)3
PHIL	651	Studies in Metaphilosophy	(3-0)3
PHIL	652	Historiography and Metahistory of Science	(3-0)3
PHIL	653	Theories of Scientific Method	(3-0)3
PHIL	654	Philosophy of Nature	(3-0)3
PHIL	655	Research Problems in Philosophy of Science	(3-0)3
PHIL	711	Special Assignments in Philosophy I	(0-1)1
PHIL	712	Special Assignments in Philosophy II	(0-2)2

DESCRIPTION OF COURSES IN Ph.D. PROGRAM

PHIL 600 Ph.D. Seminar (3-0)3

PHIL 601 Special Issues in Epistemology I (3-0)3

Study of the main issues connected with truth, belief, knowledge, skepticism, justification, reliability, coherence.

PHIL 602 Special Issues in Epistemology II (3-0)3

A continuation of PHIL 601.

PHIL 603 Special Issues in Philosophical Logic (3-0)3

Application of Modal and Intentional Logics and the possible world semantics to the main issues of philosophy.

PHIL 604 Prothesis Seminar NC

A seminar to be given by each Ph. D. degree candidate related to his/her dissertation topic.

PHIL 605 Studies in German Idealism (3-0)3

The system of Kantian critiques; the issues of freedom, nature and purposiveness. Ficthe's science of knowledge; the problem of the

foundation of knowledge, idealism-realism debate, the issues of self and freedom.

PHIL 610 Issues in the History of Turkish-Islamic Philosophy (3-0)3

Special topics in Turkish and Islamic philosophy and solutions offered by immanentist philosophers.

PHIL 621 Ontology and Philosophy of Mind I (3-0)3

Discussion of some of the major problems in contemporary philosophy of mind and the related ontological issues. The topics covered include the body-mind problem, the problem of other minds, Cartesian dualism, Behaviorism, the Identity Theory, Functionalism, Eliminative Materialism, the Supervenience Theories, Qualia, Intentionality.

PHIL 622 Ontology and Philosophy of Mind II (3-0)3

Continuation of the discussion of some of the major problems in contemporary philosophy of mind and the related ontological issues, such as Turing Test, the Chinese Room Argument, consciousness, modularity of mind, neutral monism, phenomenalism, Continental approaches to the problem of mind, computational theory of mind, personal identity, and free will.

PHIL 623 Discourse Analysis of Philosophical Texts I (3-0)3

Logical analysis of discourse, speech acts, illocutionary logic, analysis of philosophical texts.

PHIL 624 Discourse Analysis of Philosophical Texts II (3-0)3

A continuation of PHIL 623.

PHIL 627 Special Issues in Ontology I (3-0)3

Ontological aspects of modal logic and possible world semantics.

PHIL 628 Special Issues in Ontology II (3-0)3

A continuation of PHIL 627.

PHIL 630 Special Topics in History of Science (3-0)3

Discussion of a particular topic or the works of a particular scientist in the history of science.

PHIL 631 Aximotization of Scientific Theories (3-0)3

Axiomatization and logical reconstruction of the structure of physical theories.

PHIL 632 Dynamics of Scientific Theories (3-0)3

Logical analysis of the evolution of physical theories.

PHIL 633 Foundations of Logic I (3-0)3

Studies in the foundations of logical theories.

PHIL 634 Foundations of Logic II (3-0)3

A continuation of PHIL 633. Prerequisite: Consent of the instructor.

PHIL 635 Studies in Ethics (3-0)3

In depth study of ethical concepts and theories.

PHIL 636 Studies in Political Philosophy (3-0)3

Study of major problems in political philosophy.

PHIL 637 Studies in the Philosophy of Wittgenstein I (3-0)3

Studies in Wittgenstein's later philosophy.

PHIL 638 Studies in the Philosophy of Wittgenstein II (3-0)3

A continuation of PHIL 637.

PHIL 640 Logical Foundations of Statistical Inference (3-0)3

The logical interpretation, the frequency interpretation and the subjective interpretation of probability calculus. Inductive logic and logical structure of statistical inference: a) The Bayesian approach and the logic of decision, b) The likelihood approach and the logic of support.

PHIL 643 Basic Issues in Philosophy (3-0)3

Intensive discussion of the basic epistemological and ontological doctrines which have influenced the development of contemporary philosophy.

PHIL 644 Current Problems in Philosophy (3-0)3

A continuation of PHIL 643.

PHIL 647 Studies in the History of Philosophy I (3-0)3

Guided reading of basic texts, chosen from various ages of philosophical inquiry, primarily

connected with each student's proposed area of specialization.

PHIL 648 Studies in the History of Philosophy II (3-0)3
Continuation of PHIL 647.

PHIL 650 Great Philosophers (3-0)3
In-depth study of the major work of a great philosopher.

PHIL 651 Studies in Metaphilosophy (3-0)3
Investigation of the main problems concerning the end, subject matter and methods of philosophy.

PHIL 652 Historiography and Metahistory of Science (3-0)3
Examination of the philosophies, methods and sources in the history of science, and their relations to the current state of scholarship.

PHIL 653 Theories of Scientific Method (3-0)3
Views on the methods of mathematical and empirical sciences in the ancient world; theories of scientific method since Renaissance.

PHIL 654 Philosophy of Nature (3-0)3
Greek cosmology, the Renaissance view of nature, the modern view of nature.

PHIL 655 Research Problems in Philosophy of Science (3-0)3
Identifying and examining the main problems at the frontier of philosophy of science.

PHIL 699 Ph.D. Dissertation NC

PHIL 711 Special Assignments in Philosophy I (0-1)1
This course is designed as a remedial course for students who are decided to pass the departmental Ph. D. Qualifying Examination under the condition that they complete a paper or other assignment on a topic to be determined by the Qualifying Examination Committee. There will normally be lectures or examinations in this course.

PHIL 712 Special Assignments in Philosophy I (0-2)1
This course is designed as a remedial course for students who are decided to pass the departmental Ph. D. Qualifying Examination under the condition that they complete a paper or other assignment on a topic to be determined by the Qualifying Examination Committee. There will normally be lectures or examinations in this course.

PHIL 900-999 Special Topics NC

DEPARTMENT OF PHYSICS

PROFESSORS

AKINOĞLU, Bülent G.: B.S., M.S., Ph.D., METU.
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BALMAN, Şölen: B.S., Boğaziçi University; Ph.D., University of Wisconsin.
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ASSISTANT PROFESSOR

BEK, Alpan: B.S., Bilkent University; M.S., Bilkent University; Ph.D., École Polytechnique Fédérale de Lausanne.

GENERAL INFORMATION: The Department of Physics offers programs leading to degrees of B.S., M.S. and Ph.D. in Physics.

The B.S. degree in Physics is granted to a candidate who has fulfilled the requirements of the Undergraduate Physics Curriculum as well as satisfying the general requirements for this degree. Exemption from these requirements and the choice of elective courses will be subject to the approval of the student's advisor and to the Department Chair of the Department.

RESEARCH INTERESTS AND FACILITIES: The fields in which advanced studies and research are carried out include: 1) Physics of Condensed Matter, 2) Atomic and Molecular Physics, 3) Nuclear Physics, 4) High Energy Physics, 5) Astrophysics, 6) Mathematical Physics, 7) Plasma Physics, and 8) General Physics.

Department of Physics has the following teaching and research laboratories:

A. Teaching Laboratories:

1. General Physics Laboratory
2. Optics Laboratory
3. Electronics Laboratory
4. Modern Physics Laboratory
5. Solid State Physics Laboratory
6. Computational Physics Laboratory
7. Advanced Physics Laboratory
8. Optoelectronics Laboratory

These laboratories are equipped to acquaint the students with key experiments and basic experimental techniques in physics.

B. Research Laboratories:

1. Solid State Physics Laboratory: Production and characterization of semiconducting materials and devices such as photoconductors, solar cells, and infrared detectors. A clean room with a 130 m^2 working area for Si technology, layer compounds and thin film technology. Ion implantation and its applications. Semiconductor research on wide range of materials including II and III-VI ternary compounds, silicon and silicon nanostructure. Experimental work on these materials includes crystal growth of bulk and thin film materials (thermal, e-beam, magnetron sputtering methods) and the study of basic phenomena by using techniques such as I-V, C-V, PL, EL, TL, TSC, optical and magnetic properties, photoconductivity, photoresponse.

2. Superconductivity Research Laboratory: Synthesis, characterization and properties of high T_c superconductors. Voltage-current characteristics and flux-flow resistances. Effects of temperature, magnetic field and various irradiations on the structural and electrical properties. Equipment available: Furnaces, a nitrogen cryostat, closed-cycle helium cryostat, He-Ne laser, an electromagnet and electromagnetic measurement system.

3. Solid State Laser Laboratory: Diode lasers, Nd-YAG Lasers, LIBS, Optical Spectroscopy, photodetectors, optical fibers and materials.

4. Thermally and Optically Stimulated Luminescence Laboratory (TOSL) is focused on studies of interaction of ionizing radiation with solids (mainly insulators) using luminescence techniques. Basic application areas of these researches include defect characterization, radiation dosimetry (medical, high dose, environmental and retrospective dosimetry) and also dating of geological and archaeological findings. Equipments in the lab include: multi-wavelength TR-OSL measurement system, CW-OSL measurement system, UV-VIS spectrophotometers, PL measurement system, fiber coupled emission spectrometer/spectroradiometer, monochromators, hardware for low level light detection and also sample preparation facilities.

5. Solar Energy Research and Development Center (GÜNAM) was established with the financial support provided by State Planning Organization. GÜNAM laboratories located in the Physics Department buildings have equipments necessary to fabricate wafer based Si solar cells and thin film solar cells.

6. High Energy Physics Simulation and Analysis Laboratory: High Energy Physics (HEP) Simulation and Analysis Laboratory provides parallel computing environment for Monte Carlo simulation studies and data analysis. The resources for Grid Computing are also accessible from the laboratory. Our Experimental High Energy group is collaborating in the Compact Muon Solenoid (CMS) experiment on the Large Hadron Collider (LHC) at CERN in Switzerland, which is a particle accelerator to collide beams of protons at center of mass energy of 14 TeV.

7. High Energy Physics Emulsion Scanning Laboratory: Provides research facilities in High Energy Physics experiments using the nuclear emulsion technique. An *automated* microscope system which consists of a computer driven mechanical stage, an optical system, a digital CCD camera and its associated readouts is used to reconstruct tracks of elementary particles in the nuclear emulsion. This system is developed in the framework of the OPERA experiment which is proposed as an appearance search for muon neutrino to tau neutrino oscillations in the parameter region indicated by Super-Kamiokande experiment. Neutrino group at METU is the member of the OPERA collaboration at Gran Sasso

8. Plasma Physics Laboratory: Plasma diagnostics; gas discharges plasma processing; plasma focus; Relativistic electron beam and Spherical Tokamak.

9. Computer Simulation Laboratory: Provides research facilities in development of advanced high performance materials in computer. New computational algorithms are developed together with Molecular Dynamics and Monte Carlo simulation methods in studying statistical mechanics of many-body systems.

10. Molecular Physics Laboratory: Provides research facilities in atomic and molecular physics, condensed matter physics and nanoscience. Structural, electronic, magnetic, optic, and thermal properties of materials at various sizes are the subjects of interest. Classical and quantum techniques at various levels of calculations are available.

11. Terahertz Research Laboratory: The Terahertz (THz) research laboratory focuses on developing technologies and applications mainly in the far-infrared region of the electromagnetic spectrum. Spectroscopic and imaging techniques are applied through the use of novel architectures to characterize and detect a wide array of materials from semiconductors, polymers and crystals to biological and chemical agents. Research conducted in the lab is based on a wide array of topics which include development of Ultrafast Lasers: Mode-locked Solid State Lasers, Mode-Locked Er- and Yb-doped Fiber Lasers, Non-linear Optical Phenomena, Terahertz Time-Domain Spectrometers, Terahertz Imaging, RF and Optical Spectrum Analysis, High Frequency RF Systems, Laser based Optical Imaging and Surface Metrology.

12. Optoelectronics Laboratory: The Optotelectronics laboratory focuses on the development of photonics technologies based on optical fibers. Research in the lab is conducted on a wide array of topics which include development of mode-locked Er and Yb-doped fiber lasers, fiber optic gyroscopes, fiber loop cavity ring down spectroscopy, LADAR systems and super-continuum generation using photonics crystal fibers.

C. In addition to these laboratories, Physics Department has a machine shop and an electronic workshop to support the experimental research activities.

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: The Department of Physics offers graduate work in a large number of fields, such as age determination and dating techniques, astrophysics, atmospheric physics, atomic and molecular physics, general physics, general relativity and cosmology, high energy physics, mathematical physics, nuclear physics, plasma physics, solid state physics. Both the M.S. and Ph.D. programs aim at providing advanced level training and introducing the recent developments taking place at the frontiers of physics. The faculty enjoys a rightful reputation for the level of teaching and research activity at the department. As an institution devoted to basic sciences and well aware of their fundamental position in the age of "high technology", there is close contact and communication with the international scientific community. This, however, does not prevent the department from focusing on the eventual need for practical results and on making critical contributions to national development. There is considerable effort to promote applied physics programs and with the completion of new laboratories, an important step will be taken in that direction. The M.S. program is self-contained and provides a strong background for employment in industry or in science teaching. The Ph.D. program on the other hand, stresses scientific research whose objective is to meet the worldwide intellectual and economic challenge.

UNDERGRADUATE CURRICULUM

The requirements for B.S. degree in physics include the must courses and ten elective courses listed below. Four of these elective courses must be taken from the Concentrations. At least four of the remaining six elective courses must be taken from other departments.

FIRST YEAR

First Semester

PHYS	109	Mechanics	(5-2)6
CHEM	101	General Chemistry I	(4-2)5
MATH	119	Calculus with Analytic Geometry	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4

Second Semester

PHYS	110	Electromagnetism	(5-2)6
CHEM	102	General Chemistry II	(4-2)5
MATH	120	Calculus of Functions of Several Variables	(4-2)5
ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

SECOND YEAR

Third Semester

PHYS	203	Introductory Electronics	(3-2)4
PHYS	209	Math. Methods in Phys. I	(4-0)4
PHYS	221	Optics and Waves	(4-0)4
MATH	260	Basic Linear Algebra	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

PHYS	202	Modern Physics	(4-0)4
PHYS	210	Mathematical Methods in Phys. II	(4-0)4
PHYS	222	Optics and Waves Lab.	(1-4)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC
Elective			

THIRD YEAR

Fifth Semester

PHYS	311	Classical Mechanics	(4-2)5
PHYS	307	Applied Modern Physics Laboratory	(1-4)3
TURK	303	Turkish I	NC
Elective			
Elective			

Sixth Semester

PHYS	300	Quantum Physics	(3-0)3
PHYS	334	Electromagnetic Theory	(4-2)5
TURK	304	Turkish II	NC
ENG	311	Advanced Communication Skills	(3-0)3
Elective			
Elective			

FOURTH YEAR

Seventh Semester

PHYS	431	Quantum Mechanics I	(4-0)4
PHYS	400	Special Problems in Physics	(2-2)3
Elective			
Elective			

Eighth Semester

PHYS	430	Stat. Thermodynamics	(4-0)4
Elective			
Elective			
Elective			

CONCENTRATIONS

In addition to solid background in physics provided by the must courses, the following Concentrations aim to guide the students to focus in a particular area of physics during their undergraduate study, or prepare for graduate studies. Each Concentration contains two core courses and a set of courses of different flavors. Students are required to take four courses from Concentrations; two of these must be the core courses of one Concentration. Students planning on graduate study in Physics are strongly advised to follow all four restricted elective courses from the same Concentration as appropriate to their career objectives.

CONCENTRATION IN ASTROPHYSICS (AST)

ASTR	301	Solar System Astronomy
ASTR	302	Solar System Astrophysics
ASTR	305	Practical Astronomy I
ASTR	306	Practical Astronomy II
ASTR	312	Modern Astrophysics II
ASTR	401	Astrophysics I
PHYS	418	Principles of Measurement & Instrumentation II
PHYS	427	Introduction to Plasma Physics
PHYS	428	Introduction to Magnetohydrodynamics
PHYS	443	Computational Physics I
PHYS	444	Computational Physics II

Core Courses

ASTR 311 Modern Astrophysics I *or* ASTR 312 Modern Astrophysics II
ASTR 402 Astrophysics II

CONCENTRATION IN CONDENSED MATTER PHYSICS (CM)

PHYS	410	Physics of Condensed Matter II
PHYS	411	Solid State Lab I
PHYS	412	Solid State Lab II
PHYS	417	Principle of Measurement & Instrumentation I

PHYS 418 Principle of Measurement & Instrumentation II
PHYS 439 Physics of Semiconductor Devices I
PHYS 440 Physics of Semiconductor Devices II

Core Courses

PHYS 312 Elementary Condensed Matter Physics
PHYS 409 Physics of Condensed Matter I *or* PHYS 439 Physics of Semiconductor Devices I

CONCENTRATION IN MATHEMATICAL PHYSICS & RELATIVITY (M&R)

ASTR 311 Modern Astrophysics I
PHYS 407 Particle Physics I
PHYS 427 Introduction to Plasma Physics
PHYS 435 Int. to Nonlinear Dynamical Sys. & Chaos I
PHYS 436 Int. to Nonlinear Dynamical Sys. & Chaos II
PHYS 444 Computational Physics II
PHYS 448 Introduction to Stochastic Processes in Physics
PHYS 455 Introduction to Quantum Information Theory
PHYS 482 Theory of Relativity II
PHYS 491 Geometry & Topology in Physics I
PHYS 492 Geometry & Topology in Physics II
PHYS 493 Special Functions for Physicist
PHYS 495 Group Theory in Physics

Core Courses

PHYS 434 Mathematical Methods in Physics III
PHYS 481 Theory of Relativity I *or* PHYS 493 Special Functions for Physicists

CONCENTRATION IN OPTOELECTRONICS (OPTEL)

PHYS 418 Principles of Measurement & Instrumentation II
PHYS 425 Introduction to Laser Physics
PHYS 426 Lasers and Their Applications
PHYS 443 Computational Physics I
PHYS 444 Computational Physics II

Core Courses

(Any two of the following three courses)

PHYS 419 Introduction to Optoelectronics I
PHYS 420 Introduction to Optoelectronics II
PHYS 425 Introduction to Laser Physics

CONCENTRATION IN PARTICLE, NUCLEAR & ATOMIC PHYSICS (PN&A)

PHYS 403 Nuclear Physics II
PHYS 404 Nuclear Electronics
PHYS 408 Particle Physics II
PHYS 425 Introduction to Laser Physics
PHYS 432 Quantum Mechanics II
PHYS 443 Computational Physics I
PHYS 444 Computational Physics II
PHYS 450 Health Physics
PHYS 451 Spectroscopy
PHYS 455 Introduction to Quantum Information Theory
PHYS 481 Theory of Relativity I
PHYS 495 Group Theory in Physics

Core Courses

(Any two of the following three courses)

PHYS 401 Atomic Physics

PHYS 402 Nuclear Physics I
PHYS 407 Particle Physics I

CONCENTRATION IN PLASMA PHYSICS (PP)

PHYS 425 Introduction to Laser Physics
PHYS 426 Lasers and Their Applications
EE 475 High Voltage Techniques I
EE 476 High Voltage Techniques II
PHYS 305 Analog Electronics
PHYS 443 Computational Physics I
PHYS 444 Computational Physics II

Core Courses

PHYS 427 Introduction to Plasma Physics
PHYS 428 Introduction to Magnetohydrodynamics *or* PHYS 425 Introduction to Laser Physics

CONCENTRATION IN TEST & MEASUREMENT (T&M)

CENG 230 Introduction to C Programming
PHYS 306 Digital Electronics
PHYS 404 Nuclear Electronics
PHYS 417 Principles of Measurement & Instrumentation I
PHYS 418 Principles of Measurement & Instrumentation II
PHYS 443 Computational Physics I
PHYS 444 Computational Physics II

Core Courses

PHYS 305 Analog Electronics *or* PHYS 306 Digital Electronics
PHYS 417 Principles of Measurement & Instrumentation I *or* PHYS 418 Principles of Measurement & Instrumentation II

THE UNDERGRADUATE SPECIAL PHYSICS PROGRAM

The purpose of the Physics Department in offering the "Undergraduate Special Physics Program (USPP)" is to give special undergraduate physics education to successful and highly motivated physics students. This program gives students an opportunity to advance and train in a shorter period of time and draws their attention to be specialized in advanced physics projects with a wide spectrum of elective courses.

Students join the Special Physics Program in the first year by consent of the Special Physics Program Advisor and Department Chairman, based on their entrance scores. If a student's Cumulative Grade Point Average falls below 2.50, he/she is given a warning for one semester. If the Cumulative Grade Point Average is still below 2.50 the student has to transfer to the undergraduate curriculum. Students from the undergraduate curriculum can transfer to the Special Physics Program in the second or third year if the Cumulative Grade Point Average is above 3.00, by consent of the Special Physics Program Advisor or Department Chairman. In transferring to or from the Special Physics Program the substitution of courses already taken for the new program requirements and any further required courses are decided by the Special Physics Program Advisor.

UNDERGRADUATE SPECIAL PHYSICS PROGRAM CURRICULUM

The requirements for B.S. degree in physics (special program) include the must courses listed below and eight elective courses. Four of these elective courses must be taken from the Concentrations. Two of the remaining four elective courses must be taken from other departments.

FIRST YEAR

First Semester

PHYS	113	Phys. for Students of Sci. I	(4-2)5
PHYS	115	Physics Laboratory I	(1-4)3
CHEM	101	General Chemistry I	(4-2)5
MATH	119	Calculus with Analytic Geometry	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4

Second Semester

PHYS	114	Phys. for Students of Sci. II	(4-2)5
PHYS	116	Physics Laboratory II	(1-4)3
CHEM	102	General Chemistry II	(4-2)5
MATH	120	Calculus of Functions of Several Variables	(4-2)5
ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

SECOND YEAR

Third Semester

PHYS	203	Introduction to Electronics	(3-2)4
PHYS	209	Math. Methods in Phys. I	(4-0)4
PHYS	215	Phys. for Studs. of Sci. III	(3-2)4
MATH	260	Basic Linear Algebra	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC
Elective			

Fourth Semester

PHYS	210	Math. Methods in Phys. II	(4-0)4
PHYS	217	Physics Laboratory III	(1-4)3
PHYS	300	Quantum Physics	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

PHYS	307	Applied Modern Physics	(1-4)3
PHYS	311	Classical Mechanics	(4-2)5
PHYS	334	Electromagnetic Theory	(4-2)5
PHYS	343	Introductory Computational Methods for Physicists	(2-2)3
TURK	303	Turkish I	NC

Sixth Semester

PHYS	308	Experiments in Physics	(1-4)3
PHYS	415	Projects in Physics	(0-6)3
PHYS	431	Quantum Mechanics I	(4-0)4
ENG	311	Adv. Commun. Skills	(3-0)3
TURK	304	Turkish II	NC
Elective			
Elective			

FOURTH YEAR

Seventh Semester

PHYS	416	Advanced Selected Problems in Physics	(2-2)3
PHYS	429	Statistical Mechanics	(4-0)4
PHYS	432	Quantum Mechanics II	(4-0)4
Elective			

Eighth Semester

Elective
Elective
Elective
Elective

DOUBLE MAJOR PROGRAM IN PHYSICS

Physics Department views its own program as a well suiting opportunity for the students from other departments who are willing to pursue training in a second major program. Physics has become closely associated one side with technology, on the other side with social sciences which will derive insight from fundamental developments in physics.

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the Department.

MINOR PROGRAM IN PHYSICS

The aim of the program is to enable the undergraduate students of the other departments to follow the new developments in fundamental sciences and technology. At the same time, to help the students from other disciplines who would like to do graduate study in physics by establishing minimum background knowledge in Physics.

1.	PHYS	202	Modern Physics	(4-0)4
	or			
	PHYS	207	Concept of Modern Physics	(3-0)3
2.	PHYS	210	Mathematical Methods in Physics II	(4-0)4
3.	PHYS	300	Quantum Physics	(3-0)3
	or			
	PHYS	303	Quantum Theory and its applications I	(4-0)4
4.	PHYS	311	Classical Mechanics	(4-2)5
5.	PHYS	334	Electromagnetic Theory	(4-2)5
6.	PHYS	Elective		
7.	PHYS	Elective		

MINOR PROGRAM IN SOLID STATE PHYSICS

To motivate the undergraduate Electrical and Electronic Engineering and Metallurgical and Materials Engineering students to do interdisciplinary projects, and research by gaining knowledge and practice in solid state physics and microelectronics, and at the same time to enable them to follow the new developments in the fundamentals and technologies of these fields.

1.	PHYS	202	Modern Physics	(4-0)4
	or			
	PHYS	207	Concept of Modern Physics	(3-0)3
2.	PHYS	300	Quantum Physics	(3-0)3
	or			
	PHYS	303	Quantum Theory and its Applications I	(4-0)4
3.	PHYS	312	Elementary Condensed Matter Physics	(4-0)4
4.	PHYS	409	Physics of Condensed Matter I	(3-0)3
5.	PHYS	439	Physics of Semiconductor Devices I	(3-0)3

And any two of the following courses:

PHYS 410	Physics of Condensed Matter II	(3-0)3
PHYS 440	Physics of Semiconductor Devices II	(3-0)3
PHYS 411	Solid State Physics Laboratory I	(2-4)4
PHYS 412	Solid State Physics Laboratory II	(2-4)4

DESCRIPTION OF UNDERGRADUATE COURSES

PHYS 101 Physics for Nonscientists I **(3-0)3**

Physical quantities; vectors and scalars; static equilibrium; uniformly accelerated motion; Newton's laws; work and energy; conservation of energy; linear momentum; impulse; collisions; angular motion; Newton's law of gravitation; rotational work, energy, and momentum; mechanical properties of matter.

PHYS 102 Physics for Nonscientists II **(3-0)3**

Static electricity, interaction of charges, electric field, electric potential, electric current and circuits,

magnetism, Faradays law of induction, electromagnetic waves, light and optics.

PHYS 103 Fundamental Concepts of Physics I (3-0)3
The world of physics; scientific method; crystals; chaos; the big-bang; automobile collision; radiation and life; energy, entropy and environment; exponential growth; photo voltaic conversion; atmospheric electricity; plasma; superconductivity; gravity and geometry; laser; fiber optics; scanning tunneling microscope; magnetic resonance imaging; nuclear fission and nuclear fusion.

PHYS 104 Fundamental Concepts of Physics II (3-0)3
Electric charges and fields; electric potential; electric currents and circuits; magnetic fields; wave motion and light.

PHYS 105 General Physics I (3-2)4
Vectors; kinematics; particle dynamics work and energy; conservation of energy; system of particles; collisions; rotational motion.

PHYS 106 General Physics II (3-2)4
Electric charge; electric field; Gauss' law, electric potential; capacitance; current and resistance; circuits; magnetic field; Ampere's law; Faraday's law of induction.

PHYS 109 Mechanics (5-2)6
Vectors, Translational Kinematics and Dynamics Work and Energy, System of Particles, Rotational Kinematics and Dynamics, equilibrium, Gravitation Oscillations, Waves, Fluid Mechanics, Statistical Mechanics, Heat and thermodynamics.

PHYS 110 Electromagnetism (5-2)6
Electric Field and Gauss law, Electric Potentials Capacitors, Current and DC circuits, Magnetic field, Magnetic field due to Currents, Induction, Magnetism of matter, Maxwell's equations, Electromagnetic Oscillations and AC circuits, Electromagnetic waves.

PHYS 111 Physics I (Mechanics) (4-2)5
Fundamental principles and theories of mechanics; translational motion; rotational motion; gravitation; oscillations.

PHYS 112 Physics II (Electricity and Magnetism) (4-2)5
Electric charge, Coulomb's law, electric field and Gauss's law, electric potential and electric potential energy, capacitance and capacitors, current and resistance, circuits and loop theorems, magnetic field and Ampere's law, Faraday's law of induction, alternating currents, Maxwell's equations, electromagnetic oscillations and waves.

PHYS 113 Physics for Students of Science I (4-2)5
Vectors; kinematics in three dimension; dynamics-Newton's laws; work and energy; conservation of energy; gravitation; system's of particles; collisions; kinematics of rigid body; dynamics of rigid body; statics and elasticity; oscillations; fluid mechanics; kinetic theory and thermodynamics.

PHYS 114 Physics for Students of Science II (4-2)5
Electrostatics and magnetostatics; electrical and magnetic properties of matter; Maxwell's equations; electromagnetic waves; geometric optics, interference and diffraction; special relativity; quanta of light, atomic structure; quantum theory of matter.

PHYS 115 Physics Laboratory I (0-4)2
Basic experimental techniques in mechanics. Experiments on one and two-dimensional motion, Newton's laws, circular motion, simple harmonic motion collisions, energy conversion, gyroscope, water waves and acoustic waves.

PHYS 116 Physics Laboratory II (0-4)2
Experiments on fundamental laws of electromagnetism, simple circuits, solar cells, light emitting diodes, laws of radiation, diffraction and interference of light waves.

PHYS 181 Basic Physics I (4-2)5
Physics and measurement; vector and scalar quantities; describing motion: one dimensional motion; two dimensional motion; motion and force: dynamics; circular motion; work and energy; conservation of energy; linear momentum; rotational motion; static equilibrium and elasticity; vibrations and waves; sound.

PHYS 182 Basic Physics II (4-2)5
Electric charge and electric field; electric potential and electric potential energy; electric currents; DC circuits and instruments; magnetism; electromagnetic induction and Faraday's law; electromagnetic waves; semiconductors, diodes and transistors.

PHYS 202 Modern Physics (4-0)4
Special theory of relativity; particle properties of waves; wave properties of particles; Atomic structure; elementary quantum mechanics; many electron atoms; nuclear structure and radioactivity.
Prerequisites: PHYS 109 and PHYS 110

PHYS 203 Introductory Electronics (3-2)4
DC circuit analysis: branch, mesh and node analysis, and the superposition, Thevenin and Norton theorems; Phasers and complex numbers; AC circuit analysis using the same methods used in DC circuits; Power and energy; RLC circuits; Transformers; Diodes and transistors, and their applications; Introduction to digital electronics; Transducers. *Prerequisite: PHYS 110*

PHYS 207 Concepts of Modern Physics (3-0)3
Special relativity; electromagnetic waves; atomic structure; basic concepts of quantum mechanics; quantum theory of the hydrogen atom; many electron atoms and periodic table; molecules; solid state.

PHYS 209 Mathematical Methods in Physics I (4-0)4
Ordinary differential equations; boundary value problems and characteristic function representations; Fourier transforms; partial differential equations and the methods separation of variables. *Prerequisites: MATH 119 and MATH 120*

PHYS 210 Mathematical Methods in Physics II (4-0)4
Vector analysis; orthogonal curvilinear coordinates; functions of a complex variable.
Prerequisite: PHYS 209

PHYS 215 Physics for Students of Science III (3-2)4
Linear and non-linear oscillations; coupled oscillations; transverse and longitudinal waves; interference; diffraction and polarization; waves in more than one dimension; acoustic waves; non-linear optics; geometrical optics.

PHYS 217 Physics Laboratory III (1-4)3
Various experiments on oscillations, waves and optics.

PHYS 221 Optics and Waves (4-0)4
Introduction; geometrical optics; matrix methods in paraxial optics; aberrations; optical instrumentation and the optics of the eye. superposition of waves; interference of light; coherence; polarization; Fraunhofer diffraction.
Prerequisite: PHYS 110

PHYS 222 Optics and Waves Laboratory (1-4)3
Various experiments on mechanical oscillations, properties of light, geometrical and physical optics, optical properties of matter.
Prerequisite: PHYS 221

PHYS 230 Pascal Programming in Physics (3-2)4
Algorithmic approach to solving physical problems; programming in Pascal using loops, arrays, records, functions and procedures; designing structured algorithms for physics.

PHYS 251 Properties of Matter I (3-0)3
States of matter; classes of materials; atomic bonding; structural properties of matter; X-ray diffraction; experimental diffraction methods; imperfections in solids; atom movements and diffusion; mechanical properties of matter; electrical properties of matter; semiconductors.

PHYS 252 Properties of Matter II (3-0)3
Electrical properties; semiconductors; semiconducting devices; thermal properties; phase diagrams; magnetic properties; optical properties, transport properties, super-conductivity.

PHYS 260 Physics of Sports and Games (3-0)3
Fundamental ideas and concepts of physics are reviewed and applied to a large number of sports and games. Some demonstrations will be performed.

PHYS 281 Basic Physics III (3-0)3
Basic concepts in astronomy, Solar system and the Sun, astronomical coordinate systems, Newton's and Kepler's laws, astronomical instruments and communication satellites, basic knowledge of stars: observational properties, evolution, stellar remnants, galaxies: observational properties and classification, basic cosmology.
Prerequisites: PHYS 181 and PHYS 182

PHYS 282 Basic Physics IV (3-0)3
Special theory of relativity, models of atoms, quantum mechanics of atoms, nuclear physics, radioactivity and nuclear energy.
Prerequisites: PHYS 181 and PHYS 182

PHYS 283 Optics and Modern Physics (4-0)4
Optics: ray model of light; reflection and refraction; mirrors; thin lenses, simple optical instruments, waves, interference, diffraction, polarization. Modern Physics: special theory of relativity, particle properties of waves, wave properties of particles, Bohr model of atoms; introduction to quantum mechanics, nucleus and radioactivity. *Prerequisites: PHYS 181 and PHYS 182*

PHYS 291 Modern Physics for Electrical Engineering (4-0)4
Crystal structure and symmetry; basic concepts of quantum theory; waves and particles; the

Schrödinger equation; wave mechanics; quantum theory of solids; binding and bonding; semiconductors; p-n junctions.

PHYS 300 Quantum Physics (3-0)3
The postulates of quantum mechanics; function spaces and Hermitian operators; superposition, compatible observables and uncertainty relation; time development and conservation theorems; one-dimensional problems; bound and unbound states; Dirac notation; particle in a box.
Prerequisite: PHYS 202, or PHYS 207 or PHYS 215

PHYS 301 Introduction to Archaeometry (3-0)3
Application of basic sciences archaeology: prospecting, analysis of archaeological materials by chemical and physical methods, source analysis and ancient trade patterns, dating of archaeological materials.

PHYS 303 Quantum Theory and its Applications I (4-0)4
Introduction to quantum ideas; postulates of quantum mechanics; one dimensional problems; harmonic oscillator; angular momentum.

PHYS 304 Quantum Theory and its Applications II (4-0)4
Matrix formulation; perturbation theory; interaction of electromagnetic radiation with atomic systems; identical particles; quantum statistics; selected applications to lasers, semiconductors; electron conduction; superconductivity.

PHYS 305 Analog Electronics (3-2)4
Operational amplifiers; feedback; signal processing circuits; power supplies; waveform generators; contemporary semiconductor devices; complex measurement systems.
Prerequisite: Consent of the department.

PHYS 306 Digital Electronics (3-2)4
Number systems and Boolean algebra; logic gates and their applications; memory elements; counters, registers and readout systems; A/D and D/A converters; microprocessors.
Prerequisite: Consent of the Department.

PHYS 307 Applied Modern Physics (1-4)3
Several experiments in modern physics.
Prerequisite: PHYS 202 or PHYS 215

PHYS 308 Experiments in Physics (1-4)3
Selected experiments in various areas of physics, designed to familiarize the student with experimental techniques and laboratory instruments.

PHYS 311 Classical Mechanics (4-2)5
Lagrangian mechanics; Hamiltonian mechanics; the two-body central force problem; dynamics of a system of particles; motion in a noninertial reference frame; rigid body motion; small oscillations; nonlinear oscillations and Chaos.
Prerequisite: PHYS 210

PHYS 312 Elementary Condensed Matter Physics (4-0)4
Crystalline state; interatomic bonding; lattice vibrations and thermal properties; free electron theory of metals; band structure.

PHYS 315 Semiconductor Physics I (4-0)4
Crystal properties; atoms and electrons energy bands and charge carriers; excess charge carriers in semiconductors; two-terminal solid state devices.

PHYS 316 Semiconductor Physics II (4-0)4
The physics of semiconductor diodes; bipolar junction transistors; field effect transistors; modern solid-state and optoelectronic devices.
Prerequisite: PHYS 315 or consent of the department.

PHYS 318 Physics of Fluids (3-0)3
Properties of fluids; molecular structure and the continuum hypothesis; the fundamental law of viscosity; pressure variation in static compressible and incompressible fluids; description of fluid motion using Lagrangian and Eulerian methods; principle of mass conservation and Bernouilli's equation; analysis of rotational and potential flows; stream function, velocity potential and Cauchy-Riemann conditions.

PHYS 320 Physics of the Lower Atmosphere (3-0)3
A brief discussion of atmospheric thermodynamics; hydrostatic equilibrium condition and study of some model atmospheres; the fundamentals of radiation and associated radiation laws; radiative transfer mechanism; derivation of the equations of motion on a rotating earth; energy relations.

PHYS 327 Physics of Atoms, Molecules and Solids (3-2)4
The exclusion principle; ground states of multielectron atoms and periodic table; LS coupling, Zeeman effect, quantum statistics, classical and quantum description of the state of a system; electronic, vibrational and rotational energies of molecules; band theory of solids; the quantum free-electron model; the motion of electrons in a periodic lattice.

PHYS 328 Nuclear Physics and Particles (3-2)4
Nuclear properties and nuclear models; alpha, beta and gamma decays; the Mössbauer effect; excited states of nuclei; fission and fusion; elementary particles; nucleon forces; fundamental interactions and conservation laws; hyper charge and quarks; isospin; pions and muons.

PHYS 334 Electromagnetic Theory (4-2)5
Maxwell's equations; electromagnetic waves; propagation of electromagnetic waves in bounded region; Lienard-Wiechert potential; field of accelerated charge; electromagnetic radiation; Thomson cross-section; Lorentz transformation of electromagnetic fields.
Prerequisite: PHYS 210

PHYS 343 Introductory Computational Methods for Physicists (2-2)3
Introduction to the use of compiled and pre-compiled computer languages in basic problems in Physics.
Prerequisite: PHYS 209 and PHYS 215 (or PHYS 221) or consent of the department.

PHYS 352 Electron Optics (3-0)3
Electron-optical refractive index; axisymmetric lenses; general properties; thin lens approximation; quadruple lenses; electron-beam devices (transmission and scanning electron microscopes, mass spectroscopy, electromagnetic separation of isotopes, high energy accelerators).

PHYS 360 Science in History (3-0)3
Development of science and technology, and their effects on human society.

PHYS 392 Physics of Electronic Devices (4-0)4
p-n junctions; bipolar transistors; field effect transistors; surface devices; integrated circuits.

PHYS 400 Special Problems in Physics (2-2)3
One-term short research project to give practical experience.

PHYS 401 Atomic Physics (3-0)3
Atom models; radiation and matter; Wave equations for simple quantum systems; Perturbation theory and radiative transitions; Quantum Theory of one-electron atoms; Many-electron atoms; Molecular structures; Approximation methods for many-electron systems.

PHYS 402 Nuclear Physics I (3-0)3
General properties of the nucleus, nuclear force and two-nucleon systems; models of nuclear structure; nuclear decay and radioactivity: alpha, beta and gamma decay.
Prerequisite: PHYS 300

PHYS 403 Nuclear Physics II (3-0)3
Nuclear reactions; nuclear fission; nuclear fusion; fundamental interactions in nuclei: nucleon structure, the strong interaction, the electroweak interaction; nuclear astrophysics.
Prerequisite: PHYS 402 or consent of the department.

PHYS 404 Nuclear Electronics (3-0)3
Nuclear radiation and its detection; detectors and equivalent circuits; pulse electronics and processing circuits; gamma-ray spectroscopy and other applications.
Prerequisite: PHYS202 and PHYS203 or consent of the department.

PHYS 405 Neutron Physics (3-0)3
Interactions of neutrons; neutron optics; diffusion of neutrons; resonance reactions; the fission process; neutron chain reactions; applications in reactor theory.

PHYS 407 Particle Physics I (3-0)3
Introduction to particles; discoveries of particles; classification of particles and their interactions; relativistic kinematics; measurement techniques, accelerators, detectors; introduction to Feynman calculus.
Prerequisite: Consent of the department

PHYS 408 Particle Physics II (3-0)3
Quantum electrodynamics; the Feynman rules for QED; Parton model; Bjorken scaling; quantum chromodynamics and color forces; weak interactions of leptons and quarks; electroweak unification; introduction to gauge theories.
Prerequisite: Consent of the department

PHYS 409 Physics of Condensed Matter I (3-0)3
Energy bands, p-n junctions, Fermi surfaces, electron dynamics in external fields, optical properties, dielectric properties, magnetic properties.

PHYS 410 Physics of Condensed Matter II (3-0)3
Superconductivity, review of magnetic properties, magnetic resonance, Masers and Lasers, devices, defect and alloys.

PHYS 411 Solid State Physics Laboratory I (2-4)4

Theoretical and experimental studies on production processes; characterization and testing methods used in semiconductor technology.

PHYS 412 Solid State Physics Laboratory II (2-4)4
Theoretical and experimental studies on production processes; characterization and testing methods used in semiconductor technology.

PHYS 413 Experimental Techniques in Physics (2-4)4
Measurement techniques in physics.
Prerequisite: Consent of the Department.

PHYS 414 Experimental Techniques in Quantum Electronics (1-4)3
Optical resonators and laser optics; laser beam transformation in space; amplitude and frequency; measurement techniques in electro-optics; advanced laser application techniques.

PHYS 415 Projects in Physics (0-6)3
Small research and development projects under the supervision of a faculty member.
Prerequisite: Consent of the instructor.

PHYS 416 Advanced Selected Prob. in Physics (2-2)3
Theoretical and experimental projects leading to an understanding of the fundamental problems of physics.
Prerequisite: Consent of the department.

PHYS 417 Principles of Measurement and Instrumentation I (3-2)4
Special purpose circuitry for sensors, computer interfacing, GPIB interface system, data acquisition, principles of sensors, temperature sensors, pressure sensors, motion and acceleration sensors.

PHYS 418 Principles of Measurement and Instrumentation (3-2)4
Fundamentals of light detectors. Photoconductors, photodiodes, and solar cells. Semiconductor UV light detectors. p-i-n detectors for visible light. Schottky type infrared detectors. Charge Couple Devices (CCD) for imaging. Semiconductor x-ray sensors. Gas sensors. Humidity sensors, Biosensors, Sound sensors and ultrasonic measurement systems.

PHYS 419 Introduction to Optical Electronics I (3-2)4
Maxwell's Equations; the planar slab waveguide, step-index circular waveguides, dispersion, graded-index waveguides, attenuation and nonlinear effects.

PHYS 420 Introduction to Optical Electronics II (3-2)4
The beam propagation method, coupled mode theory and application, coupling between optical sources and waveguides, noise and detection, optical detectors, optical radiation and amplification, fiber-optic sensors.

PHYS 425 Introduction to Laser Physics (3-0)3
Basic principles of laser light; properties of laser and physical background of production; laser resonators, mirrors and modes; the types of lasers; solid-state lasers, gas lasers, liquid lasers, semiconductor lasers and lasers to come.

PHYS 426 Lasers and Their Applications (3-0)3
Laser principles and properties; laser spectroscopy; measurement with laser; isotope separation with laser; laser fusion; LIDAR; laser communications; laser as a heat source; holography.

PHYS 427 Introduction to Plasma Physics (3-0)3
Definition of plasma, plasma frequency, gyro frequency, Debye length, Orbit theory; plasmas as fluids; waves in plasmas; CMA diagram; diffusion and resistivity in weakly ionized gates.

PHYS 428 Introduction to Magnetohydrodynamics (3-0)3
Ideal MHD equations; single and two fluid equations; equilibrium and stability; equations of kinetic theory; derivation of fluid equations; Landau damping; nonlinear plasma physics; shock waves; parametric instabilities.

PHYS 429 Statistical Mechanics (4-0)4
The macroscopic and microscopic states; statistical basis of thermodynamics; probability concept; quantum and statistical nature of probability; elements of ensemble theory; macrocanonical, canonical and grand canonical ensembles quantum and classical statistics; Fermi-Dirac and Bose-Einstein systems, and some other applications.
Prerequisite(s): PHYS 300 and PHYS 210 or consent of the department.

PHYS 430 Statistical Thermodynamics (4-0)4
Characteristic features of macroscopic systems, introduction to concept of ensembles, states accessible to a closed system; thermal interaction, entropy and temperature, mechanical and diffusive interactions, canonical ensembles and its applications, introduction to Fermi-Dirac and Bose-Einstein statistics.

Prerequisite(s): PHYS 300 and PHYS 210 or consent of the department.

PHYS 431 Quantum Mechanics I (4-0)4
Schrödinger equation in three-dimensions; angular momentum; the radial equation; the hydrogen atom; interaction of electrons with electro-magnetic field; operators, matrices, and spin; the addition of angular momenta; time-independent perturbation theory.
Prerequisite(s): PHYS 300 and PHYS 210 or consent of the department.

PHYS 432 Quantum Mechanics II (4-0)4
The real hydrogen atom; atomic and molecular structure; time dependent perturbation theory; radiation; radiation; collision theory.

PHYS 433 Applications of Quantum Mechanics (3-0)3
Show applications of Quantum Mechanics to optics, solid state, and other areas of physics. The course is oriented to understanding of the basic physical principles involved.

PHYS 434 Mathematical Methods in Physics III (3-0)3
Series; calculus of variations; integral transforms: integral equations; Green's function.

PHYS 435 Introduction to Nonlinear Dynamical Systems and Chaos I (3-0)3
Systems of first order differential equations; classification of fixed points; flows on a circle; bifurcations; phase portraits; limit cycles; Poincarè-Bendixson theorem; closed orbits and periodic motion; Lienard systems.

PHYS 436 Introduction to Nonlinear Dynamical Systems and Chaos II (3-0)3
Hopf bifurcations and spontaneous symmetry breakdown; hysteresis in driven oscillators; coupled oscillators and quasiperiodicity; Lorenz equations; chaos on a strange attractor; one-dimensional maps; Liapunov exponents; universality; renormalization group equations; self similarity and fractals.
Prerequisite: Consent of the department.

PHYS 439 Physics of Semiconductor Devices I (3-0)3
Main processes and systems for the production of integrated circuits.

PHYS 440 Physics of Semiconductor Devices II (3-0)3
Junction effects; minority injection; transport phenomena; recombination-generation mechanism; tunneling; a.c equivalent circuit; breakdown of a junction; light absorption and emission of a semiconductor.

PHYS 443 Computational Physics I (3-2)4
Errors; distributions; interpolation techniques; linear system of equations; numerical quadrature; estimation of mean and errors; linear least square minimization and data fitting; maximum likelihood; goodness of fit.

PHYS 444 Computational Physics II (3-2)4
Numerical solution techniques of nonlinear equations and ordinary differential equations; optimization and non-linear least squares; simulation and random numbers; time series analysis and Fourier techniques; method of finite differences; partial differential equations.

PHYS 448 Introduction to Stochastic Processes in Physics (3-0)3
Fundamental concepts of stochastic processes; special processes in physics; Brownian motion, Fokker Planck equation; diffusion; noise.
Prerequisite: Consent of the Department.

PHYS 450 Health Physics (3-0)3
Atomic and nuclear structure, radioactivity, interaction of radiation with matter, radiation detection and measurement, radiation dosimetry, biological effects of ionizing radiation, radiation protection and non-ionizing radiation.
Prerequisite: Consent of the instructor.

PHYS 451 Spectroscopy (3-0)3
The Schrödinger equation; orbital angular momentum; magnetic dipole moments; Stern-Gerlach experiment; spin-orbit interaction; Hydrogen energy levels; transition rates; selection rules; exclusion principle; Hartree theory; X-ray spectra; alkali atom energy levels; fine structure; LS coupling; hyperfine structure; Zeeman effect; Molecular structure and spectra; diatomic molecules; rotational, vibrational and electronic energies.

PHYS 455 Introduction to Quantum Information Theory (3-0)3
An overview of quantum information. A review of classical information theory. Foundations of quantum mechanics from a quantum information point of view. Quantum entanglement and its uses. Entropy.

Prerequisite: PHYS 300 or Consent of the instructor.

PHYS 460 Econophysics (3-0)3
Financial markets; conventional methods for exchange predictions; the physics of socio-economic systems; stochastic models; scaling and its breakdown; empirical analysis of the S&P 500 index and ISE 100 index; distance between stocks; ultra metric spaces; methods to grow portfolios in stock exchanges.
Prerequisite: Consent of the department.

PHYS 471 Solar Energy I (3-0)3
Measurements and estimations of solar radiation; calculation of solar energy reaching inclined surfaces; fundamentals of heat transfer and applications to solar energy; low temperature solar energy conversion; solar heating and cooling; energy storage; economical aspects; special topics.

PHYS 472 Solar Energy II (3-0)3
Introduction to physics of materials; material science aspects of photothermal solar energy conversion; energy efficient windows; smart windows; transparent insulation; principles of photovoltaic conversion; other non-conventional energy sources.

PHYS 481 Theory of Relativity I (3-0)3
Galilean relativity and absolute motion in space; Axiomatic formulation of special relativity; Minkowski spacetime; Lorentz transformations and physical consequences; Covariant formulations of relativistic mechanics, Optics and electrodynamics.

PHYS 482 Theory of Relativity II (3-0)3
General introduction, tensor calculus; The principles of general relativity; The field equations of general relativity; General relativity from a variational principle; The energy-momentum tensor; The Schwarzchild solution; Experimental tests of general relativity.

PHYS 485 String Theory I (3-0)3
Review of special relativity and electromagnetism, relativistic point particle, relativistic strings, Nambu-Goto action, string parameterization and classical motion, world-sheet currents, light-cone gauge formulation of particles, fields and strins. Quantization of the relativistic point particle, open and closed strings in the light-cone gauge. Aspects of covariant quantization.

PHYS 486 String Theory II (3-0)3
D-branes and gauge fields, string charge and D-branes charges, T-duality of closed and open strings on D-branes, non-linear and Born-Infeld electrodynamics, introduction to superstrings.

PHYS 491 Geometry and Topology in Physics I (3-0)3
Vector spaces; algebras; topological spaces; simplicial homology; homotopy groups; differentiable manifolds; vectors and tensors; calculus of exterior forms; Stokes theorem; conservation laws and de Rham cohomology; parallel transport; connection and covariant derivative; geodesics; curvature and torsion. geometry of space-time.

PHYS 492 Geometry and Topology in Physics II (3-0)3
Lie groups on manifolds; Lie algebras; differential forms with values in a Lie algebra; fibre bundles; connection in a fibre bundle; curvature form. Gauge invariance; Maxwell and Yang-Mills equations; systems with spontaneous symmetry breakdown; Higgs mechanism; Hopf invariants; magnetic monopoles; characteristic classes; instantons.
Prerequisite: PHYS491 or consent of the department.

PHYS 493 Special Functions for Physicists (3-0)3
Differential equations of physics and the method of separation of variables; Legendre polynomials; associated Legendre polynomials; Laguerre polynomials; Hermite polynomials; Bessel functions; Gauss hypergeometric functions; Sturm-Liouville theory.

PHYS 495 Group Theory in Physics (3-0)3
Basic group theory. Group representations. Discrete and continuous groups. Orthogonal, unitary groups. Lorentz and Poincare groups. Applications to quantum mechanics, solid state physics, atomic, nuclear and particle physics.

ASTROPHYSICS RELATED COURSES

ASTR 201 Astronomy I (3-0)3
Solar System; sun and planets; astronomical coordinates; Kepler's Law, properties of light; Tools and Astronomy.

ASTR 202 Astronomy II (3-0)3

Basic concepts in astronomy; parallax method; brightness classification; color-magnitude relations; binary stars; internal structure of stars; evolution of stars; unusual stars; interstellar matter; galaxies universe.

ASTR 301 Solar System Astronomy (3-0)3
Fundamental concepts; size of the solar system and its place in the galaxy; measurements, units, reference frames; historical background; the sun; the earth-moon system; the planets and their satellites; other members of the solar system.

ASTR 302 Solar System Astrophysics (3-0)3
Basic solar data and solar interiors; surface phenomena and the sun; origin of the solar system and the sun; the planets; internal structure and composition; comets and small bodies in the solar system.
Prerequisite: ASTR 301 or consent of the department.

ASTR 305 Practical Astronomy I (2-2)3
Review of basic astronomical instruments and their use; selected experiments in photometry, spectroscopy and data reduction related to observational aspects of astronomy.
Prerequisite: ASTR 201 or ASTR 301 or consent of the department.

ASTR 306 Practical Astronomy II (2-2)3
Selected experiments in photometry; spectrometry and data reduction related to observational aspects of astronomy.
Prerequisite: ASTR 305 or consent of the department.

ASTR 311 Modern Astrophysics I (3-0)3
The language of astrophysics: the ideal-gas law, black-body radiation, and stellar spectra. stellar evolution: pre-main sequence, main sequence, post-main sequence and final configurations of matter.

ASTR 312 Modern Astrophysics II (3-0)3
Newtonian Gravity, The Geometry of the Universe, Simple Cosmological Models, Cosmological Constant, The age of the Universe, The Density of the Universe and Dark Matter, The Cosmic Background Radiation, The Inflationary Universe, General Relativistic Cosmology, Baryogenesis, Nucleosynthesis, Structures in the Universe.

ASTR 401 Astrophysics I (3-0)3
Observational aspects of astrophysics; stellar magnitudes and stellar colors; stellar spectra; temperature estimates for stars; radiative transfer in stellar atmosphere; convective energy transport; depth dependence of source function; theoretical temperature stratification; continuous absorption coefficient; pressure stratification; hydrostatic equilibrium equation.

ASTR 402 Astrophysics II (3-0)3
Aspects of observational astronomy: distance, brightness, magnitude, spectrum analysis; overview of stellar structure and evolution: time scales, equation of state, viral theorem; thermodynamics of gaseous systems; static stellar structure equations; nuclear energy sources; phases of stellar evolution: fully convective stars, main sequence, evolution away from the main sequence; solar neutrinos.

ASTR 405-406 Astronomy Seminar I-II (2-0)2
Discussion of current topics in astronomy.
Prerequisite: Consent of the Department

GRADUATE PROGRAMS AT THE DEPARTMENT OF PHYSICS

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: The Department of Physics offers graduate work in a large number of fields, such as age determination and dating techniques, astrophysics, atomic and molecular physics, general physics, general relativity and cosmology, high energy physics, mathematical physics, nuclear physics, plasma physics, solid state Laser and Terahertz, Technology Thermoluminescence and Nanoscience both the M.S. and Ph.D. programs aim at providing advanced level training and introducing the recent developments taking place at the frontiers of physics. The faculty enjoys a rightful reputation for the level of teaching and research activity at the department. As an institution devoted to basic sciences and well aware of their fundamental position in the age of "high technology", there is close contact and communication with the international scientific community. This, however, does not prevent the department from focusing on the eventual need for practical results and on making critical contributions to national development. There is considerable effort to promote applied physics programs and with the completion of new laboratories, an important step will be taken in that direction. The M.S. program is self-contained and provides a strong background for employment in industry or in science teaching. The Ph.D. program on the other hand, stresses scientific research whose objective is to meet the worldwide intellectual and economic challenge.

GRADUATE CURRICULUM

M.S. in Physics

PHYS	500	M.S. Thesis	NC
PHYS	502	Analytical Mechanics	(3-0)3
PHYS	503	Methods of Mathematical Physics I	(3-0)3
PHYS	505	Electromagnetic Theory I	(3-0)3
PHYS	507	Quantum Mechanics I	(3-0)3
PHYS	591	Seminar in Physics	(0-2)NC

3 Elective courses *

Total minimum credit: 21
Number of courses with credit (min): 7

* One of which is ASTR 5XX for the field of Astrophysics.

Ph.D. in Physics

If admitted by M.S. degree:

PHYS	501	Statistical Mechanics	(3-0)3
PHYS	504	Methods of Mathematical Physics II	(3-0)3
PHYS	506	Electromagnetic Theory II	(3-0)3
PHYS	508	Quantum Mechanics II	(3-0)3
PHYS	691	Advanced Seminar in Physics	(0-2)NC
PHYS	600	Ph.D. Thesis	NC

4 Elective courses **

Total minimum credit: 24
Number of courses with credit (min): 8
** Two of which are ASTR 5XX for the field of Astrophysics

If admitted by B.S. degree:

PHYS	501	Statistical Mechanics	(3-0)3
PHYS	502	Analytical Mechanics	(3-0)3
PHYS	503	Methods of Mathematical Physics I	(3-0)3
PHYS	504	Methods of Mathematical Physics II	(3-0)3
PHYS	505	Electromagnetic Theory I	(3-0)3
PHYS	506	Electromagnetic Theory II	(3-0)3
PHYS	507	Quantum Mechanics I	(3-0)3
PHYS	508	Quantum Mechanics II	(3-0)3
PHYS	691	Advanced Seminar in Physics	(0-2)NC
PHYS	600	Ph.D.Thesis	NC

7 Elective courses *

Total minimum credit: 45
Number of courses with credit (min): 15
* Three of which are ASTR 5XX for the field of Astrophysics.

GRADUATE COURSES

PHYS	500	M.S. Thesis	NC
PHYS	501	Statistical Mechanics	(3-0)3
PHYS	502	Analytical Mechanics	(3-0)3
PHYS	503	Methods of Mathematical Physics I	(3-0)3
PHYS	504	Methods of Mathematical Physics II	(3-0)3
PHYS	505	Electromagnetic Theory I	(3-0)3
PHYS	506	Electromagnetic Theory II	(3-0)3
PHYS	507	Quantum Mechanics I	(3-0)3
PHYS	508	Quantum Mechanics II	(3-0)3
PHYS	511	Computational Physics	(3-0)3
PHYS	513	Gravitation and Cosmology I	(3-0)3
PHYS	514	Gravitation and Cosmology II	(3-0)3
PHYS	515	Group Representations	(3-0)3
PHYS	516	Theory of Spinors	(3-0)3
PHYS	517	Nonlinear Evolution Equations and Solitons	(3-0)3
PHYS	518	Simulations of Many-Particle Systems	(3-0)3
PHYS	521	Theoretical Atomic Physics	(3-0)3
PHYS	523	Molecular Physics I	(3-0)3
PHYS	524	Molecular Physics II	(3-0)3
PHYS	525	Laser Design	(3-0)3
PHYS	527	Optoelectronics	(3-0)3
PHYS	531	Solid State Theory I	(3-0)3
PHYS	532	Solid State Theory II	(3-0)3
PHYS	533	Theory of Many-Particle Systems I	(3-0)3
PHYS	534	Theory of Many-Particle Systems II	(3-0)3
PHYS	535	Fundamentals of Silicon Technology I	(3-0)3
PHYS	536	Fundamentals of Silicon Technology II	(3-0)3
PHYS	537	Magnetic Properties of Solids I	(3-0)3
PHYS	538	Magnetic Properties of Solids II	(3-0)3
PHYS	539	Optical Properties of Semiconductors	(3-0)3
PHYS	541	Quantum Field Theory I	(3-0)3
PHYS	542	Quantum Field Theory II	(3-0)3
PHYS	543	Advanced Particle Physics	(3-0)3
PHYS	545	Particle Physics I	(3-0)3
PHYS	546	Particle Physics II	(3-0)3
PHYS	547	Techniques of High Energy Physics	(3-0)3
PHYS	548	Supersymmetry and Supergravity	(3-0)3
PHYS	549	Geometry of Gauge Fields	(3-0)3
PHYS	551	Nuclear Physics I	(3-0)3
PHYS	552	Nuclear Physics II	(3-0)3
PHYS	553	Neutron Transport Theory	(3-0)3
PHYS	555	Nuclear Reactor Theory	(3-0)3
PHYS	557	Introduction to Nanoscience and Nanotechnology	(3-0)3
PHYS	561	Magnetohydrodynamics	(3-0)3
PHYS	562	Plasma Physics	(3-0)3
PHYS	563	Solar and Planetary Plasma Physics	(3-0)3
PHYS	564	Fundamentals of Fusion Plasma Systems	(3-0)3
PHYS	571	Signal Processing and Instrumentation in Physics I	(2-2)3
PHYS	572	Signal Processing and Instrumentation in Physics II	(2-2)3
PHYS	573	Physics of Solar Energy	(3-0)3
PHYS	574	Scientometric Analysis in Physics	(3-0)3
PHYS	575	X-and γ-Ray Spectroscopic Analysis	(3-0)3
PHYS	576	Ionospheric Physics	(3-0)3
PHYS	577	X-Ray Diffraction and Ultrasonics I	(2-2)3
PHYS	578	X-Ray Diffraction and Ultrasonics II	(2-2)3
PHYS	582	Physics for Finance	(3-0)3
PHYS	591	Seminar in Physics	(0-2)NC
PHYS	593	Directed Studies in Physics	(1-0)1
PHYS	600	Ph.D. Thesis	NC
PHYS	691	Advanced Seminar in Physics	(0-2)NC
PHYS	693	Advanced Directed Studies in Physics	(1-0)1
PHYS	7XX	Special Topics in Physics	(2-2)3 or (3-0)3
PHYS	8XX	Special Studies	(4-2)NC
PHYS	9XX	Advanced Studies	(4-0)NC
ASTR	501	Advanced Astrophysics	(3-0)3
ASTR	505	Stellar Atmospheres	(3-0)3
ASTR	507	Stellar Interiors	(3-0)3
ASTR	508	Stellar Models and Evolution	(3-0)3
ASTR	510	Stellar Envelopes and Interiors	(3-0)3
ASTR	515	Galactic and Intergalactic Astronomy	(3-0)3
ASTR	516	High-Energy Astrophysics	(3-0)3
ASTR	517	Astronomical Instruments and Techniques	(3-0)3
ASTR	519	Spectroscopic Astrophysics	(3-0)3
ASTR	521	Physical Properties of Close Binary Systems	(3-0)3
ASTR	522	Dynamics of Close Binary Systems	(3-0)3

DESCRIPTION OF GRADUATE COURSES

PHYS 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester.

PHYS 501 Statistical Mechanics (3-0)3
Elements of the classical and quantum statistics, the partition function, ideal Fermi gas, ideal Bose gas, Ising model and some applications of statistical mechanics.

PHYS 502 Analytical Mechanics (3-0)3
Lagrange's equation, central force problem, Rigid body problem, small oscillations, Hamilton's equations, canonical transformations, Hamilton-Jacobi theory, introduction to continuous systems and fields.

PHYS 503 Methods of Mathematical Physics I (3-0)3
Functions of a complex variable, special functions of mathematical physics, partial differential equations.

PHYS 504 Methods of Mathematical Physics II (3-0)3
Integral equations, Series, calculus of variations, Green's function, group theory and applications.

PHYS 505 Electromagnetic Theory I (3-0)3
Electrostatics and magnetostatics; associated boundary-value problems and their solutions: introduction to Maxwell's equations and their simple consequences.

PHYS 506 Electromagnetic Theory II (3-0)3
Diffraction radiation; introduction to special relativity and the covariant formulation; radiation from moving charges; multiple expansions; radiation reaction.

PHYS 507 Quantum Mechanics I (3-0)3
Fundamental concepts; quantum dynamics; theory of angular momentum and central potential problems; Wigner-Eckart theorem and addition of angular momenta; symmetry in quantum mechanics; approximation methods for time-independent and time-dependent perturbations.

PHYS 508 Quantum Mechanics II (3-0)3
Systems of identical particles and second quantization; semiclassical and quantum theory of radiation; scattering theory; relativistic single-particle equations; Dirac equation and central potential problems.

PHYS 511 Computational Physics (3-0)3
Basic mathematical tools; differential equations and boundary value problems; special functions; matrix operations; algebraic methods; Monte Carlo methods.

PHYS 513 Gravitation and Cosmology I (3-0)3
Spacetime manifold. Causal structure. Lorentzian metric. Tensors on manifolds. Orthonormal frame bundles. Connection and curvature. Einstein equations. Variational methods. Noether's theorem. Conservation laws. Schwarzchild geometry. Kruskal extension. Interior solutions. Formation of black holes. Black hole temperature and entropy. Charged rotating black holes. Gravitational waves.

PHYS 514 Gravitation and Cosmology II (3-0)3
Homogeneity and isotropy of the universe. Maximally symmetric spaces. Bianchi types. Standard cosmological model. Observational cosmology: expansion of the universe. Dust filled and radiation filled universes. Inflationary models. Initial and final singularities (Big bang and big crunch). Chaotic mixmaster cosmology. Quantum cosmology. Wheeler-deWitt equation. Quantum field theory in curved spacetimes.

PHYS 515 Group Representations (3-0)3
Lie groups. Lie algebras. Symmetry groups of differential equations. Invariant forms on Lie groups. Ideals, solvability and nilpotency. Cartan subalgebras and root spaces. Coxeter-Dynkin diagrams. Classical Lie algebras. Representation theory. Tensor products. Enveloping algebras and Casimir operators. Physical applications.

PHYS 516 Theory of Spinors (3-0)3
Vector spaces and inner products. Algebra and their representations. Clifford calculus on manifolds. Spinor fields. Dirac equation. Covariances of the Dirac equation. Conversed currents.

PHYS 517 Nonlinear Evolution Equations and Solitons (3-0)3
Integrable nonlinear partial differential equations such as the Korteweg-de Vries and the Nonlinear Schrodinger equations, Solitons, Hamiltonian systems, Inverse scattering transform technique, Lax pairs, Painleve analysis.

PHYS 518 Simulations of Many-Particle Systems (3-0)3
Computer simulation methods; Empirical potential energy functions (PEFs); Useful and Practical Relations for Empirical PEFs; Surface Models of Cubic Crystals; Some Sample Computer Programs and Data; Algorithms for thermostat in MD and MC simulations.

PHYS 521 Theoretical Atomic Physics (3-0)3
Review of Atomic Physics; Review of quantum Mechanics; Interaction of electrons with EM field; Spectra of Atoms, Collisions.

PHYS 523 Molecular Physics I (3-0)3
Introduction to molecular structure: Electronic, vibrational and rotational energies of molecules. Dipole transitions; electronic structure analysis of diatomic molecules, hybridization; general methods of molecular calculations; spectroscopic methods and spectroscopic analysis of small molecules.

PHYS 524 Molecular Physics II (3-0)3
Intermolecular forces: long and short-range interactions; interactions of small atomic system; physical absorption; molecular collision theory: scattering by a central force; elastic and inelastic collisions; transition probabilities and collisional energy transfer; Scattering of atoms and molecules from solid surfaces.

PHYS 525 Laser Design (3-0)3
Principles of laser operation; excitation and oscillation problems in laser theory; standing and traveling waves in a laser and modes of oscillation of an optical cavity; stabilization and optimization conditions of a laser resonator; construction of gas lasers and liquid lasers; experimental techniques of a ring dye-laser and laser systems for Doppler-free multi-photon absorption.

PHYS 527 Optoelectronics (3-0)3
Principles of quantum optics; optoelectronic materials; rare-earth-doped silica fiber lasers; cw performance of fiber optics; Q-switching of optical fiber lasers; digital optics; atmospheric and intersattelite optical communications; thermal imaging; ring laser gyro.

PHYS 531 Solid State Theory I (3-0)3
Lattice vibrations (phonons), lattice Green's functions, local modes, electron energy bands, density of states calculations, optical properties of solids, transport properties.

PHYS 532 Solid State Theory II (3-0)3
Energy band theory, localized states, surface states and adsorption, many-body techniques, superconductivity, magnetism.

PHYS 533 Theory of Many-Particle Systems I (3-0)3
Nonrelativistic many-particle systems, ground-state formalism, Green's function, Fermi systems, Bose systems, linear response and collective modes.

PHYS 534 Theory of Many-Particle Systems II (3-0)3
Field theory at finite temperature; physical systems at finite temperature, real-time Green's functions; canonical transformations, nuclear matter, superconductivity.

PHYS 535 Fundamentals of Silicon Technology I (3-0)3
Basic processes: oxidation, doping, silicon thin film growth (amorphous, polycrystalline, single-crystalline).

PHYS 536 Fundamentals of Silicon Technology II (3-0)3
Bipolar transistors, unipolar transistors; bipolar transistor theory, integrated circuit transistors, junction field effect transistors, surface field effect transistors, design considerations for unipolar transistors in integrated circuits, applications.

PHYS 537 Magnetic Properties of Solids I (3-0)3
The dia-and paramagnetic behavior of solids for static applied fields, the properties of ferro-magnetic, antiferromagnetic, ferrimagnetic solids; magnetic properties depending on the frequency of an alternating applied magnetic fields, the maser.

PHYS 538 Magnetic Properties of Solids II (3-0)3
Paramagnetic relaxation, conditions for paramagnetic resonance; hyperfine structure: the spin Hamiltonian; the spectra of the transition group ions; the spectra of P paramagnetic molecules and other systems: paramagnetic gases, free radicals, donors and acceptors in semiconductors, traps, F centers, the defects from radiation damage; nuclear magnetic resonance; double resonance.

PHYS 539 Optical Properties of Semiconductors (3-0)3
Optical constant of solids, band structure of semiconductors, absorption processes in semiconductors, radiative recombination and photoconductivity in semiconductors.

PHYS 541 Quantum Field Theory I (3-0)3
Classical field theory. Canonical quantization of Klein-Gordon, Dirac and Maxwell fields. Interacting fields, perturbation theory and Feynman diagrams. Elementary processes of quantum electrodynamics. Radiative corrections. Divergences, regularization and renormalization.

PHYS 542 Quantum Field Theory II (3-0)3
Gauge field theories and functional integral formulation. Systematics of renormalization. Renormalization and symmetries. Renormalization group. Non-Abelian gauge theories and their quantization. Quantum chromodynamics. Anomalies. Gauge theories with spontaneous symmetry breaking.

PHYS 543 Advanced Particle Physics (3-0)3
Group theory, anomalies in gauge theories, Wilson operator expansion in gauge theories, current algebra, CVC and PCAC.

PHYS 545 Particle Physics I (3-0)3
Electromagnetism as a gauge theory; Klein-Gordon and Dirac wave equations; introduction to quantum field theory of bosons and fermions. Quantum electrodynamics: interactions of spin 0 particles and spin 1/2 particles, deep inelastic electron-nucleon scattering and the quark parton model.

PHYS 546 Particle Physics II (3-0)3
Non-Abelian gauge theories; introduction to quantum chrodynamics, phenomenology of weak interactions; hadronic weak current and neutral currents; hidden gauge invariance; spontaneous symmetry breakdown; Hooft's gauges; Glashow-Salam-Weinberg gauge theory of electro-weak interactions; intermediate bosons; Higgs sector; grand unification; supersymmetry.

PHYS 547 Techniques of High Energy Physics (3-0)3
Design philosophy of high energy particle physics experiments, developments in accelerators and beam optics, neutrino beams, hybrid detector systems, scintillation counters, Cherenkov counters, wire chambers, drift chambers, emulsion chambers, calorimeters, spectrometers. On-line and off-line analysis techniques. Selected recent experimental set-ups at CERN, DESY, SLAC and FERMILAB.

PHYS 548 Supersymmetry and Supergravity (3-0)3
Lie superalgebras. Superspace and superfields. Dynamics of spinning point particles. Spinning string dynamics. Wess-Zumino model. Supersymmetric Yang-Mills theories. Simple supergravity theory. Extended supergravities.

PHYS 549 Geometry of Gauge Fields (3-0)3
Principal fibber bundles and connections. Curvature and G-valued differential forms. Particle fields and gauge invariant Lagrangians. Principle of least action and Yang-Mills field equations. Free Dirac electron fields. Interactions. Orthonormal frame bundle. Linear connections and Riemannian curvature. Unification of gauge fields and gravitation.

PHYS 551 Nuclear Physics I (3-0)3
General properties of the nucleus and the nuclear many-body problem, nuclear forces, static properties, nuclear matter, Hartre-Fock theory, nuclear shell model. Collective models of the nucleus, deformed nuclei, nuclear rotations. Particle hole states and pairing in nuclei.

PHYS 552 Nuclear Physics II (3-0)3
Electromagnetic and weak interactions with nuclei; electron scattering, beta decay, muon capture, neutrino reactions, weak neutral current effects. Hadronic interactions; pion-nucleus interaction, optical potential, nuclear reactions, heavy ion collisions.

PHYS 553 Neutron Transport Theory (3-0)3
Linear Boltzmann equation and its mathematical and physical properties; approximate and exact solutions of the linear Boltzmann equation; variational methods.

PHYS 555 Nuclear Reactor Theory (3-0)3
Fundamentals of neutron behaviour in nuclear reactors; the fission process; diffusion of neutrons; slowing down of neutrons and thermal reactors; reactor control, perturbation theory.

PHYS 557 Introduction to Nanoscience and Nanotechnology (3-0)3
General features of nanoscience and nanotechnology; Experimental techniques for characterization of nanosystems; Fabrication of nanosystems; Atomistic simulations of nanosystems; Methods of quantum calculations for nanosystems; Types of nanoscale materials and their properties; Physics of atomic and molecular clusters and nanoparticles; Carbon Nanostructures; Applications of nanotechnology.

PHYS 561 Magnetohydrodynamics (3-0)3
Derivation of fluid and MHD equations; hydrostatic equilibrium and hydromagnetic stability; MHD instabilities; hydrodynamic waves; current topics.

PHYS 562 Plasma Physics (3-0)3
The basic equations and conservation laws; first order orbit theory; adiabatic invariants; ideal MHD model; plasma equilibrium and stability; energy principle; plasma waves; waves-particle interaction; wave-wave interaction; weak turbulence theory.

PHYS 563 Solar and Planetary Plasma Physics (3-0)3
Kinetic properties of coronal gas; hydrostatic properties of coronal atmosphere; extension of the solar wind into space; interplanetary magnetic fields; interplanetary irregularities; propagation of energetic solar particles; pulsars.

PHYS 564 Fundamentals of Fusion Plasma Systems (3-0)3
Energy alternative thermonuclear fusion; inertial and magnetic confinement systems; Tokomak, stellorators and mirror machines; plasma focus and pinches; alternative magnetic confinement systems; Laser fusion systems; concept of fusion reactors; formation and heating of a plasma.

PHYS 571 Signal Processing and Instrumentation in Physics I (2-2)3
An experimental course on signal analysis; analysis of periodic signals; transient signals; correlation; spectral analysis; operational amplifiers; computing networks; generalization; transfer functions; analog circuit examples.

PHYS 572 Signal Processing and Instrumentation in Physics II (2-2)3
General description of operational devices, departures from ideal and previsions, measurements, linear circuits, non-linear circuits, constant current and voltage sources, signal generation, filters, signal conditioners, memory, measurement circuits.

PHYS 573 Physics of Solar Energy (3-0)3
Solar thermal properties, solar materials, alternative energy sources.

PHYS 574 Scientometric Analysis in Physics (3-0)3
Physics-related quantitative analysis on general aspects; growth trends in research and researchers; experimental versus theoretical research; research subfields; indicators of research performance and performance distributions; team-work and collaboration; basic ideas of citation and citation impact; statistical models and techniques in quantitative analysis of physics education and research.

PHYS 575 X-and γ-Ray Spectroscopic Analysis (3-0)3
Excitation of photons; interaction of photons with matter; X-Ray secondary emission (fluorescence) spectrometry; internal conversion processes; photon energy and intensity measurements with scintillation and semiconductor detectors; precision and error, counting statistics; sensitivity and resolution.

PHYS 576 Ionospheric Physics (3-0)3
Formation of the ionosphere; photochemical or transport processes in the ionosphere; the D, E, F1 and F2 layers; the day-time and night-time ionosphere; example of irregular behavior and anomalies; geomagnetism and the ionosphere; the solar wind and its interaction with the Earth's magnetic field.

PHYS 577 X-Ray Diffraction and Ultrasonics I (2-2)3
Production and properties of x-rays; absorption and scattering of x-rays; geometry of crystals; theory of x-ray diffraction; structure factors; experimental diffraction methods; space group and structure determination; ultrasonic wave propagation in solids, elasticity in crystals, determination of elastic wave velocities and the elastic module

PHYS 578 X-Ray Diffraction and Ultrasonics II (2-2)3
Various applications of x-ray diffraction methods; determination of unknowns, precise parameter measurements; orientation of single crystals; x-ray fluorescence and chemical analysis; x-ray effects due to phase transformations; x-ray scattering due to amorphous and disordered matter; high pressure x-ray diffraction methods; neutron and electron diffraction ultrasonic pulse echo methods and sound velocity measurements.

PHYS 582 Physics for Finance (3-0)3
Financial markets; statistical physics background, stochastic processes; diffusion processes; kinetic model for Brownian motion; Monte Carlo simulations; quantum mechanics as diffusion processes; Black-Scholes theory; statistical analysis of stock prices; numerical approaches; power law and log-periodicity, critically self similarity from statistical mechanics.

PHYS 591 Seminar in Physics (0-2)NC

Students prepare and present a progress report or literature review on their thesis topic. The course is normally taken by students in their third semester.

PHYS 593 Directed Studies in Physics (1-0)1
M.S. Students prepare an advanced topic in the form of project or seminar in contemporary physics other than their research fields.

PHYS 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their third semester.

PHYS 691 Advanced Seminar in Physics (0-2)NC
Ph.D. Students study and present a topic under the guidance of a faculty member.

PHYS 693 Advanced Directed Studies in Physics (1-0)1
Ph.D. Students prepare an advanced topic in the form of project or seminar in contemporary physics other than their research fields.

PHYS 7XX Special Topics in Physics (2-2)3 or (3-0)3
Courses not listed in the catalogue. Contents vary from year to year according to interest of students and instructor in charge.

PHYS 8XX Special Studies (4-2)NC
M.S. Students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

PHYS 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her advisor.

ASTR 501 Advanced Astrophysics (3-0)3
Basic astronomy and astrophysics are discussed from an advanced viewpoint.

ASTR 505 Stellar Atmospheres (3-0)3
Radiative equilibrium and the energy transfer equation; solution of the equation of transfer; the opacity of stellar material; model stellar atmospheres; the theory of line formation; application of line contour theory; curves of growth.

ASTR 507 Stellar Interiors (3-0)3
The viral theorem and some consequences; equilibrium of a star; energy transfer mechanisms in star; equation of state for stellar material; nuclear reactions in stellar interiors; polytopic gas spheres; stability of convection; structure of white dwarfs.

ASTR 508 Stellar Models and Evolution (3-0)3
Observational approach to stellar evolution; Voght-Russell theorem; some standard stellar models; survey of stellar evolution; solar evolution; pre-main sequence, main sequence, phases of stars; evolution away from the zero age main sequence and the Red Giants Region; final stages of stellar evolution.

ASTR 510 Stellar Envelopes and Interiors (3-0)3
Emphasis will be on preparation of computer programs for study of stellar atmospheres in radiative and convective equilibrium. Students will be guided in methods of stellar model construction.

ASTR 515 Galactic and Intergalactic Astronomy (3-0)3
Interstellar space; galactic structure; rotation of the Galaxy; neutral hydrogen distribution; magnetic field in the galaxy; intergalactic space; clustering of galaxies; structure of the observable universe.

ASTR 516 High-Energy Astrophysics (3-0)3
Cosmic ray data; detection of relativistic particles; supernovae, pulsars, quasars, and X-ray sources; particle and photon interaction of astrophysical significance.

ASTR 517 Astronomical Instruments and Techniques (3-0)3
Discussion of observational techniques in astronomy and astrophysics; review of modern instruments and interpretation of related data.

ASTR 519 Spectroscopic Astrophysics (3-0)3
Discussion of techniques for gathering and interpreting spectroscopic data in astrophysics.

ASTR 521 Physical Properties of Close Binary Systems (3-0)3
Observational properties of close binary systems; the light, radial velocity and period changes of close binary systems; the circumstellar matter; the mass transfer and mass loss in close binaries; origin and evolution of close binaries.

ASTR 522 Dynamics of Close Binary Systems (3-0)3
Figures of equilibrium; the Roch model; the orectical light; radial velocity and period changes in close binaries; determination of the elements of eclipsing binary systems.

DEPARTMENT OF PSYCHOLOGY

PROFESSORS

AYVAŞIK, H. Belgin ***(Assistant to the President)***: B.S., Hacettepe University; M.S., University of Michigan;Ph.D., University of Mississippi.
BİLGİÇ, Reyhan: B.S., Hacettepe University; M.A. University of New York; Ph.D., Illinois Institute of Technology.
FIŞILOĞLU, Hürol: B.S., METU; M.S., BoğaziçiUniversity; Ph.D., State University of New York at Buffalo.
GENÇÖZ, Faruk: B.S., M.S., METU; Ph.D., Hacettepe University.
GENÇÖZ, Tülin ***(Department Chair)***: B.S., M.S., METU; Ph.D., Hacettepe University.
İMAMOĞLU, E. Olcay (Emeritus): B.S., METU; M.A., University of Iowa; Ph.D., University of Strathclyde.
KARANCI , A. Nuray: B.S., METU; M.S., University of Liverpool; Ph.D., University of Hull.
ÖNER ÖZKAN, Bengi: B.S., METU; M.A., London School of Economics; Ph.D., University College London.
SAKALLI UĞURLU, Nuray: B.S., Ankara University; M.A., Ph.D., Kansas University.
SÜMER, H. Canan: B.S., METU; M.S., METU; M.A., University of New Haven; Ph.D., Kansas State University.
SÜMER, Nebi: B.S., METU; M.A.,Hacettepe University; Ph.D., Kansas State University.

ASSOCIATE PROFESSORS

BOZO İRKİN, Özlem ***(Vice Chair)***: B.S., M.S., METU; Ph.D.,University of North Texas.
KAZAK BERUMENT, Sibel ***(Vice Chair)***: B.S., Hacettepe University; M.S., Ph.D., University of Warwick.
LAJUNEN, Timo: M.A., Ph.D.,University of Helsinki.
ÖZKAN, Türker ***(Assistant to the Department Chair)***: B.S., M.S., METU; Ph.D., University of Helsinki.
CANEL ÇINARBAŞ, Deniz : B.S., METU; M.S., Ph.D., Ball State University.
UYSAL, Ahmet: B.S., M.S., METU; Ph.D., University of Houston.
MISIRLISOY, Mine: B.S., M.S., METU; Ph.D., Florida State University.

ASSISTANT PROFESSORS

CİNGÖZ ULU, Banu: B.S., M.S., METU; Ph.D. York University.
TOKER, Yonca: B.S., M.S., METU; Ph.D.,Georgia Institute of Technology.
ÖZ, Bahar: B.S., M.S., METU; Ph.D., University of Helsinki
ŞAHİN ACAR, Başak: B.S., M.S., METU; M.S., Ph.D., University of New Hampshire.

INSTRUCTOR

SELÇUK, Emre: B.S., METU; M.A., Ph.D., Cornell University.

GENERAL INFORMATION: The Department of Psychology has three main functions: (a) to offer undergraduate and graduate programs in psychology; (b) to carry out research in psychology; (c) to offer courses to students of other departments to broaden their understanding of psychological phenomena.

The department offers a minor's program in psychology in addition to programs that lead to the degrees of B.S. in Psychology, M.S. in Clinical Psychology, Social Psychology, Developmental Psychology, Industrial/Organizational Psychology, Traffic& Transportation Psychology, and Family Psychology; and Ph.D. in Clinical Psychology, Social Psychology, Developmental Psychology and Industrial and Organizational Psychology. The undergraduate program is designed to acquaint students with a broad knowledge and basic skills in the main fields of psychology. For graduation, in addition to the required courses, the students need to take a minimum of 16 elective courses. Nine of these electives must be departmental, 3 of them non-departmental, 1 free and one of each from Sociology, Economics and Philosophy departments.

The graduate program is designed to provide students with advanced theoretical, empirical and methodological knowledge in specific fields of psychology and to give them opportunities to apply this knowledge into their specialization areas. Students equipped with the advanced knowledge and skills of their fields of specialization would be expected to either proceed for an academic career or to work in the field as practitioners or researchers.

Some of our students continue to work towards a Ph.D. with the goal of becoming an academician and/or scientist practitioner. A number of them work in hospitals, counseling centers (e.g., health centers of universities), nursery schools and higher level schools, driver assessment centers, research institutions, or assume administrative and research positions at certain ministries (e.g., mental health section of the Ministry of Health, Ministry of Justice, Ministry of Family and Social Policy) and in media. They can also work at various advertisement firms, and other public and private organizations to develop assessment techniques for selection, placement and to coordinate human relationships, public relations, and human resources. Naturally, the level at which they will be employed and the nature of their responsibilities will tend to vary depending on their post-graduate qualifications and the requirements of the related institutions.

RESEARCH INTERESTS AND FACILITIES:

Clinical Psychology: The role of social and cultural factors in the development; manifestation, diagnosis, and treatment of mental disorders; social support provided to patients; causal attributional dimensions for illness and other life events and their relationship with affective responses; subjective and objective burdens of the caretakers of schizophrenic patients and expressed emotion; psychological distress following natural disasters; the means by which emotions and cognitions are related; cognitive, relational, dynamic and eclectic approaches to psychotherapy; applied relaxation; mental retardation; information processing approaches in clinical psychology; cognitive restructuring; alleviating depressed mood among university students; family and marriage functioning evaluation and therapy as systems; divorce and remarriage dynamics and processes.

Developmental Psychology: The role of cognitive factors and genetics in the causation of autism; diagnostic measures of autism; parenting behaviors; children at risk for developmental problems; institutional care; interventions with infants and children; autobiographical memory; memory development; mother-child conversations language development and assessment; interpersonal relationships across the life span.

Experimental Psychology (Cognitive and Biopsychology):Memory processes; memory illusions; survival processing; attention and cognitive control; situation awareness; substance and alcohol use and misuse in humans; learning processes in drunk driving; cognitive and behavioral effects of alcohol; psycho-technical assessment in driving; encoding processes in learning and memory.

Health Psychology: Biopsychosocial factors associated with health and wellness; behavioral changes that facilitate the acquisition and maintenance of health; primary and secondary prevention; the role of psychosocial factors such as stress in the development of illness; behavioral factors in chronic illnesses such as cardiovascular disease and cancer.

Industrial & Organizational Psychology: The I part of the I/O psychology: job analysis, job redesign, recruitment and selection-testing, performance evaluation and training and evaluating the training programs; O part: Work motivation, attitudes and values at work, including job satisfaction, organizational commitment, work involvement and engagement, culture and climate, leadership, personality, abilities, and career development, stress and health at work, safety issues. Additionally, quantitative aspects of Industrial Organizational psychology.

Social Psychology: Interpersonal relationships; marriage and family; friendship; adult attachment; developmental social cognition; groups; psychology of gender; social representations; values, attitudes and beliefs; social psychology of the elderly; assessment of home environments; person-environment transactions; psychology of self, motivation.

Traffic and Transportation Psychology: The behavior of road users and the psychological processes underlying that behavior (e.g., perceptual, attentional, cognitive, social, motivational, and emotional determinants of mobility and traffic behavior), behavioral and social-psychological attitude-behavior models

in traffic psychology, the relation between behavior and accidents, mobility issues, individual and social factors in the movement of people and goods, cross cultural differences in driving and risk of accident involvement.

There are a number of research laboratories and facilities in the Department. One of these consists of a room with one-way mirrors for conducting experiments and observations in various fields of psychology. Specific equipment available including a video recorder with a T.V set and a video camera, slide projectors, some well-known intelligence test kits and personality assessment equipment. Another recently established laboratory is equipped with latest software to carry out cognitive tasks. For clinical applications, AYNA Clinical Psychology Support Unit offers psychotherapy services and psychological assessment for those who require psychological help. In this unit, graduate Clinical Psychology students follow patients under supervision. In addition, various facilities of other institutions, such as hospitals can be utilized upon permission. There is also a traffic safety and driver behavior laboratory in the department. The objective of this laboratory is to conduct research on traffic and transportation safety and risky driving behavior.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

PSY	101	Introduction to Psychology I	(3-0)3
PSY	113	Research Methods in Psychology-I	(3-2)4
SOC	109	Introduction to Sociology	(3-0)3
BIO	106	General Biology	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
TURK	101	Turkish I	NC

Second Semester

PSY	102	Introduction to Psychology II	(3-0)3
PSY	116	Statistics for Psychology I	(3-2)4
PHIL	xxx	Non-departmental Elective (from PHIL)	
SOC	xxx	Non-departmental Elective (from SOC)	
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	NC
IS	100	Introduction to Information Technologies and Applications	NC

SECOND YEAR

Third Semester

PSY	217	Statistics for Psychology II	(3-2)4
PSY	221	Developmental Psychology I	(4-0)4
PSY	251	Social Psychology I	(3-0)3
PSY	281	Experimental Psychology I: Learning	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

PSY	214	Research Methods in Psychology II	(3-2)4
PSY	222	DevelopmentalPsychology II	(4-0)4
PSY	252	Social Psychology II	(3-0)3
PSY	284	Experimental Psychology II: Cognition	(3-0)3
PSY	200	Ethics in Research and Practice of Psychology	(2-0)2
ECON	xxx	Non-departmental Elective (from ECON)	
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

PSY	331	Testing and Measurement in Psychology	(3-2)4
PSY	335	Industrial Psychology	(3-2)4
PSY	340	Theories of Personality	(4-0)4
PSY	xxx	Departmental Elective	
XXX	xxx	Non-departmental Elective	
PSY	300	Summer Practice	NC

Sixth Semester

PSY	342	Psychopathology	(4-0)4
PSY	374	Biological Psychology	(4-0)4
XXX	xxx	Non-departmental Elective	
XXX	xxx	Non-departmental Elective	
ENG	311	Advanced Communication Skills	(3-0)3 or
PSY	xxx	Departmental Elective	

FOURTH YEAR

Seventh Semester

PSY	442	Clinical Psychology	(4-0)4
PSY	449	Health Psychology	(3-0)3
PSY	xxx	Departmental Elective	
PSY	xxx	Departmental Elective	
PSY	xxx	Departmental Elective	

Eighth Semester

XXX	xxx	Free Elective
PSY	xxx	Departmental Elective
PSY	xxx	Departmental Elective
PSY	xxx	Departmental Elective
PSY	xxx	Departmental Elective

MINOR PROGRAM IN PSYCHOLOGY

Minor Program in Psychology is designed to provide a broad introduction to the fundamental concepts of the main areas of psychology. Students are expected to take a total of 6 courses, comprised of one must course and 5 elective courses. Different areas of interest of individual students can be accommodated by the choice of elective courses.

Must Course:

PSY	100	General Psychology

Electives:

Three departmental electives, one of each sub-area listed below and two free electives.

Basic Psychological Processes

PSY	281	Experimental Psychology I:Learning
PSY	284	Experimental Psychology II: Cognition
PSY	302	Visual Perception
PSY	374	Biological Psychology
PSY	482	Memory
PSY	483	Psychopharmacology

or other courses approved by the Department

Social/Developmental/Industrial/Organizational Psychology

PSY	150	Understanding Social Behavior
PSY	221	Developmental Psychology I
PSY	222	Developmental Psychology II
PSY	335	Industrial Psychology
PSY	336	Organizational Psychology
PSY	355	Consumer Behavior
PSY	454	Social Psychological View of Media
PSY	455	Psychology of Self and Attachment
PSY	456	Applied Social Psychology

or other courses approved by the Department

Personality/Clinical Psychology

PSY	240	Coping with Stress
PSY	340	Theories of Personality
PSY	371	Emotion
PSY	342	Psychopathology
PSY	442	Clinical Psychology
PSY	445	Psychology of Disasters
PSY	449	Health Psychology

or other courses approved by the Department

DESCRIPTION OF UNDERGRADUATE COURSES

PSY 100 General Psychology (3-0)3
This course aims to provide a general overview of theoretical and empirical areas of literature in psychology for non-psychology students. Students are exposed to major areas of psychology such as physiological psychology, developmental psychology, learning, memory and perception, personality and social psychology, and psychopathology. Individual instructors may tailor the course in accordance with the needs of the students taking the course.
(Elective for non-departmental students).

PSY 101 Introduction to Psychology I (3-0)3
An introduction to general theories and methods of psychology; basic concepts and research findings in major areas of psychology, such as perception, learning, cognition and emotion.

PSY 102 Introduction to Psychology II (3-0)3
A continuation of PSY 101. Basic concepts and research findings in the areas of developmental psychology, personality, individual differences, abnormal behavior, psychotherapy and social psychology.

PSY 113 Research Methods in Psychology I (3-2)4
This course is intended, first, to introduce the basic concepts of psychological research, such as the relationship between theory and research, formulating and testing hypotheses, ethics in research, presentation of results, and second, to explain the nature of and problems associated with observational research in psychology. In addition to three lecture hours a week, two hours will be devoted to the discussion, exemplification, and application of the basic principles of sound psychological research.

PSY 214 Research Methods in Psychology II (3-2)4
This course aims to familiarize students with the use of experimental methods in psychology. The content will include basic principles of good experimentation, between-group and within-group experiments, how to deal with the problems associated with these kinds of experiments, design and interpretation of factorial experiments. During the course of the semester, students will be required to create a simple experiment of their own, collect data, and report the result in a computer generated report in the appropriate format.
Prerequisite: PSY 113

PSY 116 Statistics for Psychology I (3-2)4
This course will introduce the basics of descriptive statistics and the principles of hypothesis testing. Methods of summarizing data, principles of probability, and basic assumptions and methods of hypothesis testing will be discussed as they relate to psychological research. The course will include weekly problem sessions (2 hours a week) to reinforce the learning of the principles by application.

PSY 150 Understanding Social Behavior (3-0)3
This course is designed for non-psychology students and aims to familiarize them with principles and processes involved in social conduct. Topics to be covered may include social perception and cognition, attitudes, interpersonal attraction, social influence, helping, human aggression and groups.

PSY 200 Ethics in Research and Practice of Psychology (2-0)2

An introduction to ethical issues inherent in the conduct of psychological research and practice. Topics on ethical issues and dilemmas relevant in different fields of studies, including therapy, clinical and organizational assessment, training, consulting, and forensic issues.

PSY 217 Statistics for Psychology II (3-2)4
This course is intended to introduce the methods of statistical hypothesis testing that are used frequently

in more complex research designs in psychology. The main part of the course will cover the use of Analysis of Variance (ANOVA) in analyzing psychological data. In addition, the use of non-parametric tests and the issue of statistical power will be discussed.
Prerequisite: PSY 116

PSY 221 Developmental Psychology I (4-0)4
An integrated account of the various approaches to human development emphasizing the relevant research findings in this area with special reference to psycho-motor, mental, emotional and social development from birth through adolescence. Discussion of basic issues in developmental psychology.

PSY 222 Developmental Psychology II (4-0)4
Review of theory and research on psychological problems associated with different periods of life. Adolescence, early and late adulthood, family, parenthood, work environment and retirement. Old age, abilities and psychological development of the elderly.

PSY 240 Coping with Stress (3-0)3
The course aims at introducing basic theories and empirical evidence about human stress response. Focusing on transaction between mind and body and between persons and environments, the course intends to examine how physiological, psychological, social and cultural factors come together to influence what people perceive as stressful and how they cope with it. The course also involves practical applications of various emotion and problem focused coping skills.
Prerequisite: PSY 100 or PSY 101

PSY 242 Portrayal of Mental Illness In Movies (3-0)3
Mental illness, mental health professionals, psychological treatments, and mental health institutions are frequently portrayed in popular movie films with either high or low level of realism. Realistic movie films are useful to review basics of clinical profession whereas unrealistic popular films are beneficial to improve critical thinking about how culture views mental illness. The course intends to give the students a realistic perspective about mental health issues, and to improve students' critical thinking abilities about movie films that portray mental illness and mental health professionals.

PSY 251 Social Psychology I (3-0)3
Introduction to the field and methods of social psychology; historical perspective, review of theoretical and empirical work related to areas such as social perception, cognition, attitude formation, change and measurement.

PSY 252 Social Psychology II (3-0)3
Review of theoretical and empirical work in the areas of interpersonal attraction, group processes including norms, conformity, negotiation, cooperation, conflict, leadership, productivity and socialization processes such as sex-role learning and pro and antisocial behavior.

PSY 272 Human Nervous System (3-0)3
Basic anatomy and physiology of the central and peripheral nervous system. Study of reflex mechanisms, sensory and perceptual processes, sensorimotor integration, homeostasis and endocrine system, as they relate to development and pathology of behavior.

PSY 281 Experimental Psychology I: Learning (3-0)3
A course designed to acquaint the students with the experimental literature of the psychology of learning. Areas of major emphasis are principles of classical and instrumental conditioning, reinforcement and its patterns, extinction, relation of learning to motivation, generalization and discrimination. A selective treatment of major learning theories in various contexts is distributed throughout the course material.

PSY 282 ExperimentalPsychology II: Perception (4-0)4
A survey course that concentrates on the central phenomena of perception with an attempt to clarify the theoretical problems to which these phenomena give rise. Topics to be covered include perception of size, the third dimension, direction, movement, form, neutral color and illusions. A brief discussion of sensory processes is also included.

PSY 284 Experimental Psychology II: Cognition (3-0)3
A survey course built upon the experimental cognitive approach to human information processing. Topics to be covered include sensory memory, attention, pattern recognition, short-term storage and processing, non-acoustic coding and forgetting in short-term memory.

PSY 300 Summer Practice NC
This course is designed to give students a first hand experience in the application of psychology in real life setting. Students will have the opportunity to

make observations and applications related to psychology in various institutions. They are expected to develop an understanding of practical issues relevant for the applications of their theoretical knowledge. The course also aims to give students an appreciation of ethnical guidelines for the professional conduct of psychology.

PSY 301 Background in Psychology (3-0)3
This course is designed for non-psychology majors to familiarize them with basic concepts and theories in psychology. The course will center around issues in learning, memory, motivation, emotions, human development, personality, social and environmental psychology.

PSY 302 Visual Perception (3-0)3
A course designed to acquaint the students with the human perceptual system. Major emphasis is placed on depth, form and movement perception with discussions on perceptual constancies and illusions. The course may be extended to include the social perceptual processes.
Prerequisite: PSY 301 or Consent of the instructor.

PSY 312 Experimental Design and Analysis (3-2)4
A detailed study of experimentation and related issues in psychology. General principles of good experimental design, advantages and problems associated with different experimental designs, statistical principles of hypothesis testing, application of inferential statistics.

PSY 320 Topics in Developmental Psychology (3-0)3
In-depth study of selected topics in developmental psychology. Topics may include social development, language development, cognitive development or other possible fields of interest.
Prerequisite: Consent of the instructor.

PSY 321 Cognitive Development (3-0)3
Review of basic cognitive mechanisms, characteristics of the information processing system and especially its development with particular emphasis upon knowledge structures and mental strategies. The course will provide a general introduction to current research and theories on symbolic capacity and the processes of its development.

PSY 322 Social Development (3-0)3
Mechanisms of socialization, impact of parental attitudes, peer relations and school on social, emotional, personality development. Issues related to development of social cognition will be reviewed, including the findings on the development of prosocial behaviors and social problem solving skills. International research on moral development will also be discussed.

PSY 331 Testing and Measurement in Psychology (3-2)4
Students will be exposed to the basic principles of measurement in psychology; norm development validity, reliability, and related statistics. Special emphasis will be given to test development and use of tests. Nature of abilities, intelligence and issues in intelligence testing are among the other topics covered in this course.

PSY 332 Intelligence Testing (2-2)3
A critical analysis of intelligence tests (WAIS and WISC-R in particular); discussion of procedures and principles in intelligence testing; practice in testing and reporting of test data.
Prerequisite: Consent of the instructor.

PSY 335 Industrial and Organizational Psychology (3-2)4
This course provides a general overview of industrial psychology. Topics, such as methods used in the science and practice of industrial psychology, job analysis, criterion development, personnel selection, placement and training, and performance appraisal, work motivation, satisfaction, leadership are covered with the purpose of providing a foundation in both theoretical and applied areas of the field.

PSY 336 Organizational Psychology (2-2)3
The course covers how organizations affect human behavior at work; motivation to work; communication in the organizations; leadership and related issues; satisfaction with work and other topics related to interaction of work and human behavior. The lectures will be geared toward problems that may be encountered at work by an employee or an employer without overburdening the students with the heavy theoretical content.

PSY 340 Theories of Personality (4-0)4
A survey of different theories and approaches to the study of personality. Comparison, critique and evaluation of different theories.

PSY 341 Psychology of Adjustment (3-0)3
The purpose of this course is to give an overview of theoretical perspectives on stress and coping. The course will provide a perspective on stress and

coping. The course will provide a review of literature on factors related to adjustment to major life events such as marriage, divorce, handicap and chronic illness and main coping strategies utilized throughout the adjustment process.
Prerequisite: Consent of the instructor.

PSY 342 Psychopathology (4-0)4
Historical review of the field; concepts of normal and abnormal behavior; theoretical approaches to abnormal behavior; examination of the types of adulthood psycho pathology as proposed in the latest classification system.

PSY 343 Topics in Clinical Psychology* (3-0)3
See course description at the end.

PSY 345 Speech And Language Pathology (2-2)3
The purpose of this course is to familiarize students with speech and language problems among children and adults. The course intends to provide a basic understanding about speech mechanisms and diagnostic principles and procedures.

PSY 346 Clinical Interview Skills (3-0)3
Provide general overview of content and nature of a clinical interview. Identify and demonstrate the skills of a clinical interview.

PSY 347 Counseling the Communicatively Disordered (2-2)3
The role and process of counseling in relation to speech-language and hearing disorders will be discussed. Interrelationships between speech–hearing therapy and counseling; and types of counseling approaches will also be considered.

PSY 348 Emotion (3-0)3
The course aims at introducing complementary nature of theoretical and empirical approaches to emotions. Philosophical, cultural, evolutionary, developmental, neurological and clinical issues on emotion research will be elaborated to orient the students to initiate a complete research project on affective states.
Prerequisite: Consent of the Department.

PSY 349 Aging and Communication Disorders (3-0)3
Study of the psychological, sensory, and emotional changes that are part of the normal aging process as they relate to the impaired speech-language and hearing abilities of the aging population. Implications and consequences of decrease in auditory and speech perception abilities of the elderly individuals will be discussed.

PSY 350-353 Topics in Social Psychology * (3-0)3
See course description at the end.

PSY 352 Environment and Behavior (3-0)3
The interface between the physical and social environment and individual behavior is examined from an interdisciplinary perspective. The ecological assumptions of contemporary psychological theories are discussed, along with such concepts as the behavior setting unit, territoriality, personal space and levels of analysis.
Prerequisite: Consent of the instructor.

PSY 354 Introduction to Traffic Psychology (3-0)3
The aim of the course is to give students an overview of the main theories, methods and empirical findings of traffic psychology. The main emphasis in the course is on traffic safety and means of improving driver behavior. Since traffic safety is a product of many societal, psychological and environmental factors, the course will focus on these different aspects. In addition to classroom teaching, field exercises and demonstrations will also be used.

PSY 355 The Social Psychology of Consumer Behavior (3-0)3
This course provides a clear understanding of how social psychologicalconcepts and theories can be used to explain consumer behavior. Emphasisis given to understanding the psychological and social psychologicalbasis of consumer behavior. The course briefly begins with anintroduction to the segmentation and targeting of consumers. Then, itfocuses on the psychological and social psychological core issues (motivation, perception, learning, attitude, attitude change,personality, self, group influence, and communication) and decision making processes that form the basis of consumer behavior. Finally, thecourse covers the consumer behavior of specific reference groups, suchas classes, cultures, subcultures, and cross-cultural groups.

PSY 357 Culture and Relationship (3-0)3
This course aims to acquaint students with theories and research related to universals and cultural variations in personal relations. An important objective is to view the predominantly western research from a critical perspective. An attempt at including nonwestern research is made. Various

types of personal relationships such as parent-child relations during infancy, childhood, adolescence and later adulthood, same-sex and different-sex friendships, sibling relationships, romantic and marital relations, family, relationships with kin and social networks and relationships in the workplace will be covered.

PSY 358 Social Identity, Majority-Minority Relations and Acculturation (3-0)3
The aim of the course is to furnish an introduction to the theories and methods related to the investigation of majority-minority relations. The course will start with explication of Social Identity Theory and its derivatives and examine theoretical views on minority-majority relations. Theoretical approaches and research related to measuring and changing stereotypes and discussion of research on majority-minority relations in the laboratory and in real life will follow. Various ways in which minorities and majorities make adjustments within a multicultural social context will also be covered.

PSY 360-362 Topics in Clinical Psychology (3-0)3
Selected topics in Clinical Psychology concerning personality theories, psychopathology, psychological assessment, or psychotherapy will be discussed comprehensively. The aim of the course is to improve the students' knowledge and skills on these selected topics.

PSY 372 Motivation and Emotion (3-0)3
Conceptual and experimental approaches to the study of motivation and emotion. Instincts, drives, purposive behavior, social and ego integrative motives. Nature of emotion; emotion and motivated behavior. Physiological variables in motivation and emotion. Motivational conflict and its resolution.
Prerequisite: Consent of the instructor.

PSY 374 Biological Psychology (4-0)4
The physiological basis of behavior; study of sensory, neural and motor structures for sensory coding, hunger and thirst, sleep - waking cycle, communication emotion, learning, and psychosomatic disorders.

PSY 380 Topics in Experimental Psychology * (3-0)3
See course description at the end.

PSY 382 Cognitive Processes II (3-0)3
A continuation of "Cognitive Processes I." Topics to be covered include storage and retrieval processes in long-term memory, organization of semantic memory, structure and formation of concepts, problem solving and reasoning.
Prerequisite: Consent of the instructor.

PSY 384 Speech Perception (3-0)3
The aim of this course is to teach the acoustics of speech and its perception. Basic concepts are explained. Then these concepts are applied to the description of speech sounds, and acoustic research on the perception of speech sounds and their meanings are presented.

PSY 385 Introduction to Cognitive Science (3-0)3
The course is intended to provide an introduction to the multidisciplinary study of the human mind for diverse groups of students. Students will be exposed to the basics of how cognitive psychology, artificial intelligence, linguistics, neuroscience, and philosophy approach mental phenomena. The final portion of the course will present integrated approaches to some core topics of cognitive science such as language and vision.

PSY 386 Auditory Perception (3-0)3
Review of current knowledge and theories in auditory perception. Topics will include physics of sound and the physiology of the human auditory system; loudness, adaptation of loudness and fatigue; frequency analysis, masking and the critical band concept; pitch perception; auditory pattern and space perception and the perception of speech.

PSY 390-399 Workshop (2-2)3
The major aim is to involve the students in a typical research activity in their field of interest including designing of research, data collection, analysis of the results, and writing up a research report. Areas in which workshops will be offered will be announced, together with the course codes, each semester.
Prerequisite: Consent of the instructor.

PSY 410 General Experimental Psychology (2-2)3
A course designed to acquaint the student with experimentation and report-writing in
a problem area of experimental psychology. Typically, the student finds a research problem, designs an experiment, collects data, analyzes and interprets data and writes an article based on the experiment.
Prerequisite: Consent of the instructor.

PSY 414 Computer Applications in Psychology (2-2)3
This course will provide an opportunity for students to apply statistical methods to psychological issues

through the usage of statistical package programs such as SPSS and BMDP. The specific content of the course will include the topics related to the statistical tools learned in the previous years.

PSY 420 Experimental Child Psychology (3-0)3
Practice in the application of experimental method to the study of child behavior. Basic observational techniques in child study. Special problems, both practical and ethical, in the use of child subjects. Formulation, execution and report of research projects in child psychology.
Prerequisite: Consent of the instructor.

PSY 421 Topics in Developmental Psychology * (3-0)3
See course description at the end.

PSY 422 Language Acquisition and Development (3-0)3
The course will include major approaches to the study of child language acquisition and development during infancy and elementary school years. The course explicitly aims at integrating student's knowledge in cognitive mechanisms with those known about linguistic functioning and language acquisition. Language perception, comprehension, production and the development of discourse strategies will be discussed.

PSY 424 Applied Developmental Psychology (3-0)3
The course will provide information on the applications of developmental psychology, its findings on issues related to education,
rehabilitation and fostering the growth potential of children. Theory and research base of testing, hospital and school services, scale construction, special research designs will be covered.
Prerequisite: Consent of the instructor

PSY 426 Childhood Psychopathology (3-0)3
Examination of the types of childhood psychopathology as proposed in the latest classification system; behavioral treatment and assessment of childhood disorders.
Prerequisite: Consent of the instructor.

PSY 427 Human Bonding (3-0)3
Examination of human bonding primarily from a psychological perspective, drawing on empirical and theoretical work from the fields of developmental, clinical, cognitive, personality, and social psychology, and secondarily from ethology, anthropology, sociology, and neurobiology. Discussion of the basic structure, functions, dynamics, and formation of human affectional bonds, especially those of the attachment and mating variety.

PSY 428 Developmental Psychopathology (3-0)3
The purpose of this course is to teach developmental psychopathology as a separate discipline from developmental psychology and clinical child psychology. This course specifically aims to look at childhood psychopathologies from a developmental perspective and familiarize students with the main disorders of childhood. Furthermore, developmental pathways, theoretical explanations, and diagnostic features are covered for each disorder.

PSY 430 Gender and Leadership Issues at Work (3-0)3
Review of current knowledge and theories concerning differential treatment of men and women at work, leadership through a gender lens as well as gender issues relevant to managing career and nonwork. Topics include but not limited to gender role stereotyping, different forms of inequalities and discrimination in the workplace, women and men in management and leadership, and gender as it relates to work-family interface.

PSY 431 Personality Assessment (2-2)3
Survey of techniques of personality assessment with an emphasis on projective and behavioral techniques. Clinical prediction. Measurement of personality stability and change.
Prerequisite: Consent of the instructor.

PSY 432 Job Analysis and Performance Appraisal (2-2)3
The main focus of this course is on various methods of job analysis and performance evaluation systems. It is designed to be both a theoretical and an applied course in orientation. Special emphasis is placed on the application of job analysis methods and the development of performance appraisal systems in work organizations.

PSY 434 Topics in Industrial and Organizational Psychology (3-0)3
The course provides a detailed review of the current issues, theories, and applications in I/O psychology. Topics covered include job analysis and applications; personnel selection systems and techniques; the turnover process; performance and management theory and practice; human factors in

work organizations; organizational culture and climate; leadership; and cross cultural I/O issues.

PSY 436 Job Analysis and Personnel Selection (2-2)3
This course covers the major areas of personnel testing, performance evaluations and testing, and job analysis. The problems and relevant issues of personnel decisions; various tools of personnel testing, performance appraisal systems, and job analysis will be investigated. Special emphasis will be given to developing instruments of measurement for personnel decisions in organizations.

PSY 440 Topics in Clinical Psychology * (3-0)3
See course description at the end.

PSY 441 Theories of Psychotherapy (3-0)3
Survey of different schools of psychotherapy. Review of psychotherapy research, critique and ethical standards for therapists.
Prerequisite: Consent of the instructor.

PSY 442 Clinical Psychology (4-0)4
Historical development and relationships with other disciplines; review of recent theories and research in the major areas of clinical psychology such as measurement of abilities, personality assessment, psychotherapy and prevention of behavior disorders; clinical psychology as a profession; training, legislation, licensing and ethical standards. Visits to settings where clinical psychologists are working may be arranged.

PSY 443 Community Psychology (3-0)3
Evolution of community psychology. Survey of its roots, paradigms, conceptual framework, strategies and tactics. Review of research and interventions in different systems.
Prerequisite: Consent of the instructor.

PSY 445 Psychology of Disasters (3-0)3
This course is designed to give students an overview of the psycho-social consequences of disasters and psychological intervention methods that can be used with survivors, emergency workers and volunteers following disasters. The course also provides a critical examination of individual and community responses for effective mitigation and preparedness behaviors. Ethical guidelines for psychological services and research in disaster situations will also be covered.

PSY 447 Family Therapy Approaches (3-0)3
Family as a system; adequate and dysfunctional family; several prominent approaches to family; diagnosis, stages in the process and techniques.

PSY 448 Methods of Family Therapy (3-0)3
Methods of family assessment; verbal and non-verbal methods of family intervention; therapist technique development from basic methods emphasized; application to various topical family problems.
Prerequisite: PSY 447 or consent of the instructor.

PSY 449 Health Psychology (3-0)3
This course is designed to explore the biopsychosocial factors associated with health and wellness. The aim of the course is to familiarize students with behavioral changes that facilitate the acquisition and maintenance of health, primary and secondary prevention, and the role of psychosocial factors such as stress in the development of illness. Multicultural aspects of health behavior will be examined throughout the course.

PSY 450 Topics in Social Psychology (3-0)3
See course description at the end.

PSY 451 Experimental Social Psychology (1-4)3
Uses of experimental method in social psychology. Introduction to various experimental paradigms in different topical areas in social psychology. Formulation, execution and report of social psychological experiments. Ethical issues in human experimentation.
Prerequisite: Consent of the instructor.

PSY 452 Psychology of Gender (3-0)3
The psychology of being a male or a female is pursued within a developmental perspective. Gender differences and problems in childhood, adolescence, adulthood and old-age are considered. Special emphasis is given to exploring the psychological functions and implications of gender stereotypes.

PSY 453 Political Psychology (3-0)3
An introduction to the interdisciplinary field of political psychology. Topics include applications of psychology to political behavior such as voting, mass media, nationalism, conflict resolution, and collective protests.

PSY 454 Social Psychological View of Media (3-0)3
The aim of the course is to provide an overview of the core terms used in the study of social

psychology of media communication. Some of the main topics to be explained and illustrated will include social knowledge, influence processes, the construction of meaning, and the diffusion of representations. While making the case that the study of media influence cannot be isolated from an understanding of wider social, cultural, political, and economic contexts; the major emphasis will be given on role of the individuals as to how they make sense of the media depending on their own socio-cultural contexts.

PSY 455 Psychology of the Self and Attachment (3-0)3
The course aims to provide a detailed review of the recent literature on the development of the self and attachment from the social psychological, personality, and developmental perspectives. This course also deals with how the self and attachment are related and how they interact in influencing psychological functioning later in life.
Prerequisite: Consent of the Department.

PSY 456 Applied Social Psychology (3-0)3
This course aims to familiarize the students with how the theories and findings of social psychology are applied to different real life problems in various social settings. In the course the content of applied social psychology and its main domains will be explained. Then, the students will be exposed to how several major theoretical areas within social psychology, such as social cognition, attitudes, attitude change, social influence, social norms, social relations, and prejudice can be applied to social problems relevant to health, environment, education, gender, intimate relations, politics, leadership, conflict, and sports.

PSY 460 Issues in Contemporary Psychology (3-0)3
Examination of controversial issues in present day psychology, with an emphasis on integration of theoretical and empirical approaches to each issue. Issues discussed may include the place of phenomenology in psychology, clinical vs. actuarial prediction, or other issues of current interest.
Prerequisite: Consent of the instructor.

PSY 462 Cultures, Organizations and Safety (3-0)3
General overview of the concepts of culture, organizational culture, and safety culture. Socio-psychological aspects of culture, organizational culture, and safety culture including tools, steps, and contributors of safety conditions in societies and organizations. Case studies as examples for the application of theoretical knowledge to practical implications.

PSY 470 Systems and Theories in Psychology (3-0)3
Early and modern theories and systems in psychology. Nature of theory in psychology and discussion of the trend towards mini theories. Survey of human models. Evaluation and critique.
Prerequisite: Consent of the instructor.

PSY 482 Memory (3-0)3
An introduction to a cognitive and experimental approach to memory. Topics on basic memory processes, memory problems and errors, such as working memory, episodic memory, autobiographical memory, false memory remembering, and forgetting.

PSY 483 Psychopharmacology (3-0)3
Neuropharmacological principles of drug action. Drug-receptor and drug-neurotransmitter interaction. Definition of basic concepts in psychopharmacology such as behavioral and clinical psychopharmacology, psychoactive drugs, tolerance, physical and psychological dependence and tolerance. Classification of psychoactive drugs. Basic behavioral techniques for the measurement of drug effects and behavioral models of clinical drug response.

PSY 484 Analyzing Cinematic Characters (3-0)3
Application of psychoanalytic and existential personality theories and concepts of Freud, Lacan, Klein, Campbell, and May to numerous typology examples drawn from cinema literature.

PSY 490-499 Field Practice (2-2)3
The major aim is to give advanced students a practical orientation in their fields of interest. Experience will be arranged in various settings, such as psychiatric clinics, nursery schools and guidance and testing centers. The students are required to participate in weekly discussion sessions with the supervising staff member of the department. Areas in which practice will be offered will be announced, together with the course codes, each semester.
Prerequisite: Consent of the instructor.

*** TOPICS COURSES**
Each topics course is designed to deepen the student's knowledge in a selected issue-oriented sub-area of the field. The course may involve analysis of current theoretical debates, a detailed treatment of a subarea, which may appear as a chapter in a regular survey course, or by getting acquainted with the skills required for in-depth analysis.
Prerequisite: Consent of the instructor

GRADUATE PROGRAMS AT THE DEPARTMENT OF PSYCHOLOGY

PROGRAMS OFFERED

At the Master's level M.S. degree (Thesis-program) in Psychology is offered in 4 different areas. These are Clinical Psychology, Social Psychology, Developmental Psychology, Traffic and Transportation Psychology, and Industrial and Organizational Psychology options. Non-thesis programs namely, Industrial and Organizational Psychology and Family Psychology are also available. At the Doctorate level, Ph.D. in Psychology is available in three areas; these are Clinical Psychology, Social Psychology, Developmental Psychology and Work (Industrial) and Organizational Psychology options.

M.S. PROGRAM IN PSYCHOLOGY

Option I. Clinical Psychology

Required Courses

PSY	500	Advanced Statistics for Psychology I	(3-2)4
PSY	505	Prothesis Seminar in Clinical Psychology	NC
PSY	592-593-594	Practicum in Clinical Psychology	NC
PSY	599	Master's Thesis	NC

PSY	800-899	Special Studies	NC
or			
PSY	900-999	Special Topics	NC

Elective Courses

Students are required to take seven elective courses from the list of courses offered or approved by the Department.

PSY	523	Childhood Psychopathology	(3-0)3
PSY	524	Psychology of Aging	(3-0)3
PSY	527	Mental Handicap	(3-0)3
PSY	530	Assessment of Intellectual Functioning	(2-2)3
PSY	531	Clinical Assessment	(3-0)3
PSY	532	Application in Clinical Assessment	(3-0)3
PSY	540	Dynamic Psychotherapy	(3-0)3
PSY	541	Issues in Clinical Psychology	(3-0)3
PSY	542	Adult Psychopathology	(3-0)3
PSY	543	Cognitive-Behavioral Therapies I	(3-0)3
PSY	544	Cognitive-Behavioral Therapies II	(3-0)3
PSY	545	Topics in Psychopathology	(3-0)3
PSY	546	Techniques of Psychotherapy	(3-0)3
PSY	547	Processes and Disorders of Human Communication	(3-0)3
PSY	548	Topics in Psychotherapy	(3-0)3
PSY	549	Cultural factors in Psychopathology	(3-0)3
PSY	561	Cultural Issues in Psychotherapy	(3-0)3
PSY	565	Ethical Issues in Clinical Psychology	(3-0)3
PSY	567	Psychological and Social Aspects of Disasters	(3-0)3
PSY	590	Behavioral Interventions in Health	(3-0)3

Other electives approved by the department.

Option II. Social Psychology

Required Courses

PSY	500	Advanced Statistics for Psychology I	(3-2)4
PSY	503	Prothesis Seminar in Social Psychology	NC

PSY	800-899	Special Studies	NC
Or			
PSY	900-999	Special Topics	NC

Elective Courses

Students are required to take seven elective courses from the list of courses offered or approved by the Department. At least one free elective must be taken from the other areas in Psychology.

PSY	599	Master's Thesis	NC

Sub-Area 1 (General & Social Cognition)

PSY	553	Historical Overview of Advances in Social Psychology	(3-0)3
PSY	554	Recent Advances and Problems in Social Psychology	(3-0)3
PSY	555	Social Cognition and Affect	(3-0)3
PSY	559	Human Motivation: Self Determination Theory	(3-0)3
PSY	562	Psychology of Close Relationships	(3-0)3
PSY	563	Research Design in Social Psychology	(3-0)3
PSY	653	Social Representations	(3-0)3
PSY	659	Psychology of Self	(3-0)3
PSY	660	Positive Psychology	(3-0)3

Sub-Area 2 (Attitudes, Social Influence & Groups)

PSY	552	Groups	(3-0)3
PSY	651	Attitudes and Attitude Change	(3-0)3
PSY	652	Attitude Measurement and Scale Development	(3-0)3
PSY	655	Intra-group Processes	(3-0)3
PSY	656	Inter-group Relations	(3-0)3

Sub-Area 3 (Applied Social Psychology)

PSY	550	Psychology of Women and Gender	(3-0)3
PSY	556	Applied Social Psychology	(3-0)3
PSY	557	Contemporary Issues in Political Psychology	(3-0)3
PSY	558	Interpersonal Relationships	(3-0)3
PSY	654	Social Psychology of Legal Processes	(3-0)3
PSY	657	Family Processes Through Time and Cultural Contexts	(3-0)3
PSY	658	Relationships with Parents and Peers	(3-0)3

Option III. Developmental Psychology

Required Courses

PSY	500	Advanced Statistics for Psychology I	(3-2)4
PSY	507	Prothesis Seminar in Developmental Psychology	NC
PSY	510	Advanced Statistics for Psychology II	(3-2)4
PSY	595-596	Practicum in Developmental Psychology	NC
PSY	599	Master's Thesis	NC
PSY	800-899	Special Studies	NC
Or			
PSY	900-999	Special Topics	NC

Elective Courses

At least one free elective must be taken from the other areas in Psychology.
Students are required to take six electives from the list of courses offered or approved by the Department.

PSY	512	Developmental Psychopathology	(3-0)3
PSY	514	Language Development and Bilingualism	(3-0)3
PSY	516	Development of Social Cognition	(3-0)3
PSY	518	Development of Children With Disabilities	(3-0)3
PSY	525	Life-Span Developmental Theory	(3-0)3
PSY	526	Memory Development	(3-0)3
PSY	528	Adolescence: Theory, Problems and Applications	(3-0)3
PSY	529	Applied Developmental Psychology: Social and Emotional Issues	(3-0)3
PSY	534	Tests and Measurement in Child Development	(3-0)3
PSY	622	Developmental Interventions	(3-0)3

Other electives approved by the Department

Option IV. Industrial and Organizational Psychology

Required Courses

PSY	500	Advanced Statistics for Psychology I	(3-2)4
PSY	508	Prothesis Seminar in Industrial and Organizational (I/O) Psychology	NC
PSY	510	Advanced Statistics for Psychology II	(3-2)4

PSY	599	Master's Thesis	NC
PSY	800-899	Special Studies	NC

Elective Courses
Students are required to take six electives from the list of courses offered or approved by the Department. Students are expected to take at least four of the below and two free electivesapproved by the Department/Advisor.

PSY	504	Leadership and Motivation	(3-0)3
PSY	506	Training and Evaluation	(3-0)3
PSY	509	Advanced Overview of I/O Psychology	(3-0)3
PSY	511	Interview Techniques	(3-0)3
PSY	517	Vocational Counseling and Career Development	(3-0)3
PSY	519	Human Factors and Performance	(3-0)3
PSY	535	Advanced Job Analysis and Performance Appraisal	(3-0)3
PSY	536	Personnel Selection and Testing	(3-0)3
PSY	538	Program Evaluation	(3-0)3

Other electives approved by the Department.

Option V. Traffic & Transportation Psychology

Required Courses

PSY	500	Advanced Statistics for Psychology I	(3-2)4
PSY	570	Introduction to Traffic and Transportation Psychology	(3-0)3
PSY	526	Prothesis Seminar in Traffic and Transportation Psychology	
PSY	800-899	Special Studies	NC
PSY	599	Master Thesis	NC

Elective Courses
Students are required to take six electives from the list of courses offered or approved by the Department/Advisor.

PSY	571	Accident and Behavioral Models: Theories and Implications	(3-0)3
PSY	572	Social Psychology of Driver Behavior and Attitudes	(3-0)3
PSY	573	Risk Factors for Psychomotor and Cognitive Processes in Driving	(3-0)3
PSY	574	Research methods in traffic and transportation psychology	(3-0)3
PSY	576	Situation Awareness: Theory and Application	(3-0)3
PSY	578	Accident Prevention and Safety Intervention Techniques	(3-0)3

Other electives approved by the Department.

M.S. PROGRAM IN INDUSTRIAL AND ORGANIZATIONAL PSYCHOLOGY

Program Requirements
Students are required to take ten 3-credit courses, the non-credit "Practicum in Industrial and Organizational (I/O)" and prepare a Term Project. Upon satisfactory completion of the program below, students earn a Master of Science degree in Industrial and Organizational Psychology.

Required Courses

PSY	500	Advanced Statistics for Psychology I	(3-2)4
PSY	510	Advanced Statistics for Psychology II	(3-2)4
		Change	(3-0)3
PSY	597	Practicum in Industrial and Organizational (I/O) Psychology	NC
PSY	598	Term Project	NC

Elective Courses

Field Courses: Students are expected to take at least four of the below.

PSY	504	Leadership and Motivation	(3-0)3
PSY	506	Training and Evaluation	(3-0)3
PSY	509	Advanced Overview of I/O Psychology	(3-0)3
PSY	511	Interview Techniques	(3-0)3
PSY	517	Vocational Counseling and Career Development	(3-0)3
PSY	519	Human Factors and Performance	(3-0)3
PSY	535	Advanced Job Analysis and Performance Appraisal	(3-0)3
PSY	536	Personnel Selection and Testing	(3-0)3
PSY	538	Program Evaluation	(3-0)3

Other electives approved by the Department.

Electives from related areas: At least four free electives from related areas approved by the Department/Advisor.

M.S. PROGRAM IN FAMILY PSYCHOLOGY (NON-THESIS, SECONDARY EDUCATION)

Program Requirements
Students are required to take ten 3-credit courses and prepare a Term Project. Upon satisfactory completion of the program below, students earn a Master of Science degree in Family Psychology.

Required Course

FPSY	502	Research & Statistical Assessment in Applied Settings	(3-0)3
FPSY	533	Introduction to Family and Marital Therapy	(3-0)3
FPSY	581	Applications in Family Psychology	(3-0)3
FPSY	598	Term Project	NC

Elective Courses
Field Courses: Students are expected to take sevenof the below.

FPSY	512	Developmental Psychopathology	(3-0)3
FPSY	515	Adult Development and Aging	(3-0)3
FPSY	516	Development of Social Cognition	(3-0)3
FPSY	518	Development of Children with Disabilities	(3-0)3
FPSY	523	Childhood Psychopathology	(3-0)3
FPSY	524	Psychology of Aging	(3-0)3
FPSY	525	Life-Span Developmental Theory	(3-0)3
FPSY	527	Mental Handicap	(3-0)3
FPSY	528	Adolescence: Theory, Problems and Applications	(3-0)3
FPSY	529	Applied Developmental Psychology	(3-0)3
FPSY	531	Clinical Assessment	(3-0)3
FPSY	534	Tests and Measurement in Child Development	(3-0)3
FPSY	543	Family, Marriage and Kinship Dynamics in Turkey	(3-0)3
FPSY	545	Topics in Psychopathology	(3-0)3
FPSY	546	Techniques of Psychotherapy	(3-0)3
FPSY	550	Psychology of Women & Gender	(3-0)3
FPSY	556	Applied Social Psychology	(3-0)3
FPSY	558	Interpersonal Relationships	(3-0)3
FPSY	562	Psychology of Close Relationships	(3-0)3
FPSY	565	Ethical Issues in Clinical Psychology	(3-0)3
FPSY	567	Psychological and Social Aspects of Disasters	(3-0)3
FPSY	590	Behavioral Interventions in Health	(3-0)3
FPSY	610	Advanced Research Methods and Statistical Applications	(2-2)3
FPSY	642	Treatment of Family Problems	(3-0)3
FPSY	650	Health Psychology	(3-0)3
FPSY	652	Attitude Measurement and Scale Development	(3-0)3
FPSY	654	Social Psychological Aspects of Legal Processes	(3-0)3
FPSY	657	Family Processes Through Time & Cultural Contexts	(3-0)3

FPSY	658	Relationships with Parents and Peers	(3-0)3

Other elective courses approved by the Department.

Ph.D. PROGRAM IN PSYCHOLOGY

Ph.D. in Psychology is available as Clinical Psychology, Social Psychology, Developmental Psychology and Work (Industrial) and Organizational Psychology options.

Option I. Clinical Psychology

Required Courses

PSY	510	Advanced Statistics for Psychology I I	(3-2)4
PSY	610	Research Methods in Clinical Psychology	(3-0)3
PSY	681	Applications in Clinical Psychology I	(3-0)3
PSY	682	Applications in Clinical Psychology II	(3-0)3
PSY	699	Ph.D. Dissertation	NC
PSY	800-900	Special Studies/Topics	NC
PSY	691	Internship I	NC
PSY	692	Internship II	NC

Elective Courses

Students are required to take at least 4 elective courses approved by the Department, subjected to the restriction that during their graduate education (including the Master's level) they are required to take (or have taken) at least three elective courses from each of the sub-areas given below. The list may be subject to modification by the Department.

Sub-Area 1: Psychopathology

PSY	523	Childhood Psychopathology	(3-0)3
PSY	524	Psychology of Aging	(3-0)3
PSY	527	Mental Handicap	(3-0)3
PSY	541	Issues in Clinical Psychology	(3-0)3
PSY	542	Adult Psychopathology	(3-0)3
PSY	544	Adulthood Psychopathology and Psychotherapy II	(3-0)3
PSY	545	Topics in Psychopathology	(3-0)3
PSY	547	Processes and Disorders of Human Communication	(3-0)3
PSY	549	Cultural Factors in Psychopathology	(3-0)3
PSY	644	Emotions in Psychopathology	(3-0)3

Sub-Area 2: Psychotherapy

PSY	540	Dynamic Psychotherapy	(3-0)3
PSY	543	Adulthood Psychopathology and Psychotherapy I	(3-0)3
PSY	546	Techniques of Psychotherapy	(3-0)3
PSY	548	Topics in Psychotherapy	(3-0)3
PSY	561	Cultural Issues in Psychotherapy	(3-0)3
PSY	590	Behavioral Interventions In Health	(3-0)3
PSY	643	Clinical Psychopharmacology	(3-0)3
PSY	646	Psychotherapy Supervision	(3-0)3

Sub-Area 3: Psychological Assessment

PSY	530	Assessment of Cognitive Functioning	(2-2)3
PSY	531	Clinical Assessment	(3-0)3
PSY	532	Application in Clinical Assessment	(3-0)3

Other elective courses approved by the Department.

Option II. Social Psychology

Required Courses

PSY	510	Advanced Statistics for Psychology II	(3-2)4
PSY	699	Ph. D. Dissertation	NC
PSY	800- 900	Special Topics	NC

(or an equivalent course approved by the department)

Elective Courses

Students are required to take at least seven electives, approved by the Department, subject to the restriction that during their graduate education (including the Master's level) they need to take (or have taken) at least one elective each of the sub-areas below and one free elective from the other areas in Psychology. The list may be subject to modification by the Department.

Sub-Area 1 (General & Social Cognition)

PSY	553	Historical Overview of Advances in Social Psychology	(3-0)3
PSY	554	Recent Advances and Problems in Social Psychology	(3-0)3
PSY	555	Social Cognition and Affect	(3-0)3
PSY	559	Human Motivation: Self Determination Theory	(3-0)3
PSY	562	Psychology of Close Relationships	(3-0)3
PSY	563	Research Design in Social Psychology	(3-0)3
PSY	621	Multi –level Modeling for Psychology	(3-0)3
PSY	653	Social Representations	(3-0)3
PSY	659	Psychology of Self	(3-0)3
PSY	660	Positive Psychology	(3-0)3

Sub-Area 2 (Attitudes, Social Influence & Groups)

PSY	552	Groups	(3-0)3
PSY	651	Attitudes and Attitude Change	(3-0)3
PSY	652	Attitude Measurement and Scale Development	(3-0)3
PSY	655	Intra-group Processes	(3-0)3
PSY	656	Inter-group Relations	(3-0)3

Sub-Area 3 (Applied Social Psychology)

PSY	550	Psychology of Women and Gender	(3-0)3
PSY	556	Applied Social Psychology	(3-0)3
PSY	557	Contemporary Issues in Political Psychology	(3-0)3
PSY	558	Interpersonal Relationships	(3-0)3
PSY	650	Health Psychology	(3-0)3
PSY	654	Social Psychology of Legal Processes	(3-0)3
PSY	657	Family Processes Through Time and Cultural Contexts	(3-0)3
PSY	658	Relationships with Parents and Peers	(3-0)3

Option III. Work (Industrial) and Organizational Psychology

Required Courses

PSY	500*	Advanced Statistics for Psychology I	(3-2)4
PSY	510*	Advanced Statistics for Psychology II	(3-2)4
PSY	620*	Research Methods in Industrial and Organizational Psychology	(3-0)3

(*or an equivalent course approved by the department)

PSY	699	Ph. D. Dissertation	NC
PSY	697	Internship in Industrial and Organizational (I/O) Psychology	NC
PSY	900-999	Special Topics	NC

Elective Courses

Students are required to take at least eight electives from the following pool, approved by the Department/Advisor. The list may be subject to modification by the Department.

PSY 504	Leadership and Motivation	(3-0)3
PSY 506	Training and Evaluation	(3-0)3
PSY 509	Advanced Overview of I/O Psychology	(3-0)3
PSY 519	Human Factors and Performance	(3-0)3
PSY 535	Advanced Job Analysis and Performance Appraisal	(3-0)3
PSY 536	Personnel Selection and Testing	(3-0)3
PSY 538	Program Evaluation	(3-0)3
PSY 517	Vocational Counseling and Career Development	(3-0)3
PSY 621	Multilevel Modeling: Applications for Psychology	(3-0)3
PSY 633	Personality at Work: Theories and Assessment	(3-0)3
PSY 634	Gender at Work	(3-0)3
PSY 662	Advanced Issues in Organizational Safety Culture and Climate	(3-0)3

Free Elective Courses
Students are required to take five free electives approved by the Department/Advisor.

Option IV. Developmental Psychology

Required Courses

PSY	600	Proseminar in Psychology	(3-0)3
PSY	621	Multilevel Modeling: Applications for Psychology	(3-0)3
PSY	671	Supervised Research I	(3-0)3
PSY	672	Supervised Research II	(3-0)3
PSY	673	Supervised Research III	(3-0)3
PSY	699	Ph. D. Dissertation	NC
PSY	800-900	Special Studies/Topics	NC

Elective Courses
Students are required to take one elective from the following pool, approved by the Department/Advisor. The list may be subject to modification by the Department.

PSY 512	Developmental Psychopathology	(3-0)3
PSY 513	Issues in Applied Cognitive Development	(3-0)3
PSY 514	Language Development and Bilingualism	(3-0)3
PSY 515	Adult Development and Aging	(3-0)3
PSY 516	Development of Social Cognition	(3-0)3
PSY 518	Development of Children with Disabilities	(3-0)3
PSY 520	Socialization	(3-0)3
PSY 525	Life Span Developmental Theory	(3-0)3
PSY 526	Memory Development	(3-0)3
PSY 528	Adolescence: Theory, Problems, and Applications	(3-0)3
PSY 529	Applied Development	(3-0)3
PSY 534	Tests and Measurement in Child Development	(3-0)3
PSY 622	Developmental Interventions with Children and Parents	(3-0)3

Free Elective Courses
Students are required to take two free electives approved by the Department/Advisor.

DESCRIPTION OF GRADUATE COURSES

PSY 500 Advanced Statistics for Psychology I (3-2)4
The aim of this course is to enable students to use several statistical techniques to analyze data with SPSS (Statistical Package for Social Sciences) program. The statistical techniques include t-test (independent and dependent), Chi-square, analysis of variance (ANOVA), techniques, MANOVA, correlation, regression, multiple regression, discriminant analysis and factor analysis

PSY 501 Individual Study NC
The aim of this course is to enable students to carry out literature surveys in their interest areas under the direction and guidance of specific instructors so that they will be better prepared for the Prothesis Seminar.

PSY 503 Prothesis Seminar in Social Psychology NC
The aim of this course is to guide the students in making an extensive literature review of possible thesis subjects and to choose a research topic and subsequently to formulate a thesis proposal. At the end of the course students are expected to present a comprehensive literature review of their area of interest and to formulate a thesis proposal.

PSY 504 Leadership and Motivation (3-0)3
The purpose of this course is twofold. The first purpose is to cover both the classic and modern theories of organizational leadership and work motivation. The second purpose is to focus on applying motivational principles to effective leadership. Hence, the course is designed to be both a theoretical and an applied one in orientation.

PSY 505 Prothesis Seminar in Clinical Psychology NC
The aim of this course is to guide the students in making an extensive literature review of possible thesis subjects and to choose a research topic and subsequently to formulate a thesis proposal. At the end of the course students are expected to present a comprehensive literature review of their area of interest and to formulate a thesis proposal.

PSY 506 Training, Development and Evaluation (2-2)3
This course is basically concerned with teaching basic training and employee development techniques used in industry. Furthermore, the course also covers how to evaluate the effectiveness of a specific training program. The typical topics of the course include needs assessment, training techniques, training for special groups (e.g., executives, middle managers, hard-core unemployed), the choice of criteria in evaluating training programs. The orientation of this course is both theoretical and applied.

PSY 507 Prothesis Seminar in Developmental Psychology NC
The aim of this course is to guide the students in making an extensive literature review of possible thesis subjects and to choose a research topic and subsequently to formulate a thesis proposal. At the end of the course students are expected to present a comprehensive literature review of their area of interest and to formulate a thesis proposal.

PSY 508 Prothesis Seminar in Industrial and Organizational Psychology NC
The aim of this course is to guide the students in making an extensive literature review of possible thesis subjects and to choose a research topic and subsequently to formulate a thesis proposal. At the end of the course students are expected to present a comprehensive literature review of their area of interest and to formulate a thesis proposal.

PSY 509 Advanced Overview of I/O Psychology (3-0)3
In this course, major areas of industrial and organizational psychology, such as job analysis, performance appraisal, personnel selection, training, work motivation, job satisfaction, leadership and organizational structure and design are covered with an emphasis on current issues and problems. The orientation of the course is planned to be a theoretical one.

PSY 510 Advanced Statistics for Psychology II (3-2)4
This course covers multivariate statistics such as discriminant function analysis, canonical correlation, cluster analysis, and structural equation modeling techniques in the assessment of factor structures, path models, and measurement invariance. The application of these techniques in combination with the traditional pretest-posttest designs and control of variables in multivariate designs will be reviewed together with the relevant computer software.

PSY 511 Interview Techniques (2-2)3
Interview techniques is primarily an applied course. The emphasis of the course is on techniques of conducting valid employee selection interviews. Students are expected to understand the process of

employee interviewing and to acquire the skills necessary to conduct valid interviews.

PSY 512 Developmental Psychopathology (3-0)3
The aim of this course is to look at psychopathology from a developmental perspective while familiarizing students with the main disorders of childhood such as, feeding and eating control disorders, sleep and its disorders, emotional development and disorders of mood, neurotic, somotoform and stress related disorders, conduct disorder, hyperactivity, autism, sphincter control, intelligence and learning disorders, tics and Taurette Syndrome, language and its disorders.

PSY 513 Issues in Applied Cognitive Development (3-0)3
Modern advances in applications of research findings in cognitive development will be introduced. Students are expected to study from the original publications, some exemplary applications of psychological research findings in the area of cognitive development. Some of these issues are; computers in fostering children's reading, learning and problem solving skills, training of visual and verbal information processing strategies to increase learning from visual media, modeling of numerical and mathematical concepts.

PSY 514 Language Development and Bilingualism (3-0)3
Basic mechanisms of native and second language acquisition will be comparatively reviewed. The course will also include issues of bilingualism and multilingualism in children and adolescents with a particular emphasis on research on Turkish children living in European countries. Methods of research, testing, diagnosis and intervention derived from studies of linguistic processes in children will be introduced.

PSY 515 Adult Development and Aging (3-0)3
The course will include a brief review of the current models of adult development and the research evidence on the cross-cultural replications of these models. Current knowledge about the changes in the physiological, neurological systems, personality and ability in adulthood and old age will be presented. Changes in the mental functions, memory and information processing capacities of adults will be studied.

PSY 516 Development of Social Cognition (3-0)3
Cognitive bases of representation of social reality, formation of social schemes, the self concept development, peer relations, understanding others, social perspective taking, development of social inferential abilities, and communicative skills will be included.

PSY 517 Vocational Counseling and Career Development (3-0)3
The main emphasis of this course is on career counseling and development. Topics covered will be related to individual differences such as vocational interests, personality, abilities, and knowledge in relation to vocational choice, career development and work performance.

PSY 518 Development of Children with Disabilities (3-0)3
The main aim of this course is to further understanding of the processes of development by examining the current research on the cognitive and social development of children with disabilities. This course also looks at the developmental theories, how to they explain the development of children with disabilities as well as critically evaluating the contribution of studies on disabilities to normal developmental theories.

PSY 519 Human Factors and Performance (3-0)3
Humans in organizations accomplish their task in a context of human-machine-systems. This course focuses on understanding the relationship between the system and the capabilities of working people. The course coverage includes information processing, display systems, decision making, and human error.

PSY 520 Socialization (3-0)3
The aim of the course is to acquaint students with advances and problems in the area of socialization, and particularly, the social development of children in relation to the characteristics of their social and physical environments. Some of the topics included are: historical overview and contemporary trends; parent-child relations; attachment, aggression, friendship and self, sex differences and sex-typing, moral development and social class influences.

PSY 521 Selected Topics in Psychology (3-0)3
The course content may change each academic year. Students are provided with an in-depth examination of a central topic in psychology.

PSY 522 Problems in Psychology (3-0)3
The course content may change each academic year. Students are provided with an in-depth examination of a particular problem in psychology.

PSY 523 Childhood Psychopathology (3-0)3
An advanced discussion of the problems of classification, review of current literature on types of disorders, their dynamics, and treatment.

PSY 524 Psychology of Aging (3-0)3
Psychopathology, neuropsychology and treatment approaches and issues confronting the clinicians dealing with an aged population

PSY 525 Life-Span Developmental Theory (3-0)3
The course will include main theoretical approaches in the field of developmental psychology. General theories of developmental processes, area-specific theories such as those in cognitive, social and emotional skills, or models specializing in particular phases of life (infancy, childhood, adolescence, adulthood and old age) will be reviewed.

PSY 526 Memory Development in Infancy and Childhood (3-0)3
This course will examine some basic issues related to memory system across the course of development. Some of the core topics that will be covered within the scope of this course are as following: memory development in infancy, through childhood, and in adolescence, neurodevelopmental bases of memory; cross-cultural perspectives on memory development; suggestibility and eyewitness testimony; childhood amnesia; trauma and memory; gender differences in memory development; memory in classroom context; emotion and memory.

PSY 527 Mental Handicap (3-0)3
A discussion of problems like mental retardation and other neurological disorders, their diagnosis, treatment and review of relevant current research.

PSY 528 Adolescence: Theory, Problems and Applications (3-0)3
The course will expose students to current models of adolescent development, dynamics of psychological change, behavioral and psychological problems of adolescents, research methods in the study of adolescence will also be mentioned. The course will also include problems of cross-cultural comparability of research on adolescence, and a review of the research questions and methodology of Turkish research concerning this period.

PSY 529 Applied Developmental Psychology: Social and Emotional Issues (3-0)3
The aim of this course is to cover the current developmental research that is conducted, in an effort to solve a problem or provide information that can be put to some specific use in the following areas: aggression, maltreatment of children, children in poverty and child rearing institutions, changes in the family: from extended to nuclear family and divorce, maternal daycare.

PSY 530 Assessment of Intellectual Functioning (2-2)3
The main aim of the course is the application and evaluation of intelligence tests widely used for children and adults. Tests measuring the possibility of organic impairment that are usually applied in combination with intelligence tests will also be covered. Throughout this course students are expected to acquire well-developed skills regarding the application, evaluation, and report writing in relation to intellectual functioning and organicity assessment devices.

PSY 531 Clinical Assessment (3-0)3
Research, theory and basic procedures including observational, interview, objective, projective, and behavioral techniques.

PSY 532 Application in Clinical Assessment (3-0)3
Application of the basic procedures and techniques learned in PSY. 531, identifying and discussing the problems that arise in the application, and review of the relevant literature related to the issues encountered. Report writing to suit the needs of different types of audiences.

PSY 534 Tests and Measurement in Child Development (3-0)3
The aim of this course is to familiarize students with the use of tests in different areas of child development such as main developmental scales, intelligence tests, language tests.

PSY 535 Advanced Job Analysis and Performance Appraisal (3-0)3
This course has two main segments. The first segment mainly focuses on the process of job analysis, (e.g., worker-oriented and job-oriented). The second segment covers the theoretical and practical aspects of performance appraisal systems in work organizations, (e.g., needs analysis, cognitive models of performance appraisal, development of rating systems, rating biases, and use of performance appraisal data in organizational decisions making).

PSY 536 Personnel Selection and Testing (3-0)3
The main focus of this course is on scientific personnel selection systems in work organizations.

The problems and relevant issues of personnel decisions and various tools of personnel testing will be investigated. Reliability and validity of assessment techniques used in personnel selection, fairness of personnel decisions as well as contemporary issues such as test bias, validity generalization, and utility analysis are among the topics to be covered.

PSY 538 Program Evaluation (3-0)3
Programs aimed at developing and training employees and improving both the quality and the quantity of the work are indispensable elements of organizational life. Program evaluation force is centered around the methods used to plan, develop, apply, monitor, and improve such programs.

PSY 540 Dynamic Psychotherapy (3-0)3
The aim is in-depth discussion of selected approaches to psychotherapy within the dynamic tradition. Special emphasis will be given to the psychoanalytic approach.

PSY 541 Issues in Clinical Psychology (3-0)3
Examination of issues in present day clinical psychology such as statistical versus clinical prediction, education and professionalization in clinical psychology, and other issues of current interest.

PSY 542 Adult Psychopathology (3-0)3
An advanced discussion of the problems of classification, review of the current literature on different types of disorders, their dynamics, and treatment.

PSY 543 Cognitive-Behavioral Therapies I (3-0)3
The aim of this course is to review concepts of abnormality and current classification systems in psychopathology. The course will particularly focus upon anxiety and mood disorders. The course will provide an examination of the empirical and theoretical literature on the symptomatology and etiology of anxiety and mood disorders and will also focus upon the treatment of these disorders by cognitive-behavioral therapy approaches.

PSY 544 Cognitive-Behavioral Therapies II (3-0)3
The aim of this course is to examine the empirical and theoretical literature on the symptomatology and etiology of personality disorders, sexual dysfunction and disorders and schizophrenia. The course will also focus on the treatment of these disorders, especially by cognitive-behavioral psychotherapy techniques. Special emphasis will also be given to sociocultural stresses in schizophrenia and family variables, especially expressed-emotion in relatives.

PSY 545 Topics in Psychopathology (3-0)3
In-depth study of selected topics concerning psychopathology such as the discussion of abnormal behavior from a particular theoretical perspective, community-based approaches to psychopathology, and other topics of interest.

PSY 546 Techniques of Psychotherapy (3-0)3
Examination of techniques and basic procedures of individual therapy with an emphasis on dynamic and behavioral approaches. Role-playing, films, videotapes, audio tapes or observation of real-life therapy sessions may be utilized.

PSY 547 Processes and Disorders of Human Communication (3-0)3
Developmental and acquired communication disorders across the lifespan are covered through readings, lectures, and observations in related clinical settings. Basic neuroanatomy and physiology are reviewed, followed by discussion of the etiology, diagnosis, treatment, and prognosis of communication disorders. Emphasis is placed on behavioral characteristics of language delay and disorders, aphasia, dysarthia, apraxia of speech, right hemisphere syndrome, traumatic brain injury, and fluency and voice problems. Clinical application in assessment and rehabilitation is stressed.

PSY 548 Topics in Psychotherapy (3-0)3
In-depth study of selected topics concerning psychotherapy. The topics covered may change each year. The topics may include theoretical/empirical/practical issues in particular therapy approaches or issues that cut across various therapy approaches.

PSY 549 Cultural Factors in Psychopathology (3-0)3
Problems with the classification of disorders, the issue of the definition of normal and abnormal behavior, attitudes of professionals and the general public, review of the basic theories, approaches, and the relevant literature on sociocultural factors in abnormal behavior.

PSY 550 Psychology of Women and Gender (3-0)3
The psychology of being a male or a female is pursued within a developmental perspective. Gender differences and problems in childhood, adolescence, adulthood and old age are

considered. Special emphasis is given to exploring the psychological functions and implications of gender stereotypes.

PSY 551 Social Perception (3-0)3
Processes of inference, judgment and prediction in social perception. Emphasis is on attribution models. Implications of the processes of social judgment for diagnosis, personnel selection, reactions to personal experience, naive theory building and testing.

PSY 552 Groups (3-0)3
This course will cover processes within small groups of two or more individuals. Topics to be covered will be interpersonal attraction, development and deterioration of dyadic relationships, conflict, phases in group development, leadership and factors affecting productivity.

PSY 553 Historical Overview of Advances in Social Psychology (3-0)3
A historical survey of the theoretical and empirical developments in social psychology to provide the student with an integrated overview of the field.

PSY 554 Recent Advances and Problems in Social Psychology (3-0)3
The aim of the course is to examine some recent advances and the controversial issues in present day social psychology with an emphasis on integration of theoretical and empirical approaches to each issue. Issues discussed may include, social cognition, attitude formation and change, controversial methodological issues, developmental-social psychology or other issues of current interest.

PSY 555 Social Cognition and Affect (3-0)3
A selective survey of issues of social cognition and affect in children and adults. Topics may include attribution theory, psychological control, social schemata, attention, person memory, social inference, attitudes and cognition-affect relationships.

PSY 556 Applied Social Psychology (3-0)3
A problem-oriented approach is adopted in analyzing issues such as health, gender, aging and other environmental problems.

PSY 557 Contemporary Issues in Political Psychology (3-0)3
General overview of theory and research in political psychology.Includes a discussion of historical and ideological debates in the development of the interdisciplinary area, a review of personality and social psychology theories relevant to political behavior and current political issues.

PSY 558 Interpersonal Relationships(3-0)3
A selective survey of theoretical and empirical issues of interpersonal relationships over the life span or with particular reference to one stage.

PSY 559 Human Motivation: Self-Determination Theory (3-0)3
Human motivation from self-determination theory (SDT) perspective, theoretical and empirical issues regarding SDT, application of the theory in self-regulation, relationships, education, well-being, work, cultural, and health contexts**.**

PSY 560 Environmental Psychology (3-0)3
History and nature of environmental psychology; person-environment transaction; psychological representation of molar environment; theories of and research on human territoriality, privacy, personal space, and crowding; environmental problems and environmentally-relevant psychology.

PSY 561 Cultural Issues in Psychotherapy (3-0)3
Designed to establish a theoretical and practical understanding of the multicultural psychotherapy process. Includes a focus on cultural differences, multicultural therapy competencies, models of racial and cultural identity development, multicultural assessment procedures, and culture-specific (emic) and universal (etic) helping styles. A broad understanding of diversity, including culture, religion, socioeconomic status, sexual orientation, and disability will be utilized. Also, students will be guided to challenge their own biases and assumptions toward culturally diverse individuals.

PSY 562 Psychology of Close Relationships (3-0)3
An overview of the study of close relationships is provided with a special emphasis on marital relationships. Issues of attraction, perception, communication, power, conflict and dissolution are tackled. Differences pertaining to gender, SES, female employment and marriage types are considered.

PSY 563 Research Design in Social Psychology (3-0)3
Research methodology, practical issues in research, surveys, field research, experimental, diary, dyadic, longitudinal designs, priming and automaticity, behavioral observation, research synthesis,

questionable research practices, presenting and publishing research

PSY 565 Ethical Issues in Clinical Psychology (3-0)3

The course aims at elaborating the moral values, ideas, and the codes that guide professional practice in clinical psychology, including professional codes of conduct and philosophical background of the ethical principles. Topics include moral development, acculturation, ethical principles, ethical reasoning, and ethical decision making.

PSY 567 Psychological and Social Aspects of Disasters (3-0)3

This course is designed to give students an overview of the psychological and social aspects of natural and man-made disasters. Disaster risk management; mitigation; preparedness and response; research methods and challenges in disaster situations; importance of facilitating community participation and increasing risk perception; psychological distress and growth among survivors of disasters and emergency workers; psychological intervention methods that can be used with survivors, emergency workers, and volunteers following disasters will be covered.

PSY 570 Introduction to Traffic and Transportation Psychology (3-0)3

The aim of the course is to give students an overview on the main theories, methods and empirical findings of traffic psychology. Main emphasis in the course is on traffic safety and means of improving driver behavior. Since traffic safety is a product of many societal, psychological and environmental factors, the approach in the course is interdisciplinary. In addition to class-room teaching, field exercises and demonstrations will be used.

PSY 571 Accident and Behavioral Models: Theories and implications (3-0)3

General overview of the perspectives, theories, and periods, and implications of human error and/or accident causation. Advanced aspects of Perspectives, theories, and periods of human error and/or accident causation, and their implications including models, tools, matrixes, and contributors of safety conditions in multilevel nature of life.

PSY 572 Social Psychology of Driver Behavior and Attitudes (3-0)3

Develop an understanding of key social psychological concepts and theories and how they are applied to analyze driving behaviors and attitudes toward traffic rules and regulations. Issues including aberrant driving behaviors, effective traffic safety campaigns, aggressive drivers, risk and hazard perception, situational awareness as well as social cognitive, motivational, and emotional factors in driving violations, enforcement, and traffic safety education are covered

PSY 573 Risk Factors for Psychomotor and Cognitive Processes in Driving (3-0)3

An overview of risk factors affecting psychomotor cognitive processes of driving behavior. Effects of alcohol use and substance abuse on driving behavior throughout changing psychomotor and cognitive abilities. Risk of traffic accidents due to alcohol and substance use. Fatigue and sleeplessness as risk factors in traffic accidents. Driving behavior in people with neurological disorders.

PSY 574 Research methods in traffic and transportation psychology (3-0)3

The aim of the course is to deepen students' knowledge of traffic and transportation psychology. Since traffic psychology uses many research methods, which psychology students are not usually aware of, the focus of the course is in methods and research practice. The objective is that a student specializes in one theoretical approach and method during the course by conducting a small-scale research project. Issues like study design, data collection, data analysis and communicating the results to traffic researcher community will be covered.

PSY 575 Prothesis Seminar in Traffic and Transportation Psychology NC

The aim of this course is to guide the students in making an extensive literature review of possible thesis subjects and to choose a research topic and subsequently to formulate a thesis proposal. At the end of the course students are expected to present a comprehensive literature review of their area of interest and to formulate a thesis proposal.

PSY 576 Situation Awareness: Theory and Application (3-0)3

This course is an introduction to situation awareness. The topic is covered both from a theoretical and an applied perspective, focusing on understanding, measuring, modeling, and applying situation awareness to real-life settings.

PSY 578 Accident Prevention and Safety Intervention Techniques (3-0)3

Improve traffic safety in general by reducing the likelihood of an accident and minimizing the adverse consequences of an accident, familiarize students with the main accident prevention and safety

intervention methods and help students to understand the strengths and limitations of these techniques in the applications of these techniques in traffic safety work.

PSY 580 Language and Communication (3-0)3

The course is aimed at providing a detailed review of experimental research on the psychological bases of language behavior. Specifically, language acquisition and the development of communicative skills are discussed. Topics include, the developmental aspects of auditory mechanisms, word and sentence processing, mental imagery, semantic networks and associative mechanisms, syntactic encoding and decoding.

PSY 590 Behavioral Interventions In Health (3-0)3

This course is constructed around a series of cases in which behavioral interventions are designed to improve health, prevent disease, or mitigate the effects of chronic health problems of individuals. After the lecture on the medical aspect of chosen medical disorder, students will present their cases. In each case, the health issue to be addressed will be considered in the context of the individual's overall repertoire and life circumstances. A behavioral analysis of the problem will be followed by design of an intervention plan based on behavioral principles. Besides behavioral principles that can be used for the chosen medical disorder, students are expected to give psychological and psychosocial information related to the disorder. Students are expected to use up-to date information (e.g. journal articles, books) when preparing their presentation.

PSY 592-593-594 Practicum in Clinical Psychology NC

This series of courses will provide supervised practical experience to the students in clinical/field settings. The students will be required to attend weekly discussion sessions in the department. Areas and settings in which practice will be offered will be announced each semester.

PSY 595-596 Practicum in Developmental Psychology NC

These courses are expected to provide students field practice under supervision. In principle, each course listed above, will include applied aspects that will require the students participation in essential applications. Practicum courses are planned to be offered (usually within an institution) in areas where extended or comprehensive work or skill practice is necessary.

PSY 597 Practicum in I/O Psychology NC

The main purpose of this course is to develop students in the practice of I/O psychology. Typical activities involved in this course include designing performance appraisal systems; developing and applying training programs; evaluating training programs; conducting and analyzing employee surveys; and establishing job analysis systems; redesigning jobs; development of attitude surveys; test development and validation.

PSY 598 Term Project NC

Students in this course are expected to prepare a project reporting the tasks and activities accomplished during their field work. At the end of the course a written and/or oral exam covering applied and theoretical areas of industrial and organizational psychology is administered.

PSY 599 Master's Thesis NC

PSY 600 Pro-seminar in Psychology (3-0)3

Discussion of cutting edge research in developmental, social, clinical, cognitive, health, traffic, industrial and organizational psychology, and biopsychology.

PSY 610 Research Methods in Clinical Psychology (3-0)3

The course aims at the integration of Research and practice in Clinical Psychology. The course will cover diverse topics, including experimental design, assessment, sources of artifact and bias, data analyses and interpretation, and ethical issues raised by research. The students are expected to improve their understanding of research by developing hypotheses, and selecting appropriate methods, procedures, and assessment devices for testing the hypotheses. Furthermore, topics like analyzing and interpreting the data, and preparing the written scientific reports of the results in relation to the specific research areas and issues in Clinical Psychology are also stressed. The course will also comprise quasi-experiments, case studies and single experiments for clinical use.

PSY 620 Advanced Research Methods in Industrial and Organizational Psychology (3-0)3

Explores the methods, and tools useful in the conduct of empirical research in I-O psychology. Topics include the concepts and methods used for the assessment of the reliability and validity of measures, specific types of measures and the use of various sampling procedures especially as applied to survey research, decision of doing research with various settings (field study, laboratory

experiments, field experiment, sample survey, simulation, case study, etc.)

PSY 621 Multilevel Modeling for Psychology (3-0)3
Fixed- and random-effects models. Analysis of within-person change. Longitudinal data analysis. Growth-curve models. Analysis of dyadic data.

PSY 622 Developmental Interventions with Children and Parents (3-0)3
This course will cover interventions to enhance the language, cognitive and social development of infants, children and adolescents. Following intervention topics are the focus of this course: language development, reading acquisition, joint attention, low birth weight infants, infant sign interventions, maternal sensitivity, adolescent problems, bullying, orphanage care quality and parenting**.**

PSY 631 Personality Assessment (1-4)3
Exposure to and administration of selected personality assessment techniques to normal and/or pathological cases and report writing. The students are expected to administer the currently learned techniques together with the previously learned techniques as a battery. The particular techniques of assessment will be chosen on the bases of the needs of the applied field, the preparation of the students, and the issues in Clinical Psychology.

PSY 633 Personality at Work: Theories and Assessment (3-0)3
Focuses on personality in relation to organizational criteria, such as job performance, work attitudes, counterproductive behavior, and leadership, and on the validity of different types of assessments, such as self-report rating scales, Situational Judgment Tests, and implicit personality assessments (i.e. Conditional Reasoning Tests).

PSY 634 Gender at Work (3-0)3
Explores the gendered nat**u**re of work, devaluation of women's work, differential treatment of women at work, and inequalities in the workplace as well as gender issues relevant to managing career and non-work life. Topics include women in management and leadership, gender role stereotyping, comparable worth and pay equity, forms of differential treatment at work, and gender as it relates to work-family balance and enhancement.

PSY 642 Treatment of Family Problems (3-0)3
The aim of the course is to assess, diagnose, and treat family problems by using important concepts and interventions from several family therapy models. The course introduces students to special family problems and interventions for dealing with these problems. Special emphasis will be placed upon therapeutic interventions that can assist those families. Also students are exposed to the fundamental assumptions and ideas of general systems theory and the basic promises of the various theoretical orientations within the family therapy field as background material. Selected topics to be covered in the course will include, traumatic family/life events, psychosomatic families, aging families, family-of-origin issues, single-parent families, and remarried families. Instruction will be through lecture, discussion, presentation, demonstration and videotapes.

PSY 643 Clinical Psychopharmacology (3-0)3
The course basically concerns the effects of psychoactive drugs on the brain and behavior. The course will cover the mechanisms of action, and the behavioral and side effects of psychoactive drugs that are used in the treatment of psychological disorders (e.g., anti-depressants, anti-anxiety drugs, anti-psychotics), and that affect mood and behavior (e.g., cocaine, heroine, LSD, and marijuana). The course will also focus on the neurochemical, neuroanatomical and physiological basis of psychological disorders and drug addiction. Furthermore, the course will include etiology of drug abuse, and heuristics and developmental psychopathology models of drug abuse.

PSY 644 Emotions in Psychopathology (3-0)3
The course aims at inquiring the central role of emotions in psychopathological disorders like anxiety and depression. Interface of emotion research and psychopathology will be reviewed by considering psychopathology theories, research on cognition and emotion, and practice of psychotherapy. Besides consideration of the role of emotion in specific Axis I and Axis II disorders in DSM, issues in relation to the conceptualization of emotions, facial expressions, mood regulation, and emotional intelligence will also be covered.

PSY 646 Psychotherapy Supervision (2-2)3
Review of theory and research relevant to conceptualization and practice of clinical supervision; understanding and developing psychotherapy supervision skills with an emphasis on countertransference; discussion on the ethical

dilemmas and legal issues inherent in the psychotherapy supervision proce

PSY 650 Health Psychology (3-0)3
This course is designed to provide students with a thorough and up-to-date presentation of the major issues, theories, concepts and research in health psychology. An integration of biological, psychological and social aspects of people's lives will be stressed.

PSY 651 Attitudes and Attitude Change (3-0)3
The purpose of the course is to provide students with a thorough knowledge of the theoretical and empirical issues involving attitudes and attitude change. A detailed overview of the major attitude change theories will be considered. Students will be required to read classic and current contributions to the literature.

PSY 652 Attitude Measurement and Scale Development (3-0)3
The purpose of the course is to facilitate student's research activities by examining various methods of constructing attitude scales. Students will be required to construct, administer and evaluate a scale on a topic of their choice. This course is intended to be a "how-to-do-it" methodological course.

PSY 653 Social Representations (3-0)3
The course will introduce students with the modern European tradition of research in social psychology. The content analysis of the information circulating in the society is essential, in particular the analysis of media output and its involvement in processes of social influence and social change. Thus, it should be of considerable interest to those who are also interested in the social psychology of the media.

PSY 654 Social Psychological Aspects of Legal Processes (3-0)3
The aim of the course is to explore psychological aspects of court procedures: particularly decision making in court; juries and rules of evidence; sentencing procedures; sentencing styles and bias; definition of insanity and responsibility; predicting dangerousness; status of victims in court and victimization research; special status of children in court.

PSY 655 Intra-Group Processes (3-0)3
Historical overview of approaches and developments in the group area; norms, conformity, minority influence; status differentiation and leader emergence, leadership functions and behaviors, evaluation of leaders; task characteristics, group composition, and group processes as factors affecting group productivity; social facilitation, social loafing, group polarization and group-think as special types of group productivity.

PSY 656 Inter-Group Relations (3-0)3
Theoretical and empirical issues involving perception of ingroup-outgroup members, bias and discrimination; relations between groups of unequal status; intergroup competition and conflict, and resolution of conflict.

PSY 657 Family Processes Through Time and Cultural Contexts (3-0)3
Historical influences on family with emphasis on the Turkish family, relationship between cultural values and family, formation and maintenance processes, stages in the family development, reciprocal relationships between family members, reciprocal relationships between nuclear families and social networks, family diversity and cross-cultural comparisons.

PSY 658 Relationships with Parents and Peers (3-0)3
Factors related to relationships with parents and peers; personal and academic consequences of relationships; relationships between relationships; gender differences in friendship.

PSY 659 Psychology of the Self (3-0)3
The course aims to provide a detailed review of the recent literature on the self and self-concept from the social psychological, personality, and developmental perspectives. With a specific emphasis on the cultural aspects, the issues such as self-knowledge, self-schemas, self-regulation, self-presentation, and self-esteem will extensively be covered.

PSY 660 Positive Psychology (3-0)3
The aim of the course is to provide students with a broad background in positive psychology. Accordingly, topics such as subjective and psychological well-being, importance of positive affectivity and positive interpersonal relationships, optimism, hope, self-efficacy, the interplay between positive affect and cognitive processes, flow, creativity, authenticity, wisdom, courage, empathy, altruism, foregiveness, gratitude, positive responses to "loss" and spirituality are considered. A cross-cutting theme of the course involves discussion of self- and context-related differences in the issues considered.

PSY 662 Advanced Issues in Organizational Safety Culture and Climate (3-0)3
General overview of the concepts of organizational culture and climate, and organizational safety culture and climate. Advanced aspects of organizational culture and climate, and organizational safety culture and climate including tools, matrixes, and contributors of safety conditions in organizations. Case studies as examples for the application of theoretical knowledge to practical implications.

PSY 671 Supervised Research in Developmental Psychology I (3-0)3
Reviewving the literature, formulating a research problem, preparing measures and obtaining ethical approval.

PSY 672 Supervised Research in Developmental Psychology II (3-0)3
Completing data collection and data analyses.

PSY 673 Supervised Research in Developmental Psychology III (3-0)3
Writing up a manuscript and submitting it to scholarly journal.

PSY 681-682 Applications in Clinical Psychology (1-4)3
The course aim to integrate theoretical and empirical foundations of clinical psychology as applied to specific case applications under supervision. Students will be required to develop a theoretical formulation of cases, to apply psychodiagnostic and therapeutic techniques and to prepare comprehensive case reports.

PSY 691-692 Internship NC
Internship courses are intended to provide supervised clinical experience in diverse clinical settings. The clinical experience may involve observations, applications of psychological assessment and psychotherapy. The department will announce areas and settings in which internship will be offered.

PSY 693 – 697 Independent Study (1-4)3
This course aims to offer masters and PhD students the opportunity to design and conduct a small projector and/or write and submit a scientific article to a scholarly journal. The course also provides a framework about how to prepare a scientific article or research on a specific area of specialization.

PSY 699 Ph. D. Dissertation NC

PSY 800-899 Special Studies NC

DESCRIPTION OF COURSES FOR M.S. NON-THESIS, SECONDARY EDUCATION PROGRAM IN FAMILY PSYCHOLOGY

FPSY 512 Developmental Psychopathology (3-0)3

The aim of this course is to cover disorders of childhood from a developmental psychopathology perspective, and familiarize students with the main concepts and issues of this seperate discipline.

FPSY 515 Adult Development and Aging (3-0)3

The course will include a brief review of the current models of adult development and the research evidence on the cross-cultural replications of these models. Current knowledge about the changes in the physiological, neurological systems, personality and ability in adulthood and old age will be presented. Changes in the mental functions, memory and information processing capacities of adults will be studied.

FPSY 516 Development of Social Cognition (3-0)3

Cognitive bases of representation of social reality, formation of social schemes, the self concept development, peer relations, understanding others, social perspective taking, development of social inferential abilities and communicative skills will be included.

FPSY 518 Development of Children with Disabilities (3-0)3

The aim of this course is to further understanding of the processes of development by examining the current research on the cognitive and social development of children with disabilities. This course also looks at the developmental theories, how to they explain the development of children with disabilities as well as critically evaluating the contribution of studies on disabilities to normal developmental theories.

FPSY 523 Childhood Psychopathology (3-0)3

This course includes an advanced discussion of the problems of classification, review of current literature on types of disorders, their dynamics, and treatment.

FPSY 524 Psychology of Aging (3-0)3

The aim of this course is to familiarize students with psychopathology, neuropsychology and treatment approaches in old age and issues confronting the clinicians dealing with an aged population.

FPSY 525 Life-Span Developmental Theory (3-0)3

The course will include main theoretical approaches in the field of developmental psychology. General theories of developmental processes, area-specific theories such as those in cognitive, social and emotional skills, or models specializing in particular phases of life (infancy, childhood, adolescence, adulthood and old age) will be reviewed.

FPSY 527 Mental Handicap (3-0)3

This course includes a discussion of problems like mental retardation and other neurological disorders, their diagnosis, treatment and review of relevant current research.

FPSY 528 Adolescence: Theory, Problems and Applications (3-0)3

The course will expose students to current models of adolescent development, dynamics of psychological change, behavioral and psychological problems of adolescents, research methods in the study of adolescence will also be mentioned. The course will also include problems of cross-cultural comparability of research on adolescence, and a review of the research questions and methodology of Turkish research concerning this period.

FPSY 529 Applied Developmental Psychology (3-0)3

This course will cover the current developmental research findings on the following topics - aggression, maltreatment of children, children in poverty, child rearing institutions, adoption, foster care, divorce, family violence, maternal employment and non-maternal care- that can be used for the betterment of children's lives and development.

FPSY 531 Clinical Assessment (3-0)3

This course focuses on research, theory and basic procedures including observational, interview, objective, projective, and behavioral techniques.

FPSY 534 Tests and Measurement in Child Development (3-0)3

The aim of this course is to familiarize students with the use of tests in different areas of child development such as main developmental scales, intelligence tests, language tests.

FPSY 543 Family, Marriage and Kinship Dynamics in Turkey (3-0)3

This course examines different practices of family, marriage and kinship in Turkey by taking into consideration social class, regional and religious/ethic differences. Practices of family relations, marriage and kinship, and individuals' perceptions and expectations of these relationships show diversity in Turkey in the last decades; the changing social norms, economic dynamics and policies related to the dynamics of family, marriage and kinship are also influential to the transformation of the family, marriage and kinship practices in Turkey over time.

FPSY 545 Topics in Psychopathology (3-0)3

In-depth study of selected topics concerning psychopathology such as the discussion of abnormal behavior from a particular theoretical perspective, community-based approaches to psychopathology, and other topics of interest.

FPSY 546 Techniques of Psychotherapy (3-0)3

Examination of techniques and basic procedures of individual therapy with an emphasis on dynamic and behavioral approaches. Role-playing, films, videotapes, audio tapes or observation of real-life therapy sessions may be utilized.

FPSY 550 Psychology of Women & Gender (3-0)3

The psychology of being a male or a female is pursued within a developmental perspective. Gender differences and problems in childhood, adolescence, adulthood and old age are considered. Special emphasis is given to exploring the psychological functions and implications of gender stereotypes.

FPSY 556 Applied Social Psychology (3-0)3

A problem-oriented approach is adopted in analyzing issues such as health, gender, aging and other environmental problems.

FPSY 558 Interpersonal Relationships (3-0)3

A selective survey of theoretical and empirical issues of interpersonal relationships over the life span or with particular reference to one stage.

FPSY 562 Psychology of Close Relationships (3-0)3

An overview of the study of close relationships is provided with a special emphasis on family and marital relationships. Issues of attraction, attachment, communication, power, conflict, dissolution, parenting, and child rearing are tackled. Differences pertaining to culture, gender, SES, female employment and marriage types are considered.

FPSY 565 Ethical Issues in Clinical Psychology (3-0)3

The course aims at elaborating the moral values, ideas, and the codes that guide professional practice in clinical psychology, including professional codes of conduct and philosophical background of the ethical principles. Topics include moral development, acculturation, ethical principles, ethical reasoning, and ethical decision making.

FPSY 567 Psychological and Social Aspects of Disasters (3-0)3

This course is designed to give students an overview of the psychological and social aspects of natural and man-made disasters. Disaster risk management; mitigation; preparedness and response; research methods and challenges in disaster situations; importance of facilitating community participation and increasing risk perception; psychological distress and growth among survivors of disasters and emergency workers; psychological intervention methods that can be used with survivors, emergency workers, and volunteers following disasters will be covered.

FPSY 590 Behavioral Interventions in Health (3-0)3

This course is constructed around a series of cases in which behavioral interventions are designed to improve health, prevent disease, or mitigate the effects of chronic health problems of individuals.

FPSY 610 Advanced Research Methods and Statistical Applications (2-2)3

The course aims to improve students' methodological background as well as their skills on statistical applications. The course will cover diverse topics like determining the design of a study, analyzing and interpreting the data, and also preparing a written scientific report. Statistical analysis will encompass various forms of univariate and multivariate variance analyses, and regression analyses including mediation and moderation analyses.

FPSY 642 Treatment of Family Problems (3-0)3

The aim of the course is to assess, diagnose, and treat family problems by using important concepts and interventions from several family therapy models. The course introduces students to special

family problems and interventions for dealing with these problems. Special emphasis will be placed upon therapeutic interventions that can assist those families. Also students are exposed to the fundamental assumptions and ideas of general systems theory and the basic promises of the various theoretical orientations within the family therapy field as background material. Selected topics to be covered in the course will include, traumatic family/life events, psychosomatic families, aging families, family-of-origin issues, single-parent families, and remarried families. Instruction will be through lecture, discussion, presentation, demonstration and videotapes.

FPSY 650 Health Psychology (3-0)3
This course is designed to provide students with a thorough and up-to-date presentation of the major issues, theories, concepts and research in health psychology. An integration of biological, psychological and social aspects of people's lives will be stressed.

FPSY 652 Attitude Measurement and Scale Development (3-0)3
The purpose of the course is to facilitate student's research activities by examining various methods of constructing attitude scales. Students will be required to construct, administer and evaluate a scale on a topic of their choice. This course is intended to be a 'how-to-do-it' methodological course.

FPSY 654 Social Psychological Aspects of Legal Processes (3-0)3
This course is designed to give students an overview of the psychological and social aspects of natural and man-made disasters. Disaster cause significant stress and conflict in families due to the post traumatic stress felt my all members. The course will focus on risk management; mitigation; preparedness and responses and challenges in providing support to families. Psychological intervention methods and psychosocial support that can be used with family members and families following disasters will be covered.

FPSY 657 Family Processes Through Time & Cultural Contexts (3-0)3
This course emphasizes historical influences on family with emphasis on the Turkish family, relationship between cultural values and family, formation and maintenance processes, stages in the family development, reciprocal relationships between family members, reciprocal relationships between nuclear families and social networks, family diversity and cross-cultural comparisons.

FPSY 658 Relationships with Parents and Peers (3-0)3

This course covers factors related to relationships with parents and peers; personal and academic consequences of relationships; relationships between relationships; gender differences in friendship.

DEPARTMENT OF SOCIOLOGY

PROFESSORS

ECEVİT, Mehmet: B.S., METU; Ph.D., University of Kent.
ECEVİT, Yıldız: B.S., M.S., Hacettepe University; Ph.D., University of Kent.
GÜNDÜZ-HOŞGÖR, Ayşe ***(Associate Dean of the Faculty of Arts and Sciences)***: B.S., M.S., METU; Ph.D., University of Western Ontario.
SAKTANBER, Ayşe ***(Department Chair)***: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

AYDINGÜN, Ayşegül: B.S., METU; M.A., Bilkent University; Ph.D., METU.
ERGUN, Ayça ***(Associate Director of the Graduate School of Social Sciences)***: B.A., Ankara University; M.S., METU; Ph.D., University of Essex .
KALAYCIOĞLU, Sibel: B.S., METU; Ph.D., University of Kent.
RITTERSBERGER-TILIÇ, Helga: Vordiplom, Diplom, University of Bonn; Ph.D., University of Essen.
ŞEN, Mustafa ***(Vice Chair)***: B.A., Ankara University; M.S., Ph.D., METU.
TOKLUOĞLU, Ceylan: B.S., M.S., METU; Ph.D., Carleton University.
YILDIRIM, Erdoğan: B.S., M.S., Ph.D., METU.

ASSISTANT PROFESSORS

AYBARS, Ayşe İdil ***(Vice Chair)***: B.S., M.S., METU; M.S., London School of Economics; Ph.D., University of Ulster.
BEŞPINAR, Fatma Umut: B.S., M.S., METU; Ph.D., University of Texas at Austin.
BODIRSKY, Katharina: B.A., Universitat Lüneburg; M.A., New School for Social Research; M.Phil., Ph.D., City University of New York.
TOPAL, Çağatay: B.S., M.S., METU; Ph.D., Queen's University, Kingston.
ZIRH, Besim Can: B.S., M.S., METU; Ph.D., University College London.

INSTRUCTORS

ÇELİMLİ-INALTONG, Işıl: B.S., M.S., METU; Ph.D., Columbia University
KARADEMİR HAZIR, Irmak: B.S., M.S., METU; Ph.D., University of Manchester.
MÜCEN, Barış: B.S., M.S., METU; Ph.D., Rutgers University.

GENERAL INFORMATION: The Department of Sociology has four major objectives: (a) to train sociology majors through intensive education at both the undergraduate and graduate levels; (b) to carry out research projects in selected areas of sociology; (c) to provide introductory sociology and anthropology courses to METU students; (d) to offer courses to students in other departments in order to increase their understanding of culture and society. The department offers a four-year undergraduate program leading to the B.S. degree and graduate programs leading to the M.S. and Ph.D. degrees in Sociology.

UNDERGRADUATE DEGREE: The Department offers a wide array of required and elective courses leading to the degree of B.S. in Sociology. Students are also required to take relevant courses from neighboring fields, as offered by other departments of the University. The undergraduate program is designed to provide a broad general education in sociology, rather than specialized training in any sub-field of the discipline.

REQUIREMENTS FOR THE BACHELOR OF SCIENCE DEGREE IN SOCIOLOGY: All students in the Department of Sociology are required to take a minimum of 36 courses in addition to a specified number of non-credit courses before being qualified for a B.S. Degree in Sociology. Before graduation, students are required to take 18 must/compulsory and a minimum of 7 elective courses in sociology. From outside the sociology department, students must also take PSY 100; ENG 101, 102, 211; ECON 210; HIST 150; PHIL 108 as must courses and 4 non-departmental electives. Non-departmental electives should not be less than 3 credit-hours each. The minimum credit-hour requirement of the department is 128 credit hours.

GRADUATE DEGREES: The Department offers graduate programs leading to the degrees of "Master of Science in Sociology", “Master of Science in Social Anthropology” and "Doctor of Philosophy in Sociology". To qualify for the master’s programs, candidates should have a B.A. or B.S. degree or its equivalent in sociology or social anthropology. However, candidates with a bachelor or equivalent degree from another field may also be accepted on the condition that they attend required undergraduate courses before the start of the master's programs. Entering the Ph.D. program requires an M.A. or M.S. degree or its equivalent in sociology. Candidates with a master’s or equivalent degree in another field may be accepted on the condition that they attend a preparation year from the undergraduate or master’s program in sociology before they begin the doctoral program.

M.S. PROGRAMS

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN SOCIOLOGY: Students are required to take a total of 8 courses, which include: 7 elective courses, among which at least 5 electives should be departmental electives; and 1 non-credit must course. Students are also required to write a master’s thesis. The master's degree and courses should be completed within 4 semesters, but the student can extend the period of writing the thesis by a maximum of another 2 semesters.

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN SOCIOLOGY (NON-THESIS): Students are required to take a total of 10 courses, which include: 10 elective courses, among which at least 7 electives should be departmental electives; and 1 non-credit must course which is the Term Project (SOC 589). The master's degree and courses should be completed within 6 semesters.

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN SOCIAL ANTHROPOLOGY: Students are required to take a total of 8 courses, which include: 2 compulsory courses about anthropological theory and methodology; 5 elective courses, among which at least 4 electives should be from those offered by the programs of Social Anthropology and Sociology; 1 free elective graduate course; and 1 non-credit must course. Students are also required to write a master’s thesis. The master's degree and courses should be completed within 4 semesters, but the student can extend the period of writing the thesis by a maximum of another 2 semesters.

Ph.D. PROGRAM

REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE IN SOCIOLOGY: Students are required to take 8 courses, which include: 8 elective courses, among which at least 5 electives should be departmental electives. The courses must be completed within a maximum of 4 semesters. After the completion of the courses the students have to take Ph.D. qualifying exam from major and minor areas of sociology. The successful students will be required to write a Ph.D. thesis. The maximum time for completion of the thesis is 8 semesters. The time of writing the thesis can be extended a further 4 semesters.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

SOC	101	Introduction to Sociology I	(4-0)4
SOC	121	Research Methods in Sociology 1	(4-0)4
SOC	131	Introduction to Anthropology I	(4-0)4
HIST	150	History of Civilizations	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
TURK	101	Turkish I	NC
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

SOC	102	Introduction to Sociology II	(4-0)4
SOC	122	Research Methods in Sociology II	(4-0)4
PSY	100	General Psychology	(3-0)3
PHIL	108	Introduction to Philosophy II	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	NC

SECOND YEAR

Third Semester

SOC	203	Urban Sociology	(4-0)4
SOC	241	Statistical Methods in Sociology I	(4-0)4
SOC	251	History of Sociology I	(4-0)4
ECON	210	Principles of Economics	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

SOC	204	Rural Sociology	(4-0)4
SOC	242	Statistical Methods in Sociology II	(4-0)4
SOC	218	Social Class and Mobility	(4-0)4
SOC	252	History of Sociology II	(4-0)4
HIST	2202	Principles of Kemal Atatürk II	NC
Non-Departmental Elective			

THIRD YEAR

Fifth Semester

SOC	305	Sociology of Family	(4-0)4
SOC	315	Sociology of Mass Communication	(4-0)4
SOC	341	Contemporary Sociological Theory	(4-0)4
Non-Departmental Elective			
Non-Departmental Elective			

Sixth Semester

SOC	303	Sociology of Change and Transition I	(4-0)4
SOC	314	Work and Organization	(4-0)4
SOC	363	Demography / Population Dynamics	(4-0)4
Departmental Elective			
Non-Departmental Elective			

FOURTH YEAR

Seventh Semester

Departmental Elective
Departmental Elective
Departmental Elective

Eighth Semester

Departmental Elective
Departmental Elective
Departmental Elective

MINOR PROGRAM IN SOCIOLOGY

This program provides students in the fields of technology, science and administration with an opportunity to complement their education with a sociological understanding of social transformations they themselves experience as individuals and as professionals in their fields. The program introduces them to theory and research in sociology, social theory, social change, and substantive areas in the field. The program focuses on the analysis of such processes as modernization and globalization. Before graduation, students are required to take 6 courses in total.

Prerequisite

SOC	100	Principles of Sociology (or equivalent)	(3-0)3

Compulsory course

SOC	250	Introduction to Sociological Theories	(3-0)3

Elective courses

Two of the must and two of the elective courses offered by the Department.

DOUBLE MAJOR PROGRAM IN SOCIOLOGY

This program is designed to respond to the growing importance given to interdisciplinary studies parallel to recent developments around the world. The Double Major Program in Sociology is thought to contribute to successful students who will take their place in and direct the future social, cultural, economic and political transformations in the global world. In this regard, the aim of our program is to give the successful students the opportunity to broaden their knowledge by relating two distinct disciplines. This program is open to all departments though priority is given to students of International Relations, History,

Philosophy, Public Administration, Political Science, Psychology, Management and Economics. Before graduation, students are required to take all the courses (36 courses in total of which 18 are departmental must, 7 are non-departmental must, 7 are departmental electives and 4 are non-departmental electives) which are required for sociology majors.

Compulsory Courses

SOC	101	Introduction to Sociology I	(3-0)3
SOC	102	Introduction to Sociology II	(3-0)3
SOC	121	Research Methods in Sociology 1	(4-0)4
SOC	122	Research Methods in Sociology II	(4-0)4
SOC	131	Introduction to Anthropology	(4-0)4
SOC	203	Urban Sociology	(4-0)4
SOC	204	Rural Sociology	(4-0)4
SOC	218	Social Class, Stratification and Mobility	(4-0)4
SOC	241	Statistical Methods in Sociology I	(4-0)4
SOC	242	Statistical Methods in Sociology II	(4-0)4
SOC	251	History of Sociology I	(4-0)4
SOC	252	History of Sociology II	(4-0)4
SOC	303	Sociology of Change and Transition	(4-0)4
SOC	305	Sociology of Family	(4-0)4
SOC	314	Work and Organization	(4-0)4
SOC	315	Sociology of Mass Communication	(4-0)4
SOC	341	Contemporary Sociological Theory	(4-0)4
SOC	363	Demography/Population Dynamics	(4-0)4
PSY	100	General Psychology	(3-0)3
HIST	150	History of Civilizations	(3-0)3
PHIL	108	Introduction To Philosophy II	(3-0)3
ECON	210	Principles of Economics	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
ENG	102	English for Academic Purposes II	(4-0)4
ENG	211	Academic Oral Presentation Skills	(3-0)3
IS	100	Introduction to Information Technologies and Applications	NC
HIST	2201	Principles of Kemal Atatürk I	NC
HIST	2202	Principles of Kemal Atatürk II	NC
TURK	101	Turkish I	NC
TURK	102	Turkish I	NC

Elective Courses

7 departmental electives and 4 non-departmental electives.

DESCRIPTION OF UNDERGRADUATE COURSES

SOC 100 Principles of Sociology (3-0)3
An introduction to basic principles, concepts and theories of sociology; analysis of social structure and cultural patterns, methodology of research in social sciences. The course seeks to make sociology come alive as a vital and exciting field, to relate principles to real – world circumstances, and to attune students to the dynamic processes of our rapidly changing contemporary society (only open to the students of Faculty of Engineering).

SOC 101 Introduction to Sociology I (4-0)4
An introduction to basic principles, concepts and theories of sociology; the logic and method of sociological inquiry; analysis of social structure; culture; the relationship of the individual to society; social stratification; different forms of social inequalities. Taught from a comparative perspective drawing examples from Turkey and other developing and developed countries.

SOC 102 Introduction to Sociology II (4-0)4

An introduction to the analysis of key social institutions and key changes; organizations, state and politics, education, urbanization, population growth, social movements, and globalization. Taught from a comparative perspective drawing examples from Turkey and different parts of the world.

SOC 103 Introduction to Anthropology (3-0)3

Biological structure of humans and its relationship to group life. Evolution of humankind and culture. Relationship between the human species, nature and tools. Emphasis on culture and social organization of technologically primitive societies.
Note: Offered only to students of the Department of City and Regional Planning.

SOC 104 Introduction to Sociology (3-0)3

An introduction to basic principles, concepts and theories of sociology; analysis of social structure, cultural processes and patterns; the relationship of the individual to society. Emphasis on case studies.

SOC 109 Introduction to Sociology (3-0)3

An introduction to basic principles, concepts and theories of sociology; analysis of social structure, cultural processes and patterns; the relationship of the individual to society. Emphasis on case studies.

SOC 121 Research Methods in Sociology I (4-0)4

An introduction to the methodology of social sciences and how sociological knowledge is produced. Topics include the discussions on mainstream methodological understandings (positivism, interpretative social science and critical social science) and focus on basic research techniques terminologies and applications based on quantitative data.

SOC 122 Research Methods in Sociology II (4-0)4

The course will make the students of sociology familiar with the methodology of social sciences and provide them with skills required for conducting a sociological research by using qualitative research techniques. The course will cover topics related to the qualitative methodology referring to research design, characteristics of qualitative research techniques(i.e. interviews, focus groups, oral history, historical comparative research), data analysis and writing up.

SOC 131 Introduction to Anthropology I (4-0)4

Biological structure and its relationship to group life in human and non-human primates. Biologic and cultural evolution of the human species. Relationship between the human species, nature and technology, and between environment, modes of subsistence and social organization. The structure of human language.

SOC 132 Introduction to Anthropology II (3-0)3

The study of humans in different cultural contexts. Theories of culture and social structure. An examination of major human institutions (kinship, economic, political and religious) in cross-cultural perspective. Emphasis on technologically primitive societies.

SOC 134 Social Anthropology (3-0)3

The study of human beings in different cultural contexts. Theories of culture and social structure. An examination of major human institutions (kinship, economic, political and religious) in cross-cultural perspective.

SOC 203 Urban Sociology (4-0)4

A comparative study of urban societies and institutions. The origins and the evolution of towns in Western Europe and in the East. Medieval, early modern industrial and post-modern cities. Major theoretical approaches in Urban Sociology. Recent urban trends and processes: suburbanization, gentrification and globalization.

SOC 204 Rural Sociology (4-0)4

Rural social structure, changing social relations in rural societies. Peasants in market economy and development; types of peasant production; patterns of labor utilization; modernization of agriculture and state policies; peasantry in relation to world economy.

SOC 206 The Anthropology of Kinship Organization (3-0)3

A cross-cultural comparison of kinship systems. Basic forms of descent and their relationship to residence, marriage, family forms and kinship terminologies. The relationship of kinship and family structure to ecological conditions, technology and economic and political structures.

SOC 218 Social Class, Stratification and Mobility (4-0)4

Inequality, stratification and mobility in relation to social position. Types and dimensions of social inequality. Theories of social stratification. Different types of social strata; class, caste, estate,

status, power elite. The underprivileged and the lower strata. Relations among social classes. Bases and mechanisms of social status, individual, group and stratum mobility.

SOC 241 Statistical Methods in Sociology I (4-0)4
An introduction to the statistical methods and computer applications in social sciences. Topics include the discussions on purposes and limitations of statistics in social sciences. Probability, sampling distribution, estimation, causality, inferential statistics such as analysis of variance, correlation and regression are covered

SOC 242 Statistical Methods in Sociology II (4-0)4
Advanced statistical methods and computer applications in social sciences. Topics include parametric and nonparametric statistical analysis. hypothesis testing, contingency problems and Chi-square tests, multiple regression analysis.

SOC 250 Introduction to Sociological Theories (3-0)3
Classical and contemporary sociological theories; sociological perspectives of the main figures of the discipline (Marx, Weber, Durkheim, Simmel); brief introduction to contemporary social theory; sociological insights of the key contemporary social theorists (Foucault, Derrida, Deleuze and Guattari).

SOC 251 History of Sociology I (4-0)4
The overall aim of this course is to examine the emergence of *sociological imagination*. Accordingly, topics such as the Renaissance, the Reformation, rationalism and empiricism, the theory of natural law, the Enlightenment and the conservative critique of the Enlightenment will be examined. The course will also cover the contributions of the founding figures of the discipline of sociology. The works Vico, Montesquieu, S. Simon and Comte will be examined in order to understand the "invention" of sociology as the science of society.

SOC 252 History of Sociology II (4-0)4
The principal aim of this course is to study the development of the discipline of sociology in late 1800s and early 1900s. The works of the founding fathers of the discipline, Marx, Weber, Durkheim, Simmel, and Pareto will be examined in order to display the different paths of development in the discipline. Positivism, historicism and realism will be discussed in order to understand major metatheoretical standpoints in the social sciences.

SOC 303 Sociology of Change and Transition I (4-0)4
Multi-paradigmatic nature of the theories of social/society, social change and modernization will be illustrated through the following concepts and related theories: system differentiation, social and action systems; industrial, democratic and educational revolutions; world system, globalization, information age; material vs. symbolic reproduction / transformation; structuration; capital, habitus and relational structuring of fields and subfields in modern societies.

SOC 304 Sociology of Change and Transition II (3-0)3
Transitions to modern industrial-urban world. The first transition: England. The French transition. Revolutions from below and above. Other transitions to modern industrial urban world. Transformations in institutions, political, social and cultural structures in late capitalism. Issues in development and underdevelopment in second, third and fourth worlds.

SOC 305 Sociology of Family (4-0)4
The family as a social institution; the structure and types of family; the functions (economic, social and reproductive) of the family; changing role of the family and social change; sexual division of labor within family; domestic labor; reproduction; patriarchy; child labor; kinship.

SOC 306 Economic Sociology (3-0)3
The sociology of economic life. Competing perspectives in the field of economic sociology. The comparative and historical study of the world-economy. Capital, capitalists, and capitalism. The changing forms of production and exchange. The international division of labor. Economic cycles and trends. Hegemonic transitions. Cities and the world-economy. Hierarchies and networks in the organization of business enterprise.

SOC 307 Issues in State and Social Policy (3-0)3
State and welfare systems. The fundamental issues and current trends in the light of comparative and alternative approaches to politics and economy of the welfare state. Specific emphasis on the development of state and social policy in Turkey.

SOC 308 Urbanization in Developing Countries (3-0)3
The study of various processes and structures involved in the rapid growth of cities in developing countries: migration, the problem of housing, work

and employment, capital accumulation, social networks and local politics.

SOC 309 Sociology of Religion I (3-0)3
Religion and culture in a world-wide perspective. Different approaches to the definition of religion. Patterns of differentiation of religion in relation to society. The role of religion in the modernization process, and the effects of modernization on religion. Organizational structures and patterns of institutionalization in religion. Religion and social stratification.

SOC 310 Sociology of Religion II (3-0)3
Religion and society in different parts of the world with special focus on the Middle East. Studies in comparative religion with special reference to Max Weber's Sociology of religion.

SOC 312 Political Sociology (3-0)3
The course draws together the perspectives of two disciplines, politics and sociology in an attempt to understand political structures and processes. Theoretical approaches as well as historical and empirical studies are considered. Subjects of particular interest are: political culture, political socialization, participation; the origins and growth of the modern state; legitimacy, individualism, liberalism; concept of citizenship, globalization and discussions on nation-state and citizenship; welfare state.

SOC 313 Data Processing I (3-0)3
The purpose of this course is to teach students how to process a given set of information both mechanically and sociologically. Students will learn how to transform information into a machine-readable form, and how to use computer package programs such as SPSS, BMDP or SAS. Having acquainted themselves with these skills, students are expected to make inferences about data. To learn how to make data 'speak' is the major objective of this course.

SOC 314 Work and Organization (4-0)4
Understanding the development of industrial societies; Different Industrialization strategies and their political, social implications. Historical aspects of work and work ethic, from ancient times to the present; Taylorism, Human Relations, Neo-Human Relations School, Theories of production systems (Blauner and Woodward); Labour Process Debate. De-skilling and anti-Braverman debate; Labour market segmentation; Informal Forms of Work; Women's work; Trade unions and industrial conflict; Transformation of work in post-industrial society, post-fordism.

SOC 315 Sociology of Mass Communication (4-0)4
An examination of mass communication theories. Discussion on the mass media of communication and their role as social institutions; content, audience and the effect of the mass media. The functions of communications media in the formation of public opinion, cultural values and social control. Analysis of examples from both early studies and current research.

SOC 316 Cultural Analysis of Media Texts (3-0)3
Critical discussion of different approaches to the "content" of mass media messages. Methods and techniques involved in the analysis of content. Assessment of classical and current exemplary research with regard to their theoretical efficacy and practical usages.

SOC 317 History of Sociology III (3-0)3
The study of competing schools with divergent interests and perspectives; mathematical sociology, early functionalism, sociometry, philosophical sociology, sociology of knowledge, neopositivism, systematic sociology. Critical examination of a wide range of scholars and their works, Lundserg, Cooley, McIver, Gurvitch, Sorokin, Ogburn, Mannheim, Moreno. Particular emphasis is laid on early social anthropologists such as Malinowski, Radcliffe Brown and E. Pritchard.

SOC 318 History of Sociology IV (3-0)3
The growing significance of phenomenology in sociology; Husserl's philosophy and the subjectivism of Schutz. Recent conceptualizations of social conflict. Parson's and Merton's functionalism. Perspectives and methodological principles of positivism and empirical sociology (A. Gouldner).

SOC 319 Legitimacy and Social Order (3-0)3
Power, social control and the problem of legitimation. The notion of Social Contract. Legitimation and the role of religion: theocracy, hierarchy and caesaropapism. Relations between social class and ideology in historical societies. The advent of modern society: secularization; legitimation by performance and efficiency. Lack of legitimacy and the emergence of social movements.

SOC 320 Social Movements (3-0)3
The critical analysis of social movements and collective actions which can be seen as crucial in the articulation of popular demands questioning established social orders. Currently dominant perspectives in the analysis of social movements

and collective actions, collective behavior; resource mobilization; political process; and new social movements. Feminist, environmental, anti-nuclear, peace movement, anti-globalization movements. A special focus is placed on contemporary racism and ethnicity in Europe.

SOC 321 Political Anthropology (3-0)3
Basic principles of social differentiation and hierarchy. Forms of political power in simple societies: gerontocracy, big-man systems, chiefdoms. The role of war. The emergence of state societies and the political systems of pre-modern empires. Changes induced by the ascent of the principle of popular sovereignty and nationalism. Political ecology: center and periphery. Anthropological aspects of political values and behavior in contemporary societies.

SOC 323 Methods and Techniques of Sociological Research (4-0)4
Theory and research in sociology Theoretical statements and observational statements. Assumptions and hypotheses. Fundamentals of sampling in social research. Scaling techniques. Techniques of social research: Quasi-experiments, observation (documentary, participant, etc.), interviews (formal and informal), mail questionnaires. Questionnaire design. Ethical questions in social research. Techniques of data analysis and interpretation of findings.

SOC 324 Field Methods (3-0)3
"Soft" techniques of data collection, observation, unobstructive measures, structured and unstructured interviews and depth interviewing. The aim is to teach the students the specialized skills necessary for the application of these techniques.

SOC 325 Human Ecology (3-0)3
This course deals basically with the relationship of wo/man to/in nature or society to/in nature. Contemporary ecological debates in social sciences are explored by firstly giving an overview of the historical roots of environmentalism and then focusing on different approaches like: sustainability and Neo-Malthusianism, risk society, eco-socialism, ecofeminism, deep ecology and land ethics, eco-anarchism and social ecology.

SOC 326 Medical Sociology (3-0)3
Deconstruction of medicine as the basic reference of ethics in the modern/postmodern era -as manifested, popularized and also guarded mainly by the advertisements on a societal un(der) conscious level. Body perception and the role of medicine in shaping it. Metaphoric uses of illnesses. Medicalization and social control. The transition from sin to sickness. Medicine and Foucauldian 'gaze'. Critique of postmodern conjuncture: 'Health without body, intelligence without mind'.

SOC 329 Women's Studies in Turkey (3-0)3
The objective of the course is to present a comprehensive overview of the key themes and issues taken by recent studies on women in Turkey. The research findings provide a rich multidisciplinary background for newcomers to the field. The major subject areas in relation to women's status are family, work, politics, state, law, religion, education, history, health, sexuality, art, media and popular culture.

SOC 341 Contemporary Sociological Theory (4-0)4
Examines the major approaches in contemporary social and critical theory. It covers approaches such as semiology, psychoanalysis, deconstruction, feminist theory, postcolonial theory, and theorists such as Michel Foucault, Gilles Deleuze and Felix Guattari, Jacques Derrida, Luce Irigaray, Sigmund Freud, Jacques Lacan, Gayatri Spivak and Edward Said.

SOC 345-346 Social Thought on the History and Economy of Turkey I and II (3-0)3
The analysis of the historical aspects of the development of social thought in Turkey; its Ottoman origins and background; the evolution of social thought in Republican Turkey.

SOC 349 Theory in Urban Sociology (3-0)3
Critical review of major theoretical approaches in urban sociology and current trends in urban theory.

SOC 354 Sociology of Law (3-0)3
Towards an understanding of the social bases and meanings of law: passage from everyday social practices to more or less formulated rules of conduct, *ethos* (customs, traditions), ethics and religion as ordering social practices to *nomos* and hence the law. Co-existence of the self and the other in an ordered world. Self-preservation of the self via security, delegation of power, obedience and establishment of the authority as well as social control. Connection between the law and the central body politic as the ultimate ordering of the social. The process of criminalisation and punishment. The historical-social meanings of justice and their relation to ethics and statute law. Special focus on the Turkic, ottoman, and contemporary Turkish Republican contexts.

SOC 361-362 Historical Sociology I-II (3-0)3

The German and French intellectual traditions of historical sociology. German historical sociology as a reaction to French and Anglo-Saxon positivism during the last decades of the XIXth Century. Similarities in long-term historical perspectives. Case-studies from European as well as Middle Eastern history.

SOC 363 Demography-Population Dynamics (4-0)4

The study of the measurement of the size, composition and changes in the numbers of people and the related functions of fertility, mortality and migration. Firstly, the basic sources and measures of demography (i.e.: rates and ratios of fertility, mortality, migration; population estimation/projections, life table etc.) are introduced. A special focus is given to the theories and policies of population control (i.e. fertility control – family planning and migration policies) and the role of social sciences in demographic analyses.

SOC 370 Citizenship: Past and Present (3-0)3

This course covers the recent debate on citizenship. The following topics are to be studied throughout the course: history of citizenship; main contours of citizenship; liberal, communitarian and republican approaches to citizenship; transformation of political community and citizenship today; new modalities of citizenship; citizenship and state formation in Turkey and Europe.

SOC 381 Structure and Change in Ottoman Society (3-0)3

The Ottoman socio-economic system as a historical social formation. The evolution of inherited elements from pre-Ottoman socio-economic structures. Town and country contradiction in Ottoman society. Economic structure, state and bureaucracy, commodity production and trade, the land regime, and stratification. Ideology of statecraft in the Ottoman Empire. Evolution of Ottoman society vis-à-vis the structural changes in Europe. Social conflict in Ottoman society.

SOC 382 Sociology of the Turkish Transformation (3-0)3

The Structural transformation of late Ottoman society within the context of the new global economic and political order; the Western challenge and the response of the Ottoman state; new social forces within late Ottoman society; and 'Jeune Turc' ideology and its roots. Following this framework, the process of nation-state building in Turkey is discussed with reference to various forms of resistance movements and formal political opposition experienced between the years of 1919 and the early 1940s. The ideology of nationalism and nation building is emphasized.

SOC 384 Sociology of Development (3-0)3

The developing countries in the world economic system. Relations with developed countries regions in history and at present; the impact of underdevelopment on social, political and economic structures.

SOC 385 Sociology of the Body (3-0)3

Lacanian construction of the subject as a social product. Passage from biological creature to cultural subject as sexualized beings. Self, body and ethics. Socio-historical filters through which we perceive our bodies and bodily reality. Deconstruction of the main references (from religion to fashion; from sexuality to death) that surround, shape and control our bodies. Critique of the now prevalent discourse of the performing self.

SOC 388 Representing the Study of "Other" Through Ethnography (3-0)3

Classic and recent ethnographies. Ethnographic writing, problems of representing "the Other", and recent experimental approaches in ethnographic presentation.

SOC 390 Methodology and Analysis in Sociology (3-0)3

Main discussions in philosophy of science and their reflections to the analysis in sociology. The meanings of methodology: Positivist, interpretative and critical social sciences, feminist and post-modern research. Planning and preparing qualitative and quantitative research designs, measurement and sampling. Survey research and secondary data analysis. Field research (participant observation and interview techniques), historical and comparative analysis, and life history analysis. Research examples from sociological literature. Social research and communication with others- literature review and research report writing processes. The ethics and politics of Social Research.

SOC 400 Seminar-Workshop in Special Fields of Sociology (3-0)3

This course is organized in the form of a research workshop, and the content of the course is determined the instructor.

SOC 401-402 Special Project in Sociology and Social Anthropology I-II (3-0)3

This course offers students in their final year the opportunity to carry out a sociological study of their own interest. Students may pursue a course of reading on a particular topic or undertake an empirical research project.

SOC 403 Social Problems in Turkey (3-0)3

The structural characteristics of Turkish society. Social, cultural and economic bases of Turkey's social problems. Social problems in terms of the relations between individual and society. Transformation of social problems in time and space. Different approaches to social problems and solutions.

SOC 404 Gender and Social Space (3-0)3

Gender as a basic principle of organizing society. The social construction of gender. Biology and ideology, nature versus culture debate. Production and reproduction of social space and society. The role of sexual division of labor. Sex segregation in cross-cultural perspective.

SOC 405 Industrial Sociology (3-0)3

The Industrial Revolution and the industrialization of the world. The emergence of the factory system and the disciplining of labor. Fordist, Fascist, and Stalinist models of industrial organization. The newly industrializing countries. The Information Technology Revolution and the informational-ization of the world. The transformation of work and employment. The emergence of the network society. Globalization, business networks, and the information age.

SOC 408 Population Movements in a Globalizing World (3-0)3

This course aims to answer the following question: How does global restructuring affect the movements of people across space? Five types of interrelated categories of population movements are identified: (1) population displacements due to increased conflict and civil strife as wall as natural disasters; (2) illegal forms of international migrant labour arrangements including trafficking in women; (3) reverse and return migration from north to south and urban to rural: (4) shuttle between two or more worlds with strong links in all; (5) "rented" temporary free-floating migrant labour.

SOC 410 Advanced Sociological Methods (3-0)3

Present socio-cultural structure of Turkey as well as its process of transformation. Constitution of basic identities and their reproduction in their reciprocal (usually confrontational) relationships. An hi-story of the Ottoman Empire beginning from 16th century onwards, dissolution of it, foundation of the Republic and the developments afterwards.

SOC 414 Consumption, Class and Culture (3-0)3

The course aims to explore the role played by culture in generating, maintaining and reproducing inequalities. It first explores the varying models of culture in the theories of inequality. Then, it interrogates how seemingly individual and random choices and experiences, such as our tastes, leisure time activities, friends and emotions are related to inequality. Throughout the course, the most frequently used analysis methods and the most controversial debates on class cultures will be introduced. The last four weeks aim to utilize the overviewed concepts and debates to understand class-cultural hierarchies in Turkey. By the end of the course, the students will comprehend the relationship between culture, class and consumption, as well as their various workings in the everyday life of Turkey.

SOC 415 Social Reproduction (3-0)3

The societal mechanisms of regulation, procreation, development and maintenance of the human factor. Reproduction of labor. Family, health, education and housing as components of the system of social reproduction. The role of the state and the family in the reproduction of labor.

SOC 416 Women in Economy and Society (3-0)3

Exploration of male bias in sociological and anthropological theory and practice. Critical evolution of assumptions with respect to women's role and participation in social and economic production. Differential participation of women in national development. Analysis of femininity and sexuality in cross-cultural perspective.

SOC 417 Understanding Other Cultures (3-0)3

The course probes such social and cultural questions as "Are there different kinds of rationality?", "Does language limit and control thought?", "What kind of difficulties arise when we attempt to translate from one language, or culture, into another?", "Are there universal moral principles?", "Is it possible to compare different cultures?" Basic concepts such as self, reason and sanity, money and wealth, religious beliefs, and health will be subjected to critique.

SOC 419 Sociology of the Museum and Museology (3-0)3

The course aims to acquaint students with the history, evolution, functions, transformation and types of museums from a sociological perspective. To this end, it will consider their political dimension and place a special focus on social history museums. Also, it intends to analyze museums as sites for cultural and ethnic identity revival, history and memory reconstruction, nation and state building. In addition, the organization and management of museums and their utilization as educational and research institutions will be studied. The trends that hint at the future of the museums will be studied as well.

SOC 420 Economic Anthropology (3-0)3

The course introduces students to select classic and contemporary work in economic anthropology. The course covers themes such as developments and debates in the subfield of economic anthropology, gift 'economies' and reciprocity, the role of non-capitalist societies in the making of a capitalist world system, planned / 'shortage' economies and post-socialist 'transition', Fordism and post-Fordism / neoliberalism, development, production, reproduction, and distribution in agricultural, industrial, and 'post-industrial' contexts, consumption, property, money and debt, and economic crisis – from a cross-cultural, historical comparative, ethnographic perspective.

SOC 421-422 Turkish Sociologists I-II (3-0)3

The course aims a detailed analysis of the development of the discipline of sociology in Turkey, from the early contributions to the field to the present state of theory and research.

SOC 425 State and Society in Turkey (4-0)4

The aim of this course is to familiarize the students with the main themes and issues in conceptualizing state-society relations in modern Turkey. The main focus will be on the patterns of democratization and democratic consolidation, the role of military in Turkish politics and society, formation and development of civil society, discourses and practices of human rights, women's problems, the role of religion in society and the impact of the EU on Turkish societal and political transformation.

SOC 426 Sociology of the European Union (3-0)3

The objective of the course is to examine the European Union (EU) from a sociological perspective. The course focuses on the institutional structures, governance methods, policies and politics of the EU, as well as the processes of social change it induces in national structures and actors. European integration, European institutions and policies, social foundations of the EU, European citizenship and identity, European socio-economic model, Europeanization, European enlargement and EU-Turkey relations are approached with a view to questioning the mainstream assumptions on the EU developed by political science, international relations and comparative political economy.

SOC 427 Social Analysis of Race, Ethnicity and Society (3-0)3

This course reviews the literature on theories of nationalism, nation-building, state-formation, and ethnicity mapping out the major debates and approaches within the literature. The central concepts and current trends in the literature which imply a necessary link between the process of modernization/ industrialization and nation-state building and nationalism are critically reviewed. It also examines social and ethnic relations as part of larger social systems by emphasizing the relationship of ethnicity to nations, state, class, minority groups, gender, power and politics.

SOC 428 City Culture (3-0)3

The aim of this course is to study on the subject of city culture in the global world with an interdisciplinary approach and develop some field methods and put them in application which will enable students to explore different aspects of the city culture that they live in. The city culture of Ankara is particularly targeted to observe the changing patterns of the city culture throughout different socio-economic and political periods, as Ankara being the capital of Turkey, and thus the ideal city of Turkish national modernization.

SOC 429 The Anthropology of the Turkic Peoples of Inner and Central Asia (3-0)3

A survey of the social organization and culture of the Turkic peoples from their first appearance in historical records to the modern era. The course will emphasize the Hsiung-nu, Göktürk, Uygur and other early Turkic States, but discussions will include historical migrations, current distribution and cultural continuities.

SOC 430 Sociology of Mediterranean Societies (3-0)3

The Mediterranean in historical and cultural perspective. Economy and ecology. The role of the state in Mediterranean societies. Kinship systems and the importance of the family. Patron-client relationships. The 'honor-and-shame' complex.

Gender roles in the Mediterranean area. Religion and folk beliefs.

SOC 434 Corporate and Organized Crimes (3-0)3
Patterns of deviance and crime. Theories in social deviance and crime, such as anomie, subculture, differential association and labeling approaches. Status frustration and adaptation to strain, deviance and conflict; the structure and process of deviance. Social reaction to deviant behavior and labeling outsiders. Deviance and identity, the defensive deviant act. Subculture groups. Types of crime, homicide, rape, robbery, burglary, etc.

SOC 435 Conventional Crimes (3-0)3
Organized criminal groups, white collar crimes. Functions and structure of the police; relations between the police and community. Do we need the police in a democratic society? The problem of controlling policing.

SOC 437-438 Sociology of Fine Arts & Music I-II (3-0)3
Social, cultural and ideological dimensions of art from earliest beginnings. Work-character of the "work of art." Art as gateway to truth. Commodification of artworks. Art now: just another sphere of commodity and information flow or a privileged field of emancipatory forces? *Is art dead*, given today's social, economic and technological matrix? Artwork as simulacrum and dissimulation. Subjectivity as the constituent dimension of aesthetic experience in techno-scientific age.

SOC 439 Comparative Historical Methods and Sociological Debates (3-0)3
This course begins with the examination of the methods of comparative historical sociology, such as parallel investigation of a theory, interpretation of contrasting events and analysis of causalities at the macro level. In the second part, well-known studies of the comparative historical sociology are discussed in light of the theoretical and methodological knowledge gained in the first part.

SOC 440 Sociology of Knowledge (3-0)3
A description of structural analysis of the ways in which social structures and relationships influence the products of consciousness. Historical and contemporary analysis of the relationship between social structure, on one hand, and knowledge and ideologies on the other.

SOC 442 Sociology of Science and Technology (3-0)3
An overview of the cognitive framework and technological basis of modern scientific knowledge in historical perspective; the development of the sociology of science as a distinct area of research; science as a determinate form of knowledge; science as social relations, science as a production process; the institutional and social context of scientific activity; inner hierarchy and social stratification in science. Enframing of techno-science in the 'Information' age.

SOC 444 Sociology of Surveillance (3-0)3
Overview of surveillance theories from a sociological perspective; surveillance and modernity; surveillance and postmodernity; surveillance in different social contexts; current trends in surveillance; relation of surveillance to globalization, immigration, communication and information technologies; political economy of surveillance.

SOC 452 Critique of Sociology (3-0)3
The formation of sociology; sociology and ideology; sociology and politics; the "sociological" conception of society. Debates on modernity and post-modernity.

SOC 454 Sociological Perspectives on Literature (3-0)3
This course is designed to discuss selected examples from literature with classical texts of the discipline of sociology. The main objective is to discuss literal examples, which reflect socio-cultural and political characteristics of the era and society they are produced, through a sociological perspective.

SOC 455 Literature, Culture and Society (3-0)3
Examines the literature of Turkish diasporic communities in Germany in its historical, social, political and cultural context. Focuses on the literature that emerges out of the experience of being marginalized as a 'foreigner' or 'guest', experience of Turkish immigrants. Examine how a variety of concerns represented in these writings such as the question of determining what is one's "own" culture, tensions of defining a non-German self, cultural differences, the role of language in establishing identity in an "alien" culture, the loss of mother tongue, assimilation and alienation, cultural signs of hybridity, loss of the past, longing for home in displacement.

SOC 456 Sociology of the Middle East (3-0)3

Ethnic origins of Middle Eastern peoples and the historical roots of Middle Eastern culture. Ecological, cultural and socio-economic diversity. The process of transformation of selected countries.

SOC 457 Culture, Identity and Post-Colonial Theory (3-0)3

This course will focus on the strategies by which demarcations between self and other and corollary distinctions between First World-Third World, West-East and masculine-feminine are deployed in various cultural and political discourses. The emergent and contested dimensions of modern, gendered, national and cultural identities will be examined through post-colonial theorists such as Gayatri Chakravorty Spivak, Homi Bhabha, Edward Said, Frantz Fanon.

SOC 461 Debates on Turkey (3-0)3

This course aims to cover the principal academic and political debates on Turkey's social structure. Debates on the following issues are to be examined: The formation, consolidation and collapse of the Ottoman Empire; main paths in Ottoman modernisation; the foundation of the Republic; 1930s: present vs. past and inkilaps vs. traditions; the agents of the inkilap: the Turkish Hearths, the People's Houses, and the Village Institutes; the transition to multi-party era and the true nature of Democratic Party; the 1960 Coup; Turkey as a feudal, Asiatic or capitalist society; the rise of political Islam and ethnic revival in 1990s.

SOC 485 Third World Politics (3-0)3

This course adopts a comparative approach in discussing political issues of the Third World. Key elements of the political process will be examined within the context of three main regions: Latin America, Africa and the Middle East. Special attention will be given to the different ways in which these regions were integrated into the global system.

SOC 497 The Secularization Debate: Comparative Perspectives and Case Studies (3-0)3

This course aims to acquaint students with the secularization debate. Enlightenment, secularizing effect of modernity, classical theories of secularization and recent approaches, different dimensions of secularization and Western secularisms will be critically analyzed. The development of secularism in different Western countries will be studied with a comparative perspective.

SOC 498 Secular State and Islam (3-0)3

The principal aim of this course is to acquaint students with the secularization process, the secular state in predominantly Muslim societies and also in Muslim-minority states. Experience of secularization, *laicité* and secular state, and the relationship between Islam and politics will be critically and comparatively examined in different countries such as Indonesia, Malaysia, India, Egypt, Iran, Israel and Turkey.

GRADUATE PROGRAMS AT THE DEPARTMENT OF SOCIOLOGY

M.S. PROGRAM IN SOCIOLOGY

Required Courses

SOC	500	Prothesis Seminar	NC
SOC	589	Term Project (Non-thesis)	NC
SOC	599	Master's Thesis	NC
SOC	800-899	Special Studies	NC

Elective Courses

SOC	501	Sociological Theory I	(3-0)3
SOC	502	Sociological Theory II	(3-0)3
SOC	503	Problems of Studying Women in Muslim Societies	(3-0)3
SOC	505	Advanced Political Sociology I	(3-0)3
SOC	506	Advanced Political Sociology II	(3-0)3
SOC	507	Research Methods I	(3-0)3
SOC	508	Research Methods II	(3-0)3
SOC	509	International Regimes and Gender Equality	(3-0)3
SOC	510	Urban Theory and Policy	(3-0)3
SOC	511	Local Politics	(3-0)3
SOC	512	Population Movements in a Globalizing World	(3-0)3
SOC	513	Comparative Studies in the Sociology of Religion	(3-0)3
SOC	514	Sociological Perspectives on Literature	(3-0)3
SOC	515	State and Civil Society in Eurasia	(3-0)3
SOC	516	Gender, Media and Cultural Representation	(3-0)3
SOC	517	Economic and Social Transformations in Eurasia	(3-0)3
SOC	518	Social Movements and Civic Action	(3-0)3
SOC	519	Feminist Methodology in Social Sciences	(3-0)3
SOC	520	Introduction to Structural Equation Models	(3-0)3
SOC	521	Sociology of Structural Transformations	(3-0)3
SOC	522	Sociology of the Middle East	(3-0)3
SOC	523	Data Analysis	(3-0)3
SOC	524	Modernity and Post-Modernity	(3-0)3
SOC	525	Global and Local Debates on Civil Society	(3-0)3
SOC	526	Issues in Women's Work and Employment	(3-0)3
SOC	528	Post-structuralism, Deconstruction and Feminist Theory	(3-0)3
SOC	529	Migration and Ethnicity in Eurasian Societies	(3-0)3
SOC	530	Kinship, Tribe, Confederation and State in Central Asia and the Middle East	(3-0)3
SOC	531	Sociological and Political Issues in Turkey	(3-0)3
SOC	532	Sociological Themes and Debates in Politics, Science and Culture	(3-0)3
SOC	533	Gender Issues on Class and Patriarchy	(3-0)3
SOC	534	Anthropology of Europe	(3-0)3
SOC	535	Contemporary Feminist Theory	(3-0)3
SOC	536	Peoples and Cultures of Central Asia	(3-0)3
SOC	537	Anthropology of Religion	(3-0)3
SOC	538	Human Development and Social Policy	(3-0)3
SOC	539	Social Policy and Welfare Issues in Turkey	(3-0)3
SOC	540	Class and Ethnic Relations in the Middle East	(3-0)3
SOC	541	Labor Market and Social Rights	(3-0)3
SOC	542	Qualitative Research	(3-0)3
SOC	543	Family, Marriage and Kinship Dynamics in Turkey	(3-0)3
SOC	544	Anthropology of the Middle East	(3-0)3
SOC	545	Sociology of Everyday Life and Interpersonal Relations	(3-0)3
SOC	546	Issues in Criminology	(3-0)3
SOC	548	Art in Turkey: Sociological Perspecctives	(3-0)3
SOC	550	Middle East Women, Feminism and Orientalism	(3-0)3
SOC	551	Seminar in Sociology of Religion	(3-0)3
SOC	552	Sociology of Culture	(3-0)3
SOC	553	Sociology of Consumption	(3-0)3
SOC	554	Challenges of Social Policy in the EU and Turkey	(3-0)0

SOC	555	Anthropology of Migration and Transnationality	(3-0)3
SOC	560	Globalization and Diasporas	(3-0)3
SOC	561	Ideology and Discourse Analysis	(3-0)3
SOC	570	Citizenship and Society	(3-0)3
SOC	571	Conflict, War, and Human Rights in the New Era	(3-0)3
SOC	578	State Subject and Legitimacy in Turkey	(3-0)3
SOC	580	Current Issues in Cultural Studies and Critical Theory	(3-0)3
SOC	582	Seminar on Ethnographic Field Research	(3-0)3
SOC	590	Nations and Nationalism in the Modern Middle East	(3-0)3
SOC	598	Debates in Society and Theory	(3-0)3

M.S. PROGRAM IN SOCIAL ANTHROPOLOGY

Required Courses

SAN	500	Prothesis Seminar	NC
SAN	501	Anthropological Theory and Method I	(3-0)3
SAN	502	Anthropological Theory and Method II	(3-0)3
SAN	599	Master's Thesis	NC

Elective Courses

SAN	510	Culture: Concept, Theoires, Approaches	(3-0)3
SAN	511	Culture and Health	(3-0)3
SAN	512	Forms of Cultural Production	(3-0)3
SAN	513	Visual Anthropology	(3-0)3
SAN	515	Folklore as Performance	(3-0)3

Ph.D. PROGRAM IN SOCIOLOGY

Required Courses

SOC	699	Ph.D. Dissertation	NC
SOC	800	Special Studies	NC

Elective Courses

SOC	628	Global Society	(3-0)3
SOC	631	Current Issues in Sociology and Social Theory	(3-0)3
SOC	632	Recent Developments in Methods and Sociological Inquiry	(3-0)3
SOC	633	Social History of Institutions	(3-0)3
SOC	641	Sociology of Industrialization and Modernization	(3-0)3
SOC	642	Sociological and Anthropological Studies in Turkey	(3-0)3
SOC	643	Advanced Issues in the Sociology of Knowledge	(3-0)3
SOC	644	Public Opinion, Culture and the Media	(3-0)3
SOC	646	Family, Marriage and Kinship: Debates and Issues	(3-0)3
SOC	647	Power, Status and Social Rank	(3-0)3
SOC	648	Order and Social Control: Formality and Informality	(3-0)3
SOC	649	States, Nations and Political Alignments	(3-0)3
SOC	651	Comparative Study of Agrarian Social Structures	(3-0)3
SOC	652	Organization and Work	(3-0)3
SOC	653	Sociology of Studies on Women	(3-0)3
SOC	654	Economic and Social History Of Turkish Society	(3-0)3
SOC	659	Space, Place And Gender	(3-0)3
SOC	660	Sociology, History and Religion	(3-0)3
SOC	671	Sociology and History I	(3-0)3
SOC	672	Sociology and History II	(3-0)3

SAN 501 Anthropological Theory and Method (3-0)3

This course introduces students to major theories, methods, debates, and works in the discipline of social anthropology. Students will be exposed to both classics and contemporary works in ethnographic literature. Particular attention will be given to developing basic skills in anthropological theory and methods.

SAN 502 Anthropological Theory and Method (3-0)3

This course introduces students to major theories, methods, debates, and works in the discipline of social anthropology. Students will be exposed to both classics and contemporary works in ethnographic literature. Particular attention will be given to developing advanced skills in anthropological theory and methods.

SAN 510 Culture: Concept, Theories, Approaches (3-0)3

The course offers a brief intellectual history of the Culture concept in Anthropology with special focus on methodologies adopted by Boas, Taylor, Malinowski, Mauss, Barthes, Jameson, Benedict, Geertz, Strathern, Weiner, etc. In addition to showing how to write about Culture, the 'work' it does as well as the theoretical and comparative perspectives it offers, the course will focus on how the concept has enhanced understandings of the Gift, Space and Place; Emotion and Language. The course will investigate the limits of cultural analysis and interrogate the utility of the concept for anthropological understanding.

SAN 511 Culture and Health (3-0)3

Culture and Health aims to instruct students on issues relevant to health and illness from a cultural point of view. It covers the topics of health and illness, environmental factors, culture specific diseases, development and health, treatment of illness as well as research topics and methods in culture and health. The course will be carried out both as lectures and as a workshop where active participation and term-project presentation are expected from students. Whenever possible the instructor will make use of audiovisual means during the lectures.

SAN 512 Forms of Cultural Production (3-0)3

Cultural difference as historically produced in shared spaces within fields of power. How concepts such as emotion, speech, sound, language, poetics, metaphor, memory, sexuality and gender, facilitate understandings about cultural production; narratives about common and shared cultures; logic and mechanisms involved in production and transmission of myth, epics, oral and folksong genres; activation of cross-cultural imagination to understand the production of culture. An updated approach to the understanding of orally transmitted cultural forms.

SAN 513 Visual Anthropology (3-0)3

The course introduces students to collecting or using visual materials as part of ethnographic research. It presents various approaches and methodologies through which visual materials are interpreted and analyzed, e.g. semiology, psychoanalysis and reception theory. It attempts to uncover cultural meanings that are produced in and through visual materials such as tattoos, sculptures, reliefs, cave paintings, jewelry, hieroglyphics, paintings, and photographs.

SAN 515 Folklore as Performance (3-0)3

This course introduces students to the discipline of folklore. Students will be provided with different approaches to folklore, particularly folklore as text and folklore as performance. Topics to be covered in the course include tradition, narrative discourse, epics, folk romance, folktales, and shamanism.

SOC 500 Prothesis Seminar NC

SOC 501-502 Sociological Theory I-II (3-0)3

The aim of this course is to make students familiar with concepts, issues and debates in the field of contemporary social and critical theory. It will examine key concepts such as representation, power, subjectivity, desire, signification, sexuality, the unconscious, and difference by way of examining major continental critical theories.

SOC 503 Problems of Studying Women in Muslim Societies (3-0)3

This course aims to stimulate debate about the problem of considering "Muslim Women" as a distinct category to study the status, image and role of women in Muslim societies. It discusses the impact of Islam in the formation of patriarchal structures, practices, and discourses of Middle Eastern societies in their cultural and historical specificities while focusing on the literature which examines the predicaments of women in Turkish society.

SOC 505-506 Advanced Political Sociology I-II (3-0)3
The main theme of this course is elites and elite theories. Following the introduction of elite theories, students are expected to discuss the pros and cons of each theory. After the historical review of elite theories, recent problems relating to elites will be taken up and discussed in the light of the experiences of Western and Middle Eastern countries.

SOC 507 Research Methods I (3-0)3
This course aims to relate recent discussions in the philosophy of science to methodological issues in the social sciences and humanities. Various philosophical issues which have implications for social science research and limitations of the social sciences are discussed.

SOC 508 Research Methods II (3-0)3
This is a continuation of Soc 507. Students learn and apply research and data analysis techniques by using real social science data. Quantitative as well as qualitative research techniques are introduced and applied to various data-sets of Internet. The course seeks to increase the data analytical skills of the students.

SOC 509 International Regimes and Gender Equality (3-0)3
The course aims to analyze the interplay between governmental and non-governmental actors at national and international levels in establishing international regimes to transform social inequalities particularly in the area of gender. It starts out with a discussion on the need to link paradigm (academia), policy (governance structures) and praxis (activism) in the production of socially relevant knowledge. The focus will be on international regimes, particularly those within the context of the United Nations, that promote equality and human rights of women. It will focus on both the processes of the intergovernmental bodies (Commission on the status of Women (CSW), Economic and Social Council (ECOSOC), General Assembly (GA)) and the treaty body (Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)) and the impact of scholarship and activism on their creation. Equality policies and human rights instruments and the institutional support mechanisms for these bodies will be analyzed. The effectiveness of the 4 World Conferences and World Conferences of the 1990's in fostering compliance with equality policies and international law will also be analyzed. Finally, the affect of these mechanisms and processes in achieving gender equality at the national level will be examined.

SOC 510 Urban Theory and Policy (3-0)3
Theories relating to urbanization and urban life are discussed and policies formulated to cope with urban problems are evaluated. Social stabilisation has placed the question of daily practices back on the agenda. It forces us to think about individual diversity and questions of social (re-) production and ‘ways of life’. Thus our leading question will be to discuss structure and/vs. the positions of agents in the context of contemporary urban theories. Special attention is given to the case of Turkey.

SOC 511 Local Politics (3-0)3
Goals, processes and patterns of territorial distribution of power. Administrative decentralization and political decentralization. Community power structure and decision-making at local levels. Politicization of the periphery. Local and regional autonomy in the European integration.

SOC 512 Population Movements in a Globalizing World (3-0)3
This course aims to answer the following question: How does global restructuring affect the movements of people across space? Five types of interrelated categories of population movements are identified: (1)population displacements due to increased conflict and civil strife as well as natural disasters; (2)illegal forms of international migrant labor arrangements including trafficking in women; (3)reverse and return migration from north to south and urban to rural; (4)shuttle between two or more worlds with strong links in all; (5)"rented" temporary free-floating migrant labor. Relevant international organizations; immigration policies; gender differentials; social construction of identities, networks and communities; household survival strategies and emerging trends, constraints and prospects for population movements will be considered. While these patterns of population movements will be analyzed within a global context, students will be expected to analyze each category as it is experienced in the case of Turkey.

SOC 513 Comparative Studies in The Sociology of Religion (3-0)3
Comparative approaches to the study of religion and society with special reference to the problems posed by modernity, secularism, nationalism, democracy and generalized education. The main emphasis is on the religions of the developed world.

SOC 514 Sociological Perspectives on Literature (3-0)3

This graduate level course is designed to discuss selected examples from literature with classical texts of the discipline of sociology. The main objective is to discuss literal examples, which reflect socio-cultural and political characteristics of the era and society they are produced, through a sociological perspective.

SOC 515 State and Civil Society in Eurasia (3-0)3

This course will enable students to understand state and civil society relations in the post-Soviet transformation. The course aims to introduce students to the main theoretical debates concerning the causes and the nature of the political, social, and economic transformation from communism; to provide theories of transition, democratisation and theoretical approaches to state-society relations while explaining varieties of post-Soviet transition. The course will particularly focus on the formation of civil society organizations (non-governmental organisations, unions, movements, umbrella groups), their aims and activities, their role in the process of transition and democratisation and the nature of the relationship between governments and civil society organisations. The course will also explore the impact of the international element (international governmental and non-governmental organisations) on governments and NGOs and its role enable in the formations of state-civil society relations.

SOC 516 Gender, Media and Cultural Representation (3-0)3

This course aims to focus on the modalities of mass media by which hegemonic construction of gender identities come to be realized. Film, television and texts produced through cyberspace, photography, and the graphic arts and also "women genres" as objects of analysis and as research tools. Retrospective inquires on the selected topics will depend on the current research interests of students and they will design and carry out their projects.

SOC 517 Economic and Social Transformations in Eurasia (3-0)3

This course analyses the fundamental economic and social changes in Eurasia in recent decades. It focuses on the establishment and functioning of the socialist system and its later dismantling in favor of a market economy. Both of these transformation processes included not only the change of economic patterns and property rights but also affected social relations, values and ideologies. The course discusses general issues and theories of transformations as well as comparing selected case studies. Particular attention will be given to the impacts of political and macro-economic changes on local communities.

SOC 518 Social Movements and Civic Action (3-0)3

The course will critically examine the major theoretical approaches to the study of social movements and NGOs. The emergence and development of any social protest: recruitment and mobilization, tactics and strategies, and external opposition and control. Do contemporary forms of protest strengthen civil society and democratic development around the world? The objective of course is to critically apply the theories we discuss to contemporary protest and political activity.

SOC 519 Feminism and Methodology in Social Sciences (3-0)3

This course aims to review and re-evaluate the feminist methodological literature and the basic themes in feminist research methods with a critical perspective. This involves the historical and current discussions in women's studies on the relations between science and philosophy; theory and methodology; research and epistemology; and objectivity and subjectivity. The course questions the purpose and sources of knowledge and the legitimized "knower".

SOC 520 Introduction to Structural Equation Models (3-0)3

The aim of this course is to prepare students to understand the structural equation models which are widely used in the literature, and to teach them how to use them for their own research. The emphasis is on correlation specification error, measurement error, unobserved variables, multiple, indicators, and the form and substance of sociological models.

SOC 521 The Sociology of Structural Transformations (3-0)3

Historical sociological approach to the problem of structural transformations. History and new conceptions of time. Transformational mechanisms in non-linear social history. From hierarchical to network society. Society, state and non-governmental organizations. From civil society to resistance and project communities/identities. From defense of place to space of flows.

SOC 522 Sociology of the Middle East (3-0)3

The Middle East in historical and world context. Islam and development of secularization in Turkey and other countries in the Middle East. Social, cultural, and educational transformations in selected

countries of the Middle East. Modernity, post-modernity, globalisation, orientalism, fundamentalism, authenticity, identity and religion. Sociological and anthropological depictions of cultural transitions in the Middle East and Islamic world.

SOC 523 Data Analysis (3-0)3
This is basically a computer assisted data analysis course. Knowledge of introductory statistics and any computer program such as SPSS, SAS, Minitop are required. Students learn various statistical data analysis techniques by analysing real social science data.

SOC 524 Modernity and Post-Modernity (3-0)3
The origins of modernity. Kantian and Hegelian visions of Enlightenment. Tradition and modernity: The aftermath of the Structuralist debates: Different theoretical approaches to the constitution of modern 'subjectivity'. Post-modern politics and the question of democracy. The Enlightenment Project: incomplete or aborted?

SOC 525 Global and Local Debates on Civil Society (3-0)3
This course explores theories and central debates evolving around the issue of civil society. It focuses on the relationship between state and civil society organizations which has been central to sociological analysis and the changing role of these organizations pertaining to globalization. It particularly examines recent debates on civil society and discourses of civil society organizations in Turkey. Controversial issues that affect civil society organizations are also discussed.

SOC 526 Issues in Women's Work and Employment (3-0)3
The actual and potential contribution of women in economic life. Gender segregation and discrimination in the labor market and the causes and consequence of women's unequal position at work. Impact of technological changes and economic recession on women's work; gender in the international division of labor, the economic importance of the informal sector and of women's labor.

SOC 528 Post-structuralism, Deconstruction and Feminist Theory (3-0)3
This course explores the general problematic of sexual difference by examining several thinkers such as Irigaray, Kristeva, Le Douffe, Cixous, Butler, Cornell, and the ways in which they have utilized poststructuralist theories developed by thinkers like Jacques Lacan, Deleuze, Guattari, Derrida and Foucault who have provided theoretical tools by which we can critically examine the construction of the subject, sexuality, and identity.

SOC 529 Migration and Ethnicity in Eurasian Societies (3-0)3
The aim of this course is to scrutinize the relationship between identity, ethnicity, migration and culture; the interaction between dominant cultures and minority groups and its impact on ethnic identity formation in Eurasian societies. Case studies for this course come from groups such as the Crimean Tatars, Meskhetian (Ahiska) Turks, Soviet Germans, Soviet Jews and the Russians. In addition to the western theories on ethnicity, the Soviet ethnos theory and the Soviet nationality policy are critically examined to analyze the groups specified above.

SOC 530 Kinship, Tribe, Confederation and State in Central Asia and the Middle East (3-0)3
The kinship-based structure of tribal organization and its relation to supra-tribal and non-tribal forms of organization in Central Asia and the Middle East. Concept of the segmentary lineage system and its critics; tribal structure as an organizational framework functioning simultaneously at various levels from local to societal; the historical conflict between tribe and state in the two regions.

SOC 531 Sociological and Political Issues on Turkey (3-0)3
Formation of nation-state; capitalist penetration and incorporation; state and capital; populism; ideological conservatism; modernity, Westernization; statism; merchant bourgeoisie and political rule; state and hegemony; breakdowns of the internal order and the establishment of hegemony; ideologies and patterns of domination in internal politics; social movements; relations among and between subordinate and dominant classes.

SOC 532 Sociological Themes and Debates in Politics, Science and Culture (3-0)3
Critical analysis of the historical and contemporary themes and debates in politics, science and culture: confusion between social science and social philosophy; how material and spiritual cultures are related and what are their bases; historical development of the forms of social consciousness; politics and contemporary philosophical analysis; a critical evaluation of the methodology of modern political science.

SOC 533 Gender Issues on Class and Patriarchy (3-0)3

The classical approaches to class and patriarchy in historical and contemporary perspectives; interpretation and explanation of structured social inequality, patriarchal relations and their implications on politics and social change; women's position and the system of economic exploitation; feminist and main-stream stances on the gender and stratification debate feminist approaches giving emphasis on patriarchal structures.

SOC 534 Anthropology of Europe (3-0)3

This course offers a general overview of the European society and culture through a critical discussion of the anthropological works on the area. The principal aim is to provide students with the necessary theoretical and methodological tools to explore and appreciate the diversity of individual and collective experiences in Europe from a culturally relativistic point of view. Moreover, the European Union and its enlargement process as reflected through the anthropological lens will be major focus of the readings and class discussions.

SOC 535 Contemporary Feminist Theory (3-0)3

This course explores a number of theories and central issues evolving around the issues of women's oppression. It particularly focuses on patriarchy which has been central to much feminist analysis and continues to inform a great deal of feminist work.

SOC 536 Peoples and Cultures of Central Asia (3-0)3

The course will provide an understanding of the region and its peoples over the course of the last century. So it will start with a general overview of its geography and history as well as some general patterns of traditional economy and society, including the major religions in the past and in the present. The second part will introduce the indigenous peoples in the region, i.e. those that were already living there before the area was annexed by the Russians and the Chinese respectively. In the third and fourth part of the changes that took place during the socialist times and in the aftermath of the dissolution of the socialist systems will be discussed.

SOC 537 Anthropology of Religion (3-0)3

The course deals with religion as an aspect of social-cultural system; recognizing religion as a system of symbols which gives meaning to the "life-world"; social and cultural dynamics of the "Sacred"; the place and role of religion in the worldly/political processes and power struggles; general assessment of theoretical approaches to the nature, origin and functions of religion. The course also aims at studying religion as a social phenomenon and focuses on the cultural bases of religious thought and behavior, comparative assessment of world religions; the ways in which religious activities are organized in a society and mobilize people in common action; comparative and critical analysis of different theoretical perspectives on religion in anthropology and sociology.

SOC 538 Human Development and Social Policy (3-0)3

This course explores the concept and practice of Human Development as a sociological analysis tool with emphasis on national and social development policy building. The course will examine the multifarious social and economic development debates offered by the global Human Development Reports (HDR) or UNDP, published annually since 1990. Particular emphasis will be given to analysis and discussion of Turkey's human development performance in the context of the construction of the Human Development Index (HDI) and in the time period of 1990-2005 while comparative perspective maintained with those of selected UN member states, EU and OECD countries. Controversial human development issues will be discussed with the aim of shifting analysis towards the adoption of the Human Development perspective in policy making and development priority setting for socio-economic development and formulation of related action programmes/projects.

SOC 539 Social Policy and Welfare Issues in Turkey (3-0)3

This course seeks to develop a criticial understanding of social policy and welfare issues in Turkey and internationally, considering the value of cross-national comparison in the analysis of social policy. In the first part, after a brief presentation of the existing arrangements and new perspectives on the welfare state in Europe, the course leads to explore whether broad international trends can be identified in the case of Turkey. Key issues of welfare and the changes in previous after 1980 will be examined. The course will also cover the relationship between welfare state and civil society. In the second part of the course students are expected to study of the following issues (Social security/education/employment and unemployment distribution/health/ housing/family/childcare/ageing and elderly care / disability / poverty / child abuse and child poverty/ social services/ social assistance and / or other issues) in relation and with reference to Turkey, that would be integral and consistent to the content of the course.

SOC 540 Class and Ethnic Relations in the Middle East (3-0)3

This course focuses on patterns of collective identity, solidarity and conflict based on such ascriptive factors as descent, language, customs and belief systems and examines how communal fragmentations coexist with the emerging class formations in the Middle East. Comparative analysis will be used to identify political cleavages within as well as among communal groups in this particular region.

SOC 541 Labor Market and Social Rights (3-0)3

Exploration of key arguments of and debates on the labor market and social rights in the global perspective; analysis of classic theories of the relationship between the state, labor market and social rights; comparative focus on organization of social policies and major social policies and programs.

SOC 542 Qualitative Research (3-0)3

The aim of this course is to introduce post-graduate students the features and practice of the qualitative research. It will particularly focus on the nature of the qualitative research, its research techniques, its design and conducting fieldwork. It will also highlight ethical aspects of qualitative research and relations in the field. This course will also enable post-graduate students to write up research papers, articles and thesis based on the qualitative data. Students will acquire in-depth knowledge about the qualitative research as well as practical skills for conducting fieldwork.

SOC 543 Family, Marriage and Kinship Dynamics in Turkey (3-0)3

This course examines different practices of family, marriage and kinship in Turkey by taking into consideration social class, regional and religious/ethnic differences. Practices of family relations, marriage and kinship, and individuals' perceptions and expectations of these relationships show diversity in Turkey in the last decades; the changing social norms, economic dynamics and policies related to the dynamics of family, marriage and kinship are also influential to the transformation of the family, marriage and kinship practices in Turkey over time.

SOC 544 Anthropology of the Middle East (3-0)3

This course offers a general overview of the Middle Eastern communities and cultures through a critical discussion of the anthropological works on the area. The principal aim is to provide students with the necessary theoretical and methodological tools to explore and appreciate the diversity of individual and collective experiences in the Middle East from a culturally relativistic point of view. Students will be exposed to a wide-range of ethnographic studies based on participant observation in various parts of the Middle East.

SOC 545 Sociology of Everyday Life and Interpersonal Relations (3-0)3

Studies on the sociology of everyday life and the studies on interpersonal relations in small group contexts will be brought together in this course through a critical survey and discussion of recent literature.

SOC 546 Issues in Criminology (3-0)3

The relationship between criminal law and social structure. Social order and crime. Police force,jails and courts, prejudice and stereotype definitions. Crime as a social product. Theoretical issues and methodological problems.

SOC 548 Art in Turkey: Sociological Perspecctives (3-0)3

A sociological perspective on the last 150 years (1850-2000) of the art of painting in the Ottoman Empire and Turkey. Emphasis on master pieces and/ or the omitted pieces of each period with regards to social, cultural, political, economic, geographical and historical conditions leading to their creation. Putting artists background, education and relations under a magnifying glass. Highlighting questions such as how and why art changes and looking for answers in relation to the history of modernization in Turkey. Revisiting Orientalism/ Occidentalism, rethinking evolution in art and the appropriation/ translation of Western art movements in Turkey.

SOC 550 Middle East Women, Feminism and Orientalism (3-0)3

Feminist debates concerning the problems that pertain to the cross-cultural representation of Middle Eastern women. Studies which call into question the assumptions of a singular, unitary and homogeneous category of the Middle East women. The epistemological, and theoretical of Orientalist and evolutionary paradigms. The traditional geopolitics such as colonialism, modernization and nationalism.

SOC 551 Seminar in Sociology of Religion (3-0)3

Principally being supplementary to SOC 650, Sociology and History, this course aims at deepening perspectives on Historical Sociology by concentrating on problems raised by different kinds of religious movements. Based on perspectives developed within comparative religion, special

attention will be given to developments in the Middle East.

SOC 552 Sociology of Culture (3-0)3
Overview of theories of culture from a sociological perspective in order to gain an understanding of the impact of culture on social processes and the impact of social prosses on cultural forms.The course will also highlight the relationship of culture to concepts such as class , power, inequality, identity.The relationship of culture and economy will be explored, as well as how cultural practices are produced and reproduced within social systems.

SOC 553 Sociology of Consumption (3-0)3
Overview of theories of consumption from a sociological perspective; consumption and modernity; consumption and postmodernity; consumption in different social and cultural contexts; current trends in consumption; relation of consumption to globalization, commodification, class, race, gender and identfy; political economy of consumption.

SOC 554 Challenges of Social Policy in the EU and Turkey (3-0)0
The objective of the course is to examine the diversity of welfare state and social policy traditions in the European Union(EU)and in Turkey in view of understanding the challenges of social policy in the face of globalization,Europeanization and enlargement.The course focuses on the welfare regime typologies in Europe and the emergence ,development,dynamics and processes of EU social policy.Social policy and welfare state in Turkey will be examined in the context of EU membership,with a view to outlining the implications of EU social policy for Turkey ,as well as the implications of Turkish accession for EU social policy.

SOC 555 Anthropology of Migration and Transnationality (3-0)3
This course deals with relevant theoretical and empirical contributions of anthropology to the field of migration and transnationality. It particularly focuses on the application of theoretical concepts in various ethnographic studies. The course further deals with questions of fieldwork and comparative approaches in the context of mobility and complexity. It includes material from different parts of the world and particularly explores flows of people, transnational relations and local regulations of diversity.

SOC 560 Globalization and Diasporas (3-0)3
This course aims to analyze the political, economic and cultural dimensions of globalization at an advanced level. It will focus on the formation of diasporic communities; bi-national affiliations and multiple loyalties; the role and status of the nations-state; arguments of de-nationalization; new forms of racism and counter-forces of multiculturalist claims; global cities as the most intensely polarized social spaces of the activities of globalization; cosmopolitan attachments and the different ways in which borders are crossed by migrants and tourists.

SOC 561 Ideology and Discourse Analysis (3-0)3
This course aims to study the trajectory of the categories of “ideology” and “discourse” in radical social thought with a focus upon the issues of “constitution of meaning” and “constitution of subject”. The topics to be discussed throughout the course are as follows: Marxism and ideology, ideology as false consciousness (Lukacs), the question of hegemony (Gramsci), ideology as interpellation (Althusser), significatory theory of linguistics (Saussure), the priority of utterance (Voloshinov), archeological and genealogical readings of texts (Foucault), the discursiveness of the social (Laclau and Mouffe) and intertextuality (poststructuralism and Derrida)

SOC 570 Citizenship and Society (3-0)3
A brief history of citizenship. Main contours of citizenship. Citizenship as membership; citizenship and political community. Citizenship as status; citizenship rights. Citizenship as participation. Liberal, Communitarian and Republican approaches to citizenship. Transformation of political community and citizenship today. New modalities of citizenship. Citizenship in the European Union.

SOC 571 Conflict, War, and Human Rights in the New Era (3-0)3
This course aims to examine the changing nature and dynamics of contemporary conflicts within the framework of shifting boundaries of global power, transnational politics and the emerging international system of governance and law and order. This includes identifying the root causes of conflicts and the review of theories and conceptual frameworks required for a holistic understanding of the phenomenon. It will also familiarize the students with intervention strategies, the international normative framework for peace and justice and initiatives for conflict resolution. The course will connect theory to practice through the analysis of research and case studies from all over the world.

SOC 578 State Subject and Legitimacy in Turkey (3-0)3
This course addresses state–subject (citizen) relations in Turkey. Its primary aim is to examine

the 'evolution' of "subjecthood" in Turkey. The idea is to compare the logic of the (Ottoman) Empire and the (Turkish) Republic in this respect. Comparison between these two logics will be conducted with a particular emphasis upon the question of legitimacy. The resemblances and the differences in the ways in which state–subject relations have been legitimized in the era of Empire and that of Republic will be studied. In studying the question of legitimacy, priority will be given to the examination of such domains as law, justice, and ideology in the Ottoman Empire and the Turkish Republic.

SOC 580 Current Issues in Cultural Studies and Critical Theory(3-0)3

In the last decade or so, the label "cultural studies" has become one of the widely used terms. This course offers a critical exploration of the current literature in the emerging field of Cultural Studies. We will map out and trace some of the issues, concepts and subjects that have come to define the field of cultural studies and those that are mostly likely to influence where it is heading towards, such as identity, otherness, subalternity, representation, transnationalism, postmodernism, orientalism, multiculturalism, nationalism and deconstruction such as. Our aim will not be to search definitive answer to the convoluted social and cultural issues, but regard this course as a chance to grapple with the intricacies of social, cultural life and theory.

SOC 582 Seminar on Ethnographic Field Research (3-0)3

This course introduces students to ethnographic field research by way of methodological readings and field practice. In the first part of the course, students will be provided an overview of various field techniques used by ethnographers as well as different ways of managing, coding, and analyzing field dates. In the second part of the course, students will be asked to carry out ethnographic fieldwork and present their findings.

SOC 589 Term Project (Non-thesis) NC

SOC 590 Nations and Nationalism in the Modern Middle East (3-0)3

In spite of the contemporary strong forces at work in the direction of globalization, formation and consolidation of nations is no less significant. Nation-building is a decisive part of modernity. As such it has a longer history in Europe than in other regions in the world. In the Middle East, for example, nation building is a process that mainly got under way during the last (20th) century. Many problems facing this part of the world today –like the current political and social instability and questioned territorial boundaries – are closely related to the process of nation-state formation. During the last couple of decades the development of radical Islam has overshadowed what is happening on the level of nations and national identity formation. The aim of this course is to study this aspect of recent Middle East developments and to do so in the light of rich theoretical literature on nations and nationalism that has appeared since the collapse of the Soviet Union.

SOC 598 Debates in Society and Theory (3-0)3

A through reading and discussion of the crucial social and theoretical issues in contemporary society. Each semester the course will focus on one of the basic questions in contemporary society like the meaning and import of modernity and postmodernity, faith, subjectivity, identity, constitution of the social, theory of history and historiography, knowledge and the knowledge of the social, value and the social constitution of the value, differentiation of morality and ethics. As much as the topics overlap, the specific focus on a certain topic will also include discussions concerning other topics as well.

SOC 599 Master's Thesis NC

SOC 600 Ph.D. Seminar (3-0)3

The purpose of this seminar is to help Ph.D. students in writing up their proposals and conducting their research.

SOC 628 Global Society (3-0)3

This course aims to identify the major trends of change within the globalization process, i.e. transformation of contemporary world. The emphasis will be on the changing character of global division of labor and its implications for the relationships between state, community and the individual both in developed as well as underdeveloped societies.

SOC 631 Current Issues in Sociology and Social Theory (3-0)3

The purpose of this course is to follow up the most recent topics of discussion in sociology. Concepts and theories will be critically scrutinized in terms of logical consistency, empirical validity and the general relevance of the issues.

SOC 632 Recent Developments in Methods of Sociological Inquiry (3-0)3

The course will introduce recent quantitative/ qualitative techniques to students. Various techniques for data collection, fieldwork and data analysis will be introduced. Students will be

encouraged to use recent research techniques in the course so as to increase their mastery of the research tools.

SOC 633 Social History of Institutions in Turkey (3-0)3

The key institutions and processes of institutionalization in Turkey's recent history. Course material will include basic books, official reports, legal documents, newspapers collections, pamphlets, literary works as well as personal materials such as letters, diaries and journals.

SOC 641 Sociology of Industrialization and Modernization (3-0)3

A critical review of theories and debates on the transition from agrarian social structure to modern structures in the West and in the Third World. A critical evaluation of strategies of industrialization and its consequences. Industrialization, urbanization, their interrelationships and their social and cultural consequences.

SOC 642 Sociological and Anthropological Studies in Turkey (3-0)3

This course has two aims. First, to ensure that the students are familiar with the range of available empirical researches and studies on Turkey, and secondly to examine critically and in detail some selected examples.

SOC 643 Advanced Issues in the Sociology of Knowledge (3-0)3

An understanding of the dynamic relations between ideas, ideologies, norms and values; social groups and strata. Reading of classical theorists in the sociology of knowledge. The role of ideas, norms and values in the constitution of historically-determinate social formations and civilizational complexes. The relationships between knowledge and everyday life.

SOC 644 Public Opinion, Culture and the Media (3-0)3

The role of the mass media in molding and reflecting public opinion and cultural values. "Agenda-setting" or "mainstreaming" functions of the media; the organization of public debate around a certain issue in current affairs and news programs. Media and politics; political propaganda and campaigning and its effects on political attitudes and voting behavior. Media and culture; advertising and the formation of dominant image patterns.

SOC 646 Family, Marriage and Kinship: Debates and Issues (3-0)3

Current controversies concerning the relation between modern industrial systems of production and the social relations of reproduction based on domestic groups, marriage and kinship relations.

SOC 647 Power, Status and Social Rank (3-0)3

Current debates on selected issues in stratification and social mobility. Patterns of status and class differentiation in relation to division of labor, prestige, and of esteem. Class formation and internal class divisions. Poulantzas, E.O. Wright and P. Bourdieu on class and status: class and consumption, life-style; class and gender; class and race and ethnicity migration; class and poverty; class and citizenship.

SOC 648 Order and Social Control: Formality and Informality (3-0)3

Theories and controversies, with detailed examples, concerning the relation between the judicial and penal systems of a modern state and the informal controls over individual conduct based on day to day social interaction.

SOC 649 States, Nations and Political Alignments (3-0)3

The formation of states, in the light of different theoretical constructions such as Eisenstadt's "bureaucratic empires", P. Anderson's "absolutist state", Weber's "patrimonialism", Rokkan's "nation state". Nationalism in the modern world. Increased bureaucratization and the broadening of political participation, the question of democracy and ideologies that either accept or reject its tenets.

SOC 651 Comparative Study of Agrarian Social Structures (3-0)3

Organization and structure of peasantry, peasant family, village communities and their relationship with market, state and cultural contexts and major changes that have been taking place in these structures and relationships will be studied in historical and comparative perspective.

SOC 652 Organization and Work (3-0)3

This course attempts first a comparative study of current debates about the way people in different societies organize productive and service sector activities, from hunting to modern industry; and secondly, a reading of a number of selected intensive case studies.

SOC 653 Sociology of Studies on Women (3-0)3

Critical examination of the data and theories in sociology about women. Biological versus social explanation, stereotyping, sex roles in different societies, and the gender component in power relations. Neoclassical and radical approaches to labor force participation, domestic work, the household and female sexuality. Theoretical and empirical analysis of the connections between production, reproduction and the sexual division of labor.

SOC 654 Economic and Social History of Turkish Society (3-0)3

This course attempts a comprehensive study of Turkish society in historical perspective, based on the rigorous reading of classical and modern texts of relevance. This project is to be realized at two levels: 1. the survey of certain social structures Turks had, notably those of Central Asia, Seljukid and Ottoman Anatolia, and modern Turkey; 2. issues and theoretical problems and debates of modern Turkish historiography concerning these past forms.

SOC 659 Space, Place And Gender (3-0)3

This course stems from a discussion which argues that throughout history and across cultures, architectural and geographic spatial arrangements have reinforced status differences between different gender identities, and, thus aims to examine the relationship between space, place and gender from an interdisciplinary feminist perspective by focusing on the current debates in urban theory, social history, feminist geography, architecture, gender and cultural studies. Feminist postmodern critique of modernist either/or distinctions and the gendered manifestations of these distinctions in different political and cultural contexts which created exclusivist claims to places, and how these claims are both challenged and negotiated by various social agents constitute the central discussion topics of the course with special emphasis on the global sense of the place within a space-time continuum.

SOC 660 Sociology, History and Religion (3-0)3

The objective of this course is to compare sociology and history with respect to their theoretical and methodological perspectives. Where do they differ and where do they overlap? What can they lear from each other?

SOC 671-672 Sociology and History I-II (3-0)3

This course, which runs over two semesters, aims at an in-depth study of historical sociology. Characteristic for this tradition within sociology is not only that a historical dimension is added the analysis of sociological (or social) problems, but that society is perceived of an ongoing process, which has to be evaluated in a long-term perspective. This approach, characteristic for classical sociology, was lost under the spell of the specialization on different branches within sociology, which came to dominate the discipline after the Second World War. This tradition has, however, been taken up again, both by historians and sociologists, and it is especially these 20th century carries of the classical sociological tradition that will be the focus of this course. The fundamental idea behind historical sociology is that long-term history cannot successfully be carried out without a theory about society. On the other hand, sociology with a long-term processual perspective cannot do without proper historical scholarship. Therefore these two disciplines can only develop by learning from each other. The 20th century sociologists who has been more articulated on this issue than most others is Norbert Elias, and for that reason the first part of this double course, will concentrate on his extensive work, starting from his The Civilizing Process. In the second part of the course several other representatives of long-term processual perspectives will be analyzed, like Ferdinand Braudel, Marshall Hodgeson, Eric Hobsbawn, Charles Tilly, Michel Foucault, Pierre Bourdieu. Special emphasis will be given according to the interests and preparations of the student.

SOC 699 Ph.D. Dissertation NC

SOC 800-899 Special Studies NC

SOC 900-999 Special Topics NC

SOC 5555 International Student Practice 0

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DEPARTMENT OF STATISTICS

PROFESSORS

AKKAYA (DENER), Ayşen: B.S., M.S., Ph.D., METU.
BATMAZ, İnci ***(Department Chair)***: B.S., METU; M.S., Ph. D., Ege University.

ASSOCIATE PROFESSORS

İLK DAĞ, Özlem ***(Vice Chair)***: B.S., METU; M.S., Ph.D, Iowa State University.
PURUTÇUOĞLU, Vilda: B.S., M.S., METU; Ph.D., Lancaster University.
SÜRÜCÜ, Barış: B.S., M.S., Ph.D., METU.

ASSISTANT PROFESSORS

BAŞBUĞ ERKAN, Berna Burçak: B.S., METU; M.S., University of Warwick; Ph.D., London School of Economics.
KALAYLIOGLU, Zeynep, B.S., METU; M.S., Ph.D., North Carolina State University.
YOZGATLIGİL (TALU), Ceylan: B.S., M.S., METU; Ph.D., Temple University.

GENERAL INFORMATION: The Department of Statistics offers courses leading to the degree of Bachelor of Science, Master of Science and Doctor of Philosophy.

The purpose of the programs is to train students and researchers to carry out research based on extensive observations and experimentations; collection and analysis of data in laboratories and social, economic and public systems and organizations and to derive inferences about the behavior of such systems. The students who complete the statistics education in the Department will be able to make their skills available in the science of inductive inference for research, industrial and social organizations by playing an important part in solving problems of science and practical life. Graduates are expected to take part in research and development activities in such institutions as the State Planning Organizations, State Institute of Statistics, Ministries, State Economic Enterprises and other public and private. To this end, the Department emphasizes both the theory and the applications of statistics with special emphasis on computational statistics in its undergraduate and graduate programs.

LABORATORIES AND EQUIPMENT: The department has its own computer facilities. A laboratory is open to the use of the students of the department. A large number of statistical and graphical package programs are available in the PC's of the laboratory.

MAJOR RESEARCH INTERESTS OF THE STAFF: The major graduate level research areas are, optimal design of experiments, statistical reliability, time series data, longitudinal data, biostatistics, survival analyses, bioinformatics and genetics, system and computational biology, actuarial risk and data analyses, disaster management, extremes of random functions and applications, stochastic modeling of engineering systems, metamodeling, multi-level modeling, computational statistics, response surface methodology, simulation, quality improvement, survey methods research, categorical data analysis, robust statistical methods, environmental statistics, Bayesian inference, and data mining…

UNDERGRADUATE PROGRAM: The required courses for the Bachelor of Science (B.S.) degree in Statistics are listed in the following pages. All students are required to develop working knowledge and skills in the computers, scientific and statistical computing.

GRADUATE PROGRAMS:

Degrees

The Department of Statistics offers M.S. and Ph.D. degrees in Statistics, and M.S. degree in Interdisciplinary Statistics. The programs enable students to acquire a sound understanding of the theoretical basis of statistics and emphasize the formation of research capability in applied research work.

In addition to the relevant regulations of the Graduate School for granting the M.S. and Ph.D. degrees, the following are required by the Department,

a) For the M.S. degrees: The completion of at least seven credit courses.
b) For the Ph.D. degree: The completion of at least eight credit courses.

The main objective of the master's program is to train students in applied statistics by imparting knowledge of the theory and practice of statistics. This program will furnish its graduates with abilities to take part in studies involving extensive observations and experimentations; collection and analysis of data in laboratories, social, economic and public systems, organizations and to derive inferences about the behavior of underlying systems. On the other hand, the Ph.D. program is structured with the objective of preparing students for careers in university teaching and research and for industrial and government positions that involve consulting and research in new statistical methods.

CAREER OPPORTUNITIES: The graduate programs are designed to train students for positions in industry, government and academic institutions. The graduates of the programs will be able to make their skills available in the science of inductive inference to research, industrial and social organizations by playing important part in solving problems of science and practical life. The interdisciplinary nature of the programs brings together faculty and students interested in statistical applications in engineering, science, social sciences, management and planning, as well as statistical theory, and this nature enriches the career opportunities for graduates. Some career opportunities for the graduates are:

Teaching and academic positions which involve research in the universities; Industrial and governmental positions involving consulting and research in existing and new statistical methods; Programmer and analyst in statistical software development centers.

STATISTICAL COMPUTING: All graduate students are required to develop working knowledge and skills in the computers and scientific computing.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

STAT	153	Probability I	(3-2)4
STAT	155	Principles of Statistics	(3-2)4
MATH	119	Calculus with Analytic Geometry	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Application	NC

Second Semester

STAT	154	Probability II	(3-2)4
STAT	156	Statistical Methods	(3-2)4
MATH	120	Calculus for Functions of Several Variables	(4-2)5
ENG	102	English for Academic Purposes II	(4-0)4
CENG	230	Introduction to C Programming	(2-2)3

SECOND YEAR

Third Semester

STAT	271	Mathematical Statistics I	(3-2)4
STAT	291	Statistical Computing I	(3-2)4
MATH	219	Intro. to Differential Eqns.	(4-0)4
MATH	260	Basic Linear Algebra	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

STAT	272	Mathematical Statistics II	(3-2)4
Non Departmental Elective			(3-0)3
STAT	292	Statistical Computing II	(3-2)4
MATH	250	Advanced Calculus in Statistics	(4-2)5
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

STAT	361	Computational Statistics	(3-2)4
STAT	363	Linear Models I	(3-2)4
STAT	365	Survey Sampling Techniques	(3-2)4
STAT	391	Probability Theory	(2-2)3
ENG	311	Advanced Communication Skills	(3-0)3

Sixth Semester

STAT	356	Statistical Data Analysis	(3-2)4
STAT	364	Linear Models II	(3-2)4
STAT	366	Survey Research Methods	(3-0)3
STAT	376	Stochastic Processes	(3-2)4
TURK	304	Turkish II	NC
TURK	303	Turkish I	NC

FOURTH YEAR

Seventh Semester

STAT	457	Statistical Design of Experiments	(3-2)4
STAT	465	Multivariate Analysis I	(3-2)4
STAT	499	Undergraduate Research	
or			
Departmental Elective			(1-4)3
Non Departmental Elective			(3-0)3

Eighth Semester

STAT	460	Nonparametric Statistics	(3-0)3
STAT	466	Multivariate Analysis II	(3-2)4
Departmental Elective			(2-2)3
Non Departmental Elective			(3-0)3

MINOR PROGRAM IN STATISTICS

This program is designed for students of non-statistical background.

Preliminary courses required for admission:
MATH 119 Calculus I or equivalent
MATH 120 Calculus II or equivalent

Compulsory Courses

STAT 153 Probability I
STAT 154 Probability II
STAT 271 Mathematical Statistics I
STAT 272 Mathematical Statistics II
STAT 363 Linear Models I

Plus one elective course offered by the Department of Statistics.

DESCRIPTION OF UNDERGRADUATE COURSES

STAT 153 Probability I (3-2)4
Sample space, events. Basic combinatorial probability, conditional probability. Bayes' theorem, independence, random variables, distributions, expectation.

STAT 154 Probability II (3-2)4
Transformations of random variables, generating functions, conditional expectation. Limit theorems, central limit theorem, limiting distributions.
Prerequisites: STAT 153, MATH 119

STAT 155 Principles of Statistics (3-2)4
Brief history of statistics. Basic definitions and types of data, descriptive statistics. Elementary probability, random variables, probability distributions and their properties. Introduction to use of computer solving tools.

STAT 156 Statistical Methods (3-2)4
Sampling distributions, estimation, confidence intervals, hypothesis testing, power of test, analysis of variance for one or two factor designs, linear regression, basic nonparametric procedures.

Elementary time series analysis, trends, seasonality, forecasting.
Prerequisite: STAT 155 or Consent of department.

STAT 201 Introduction to Probability and Statistics I (3-0)3
Experiments and events. Set theory. Axioms and basic theorems of probability. Finite sample spaces and counting techniques. Independent events. Conditional probability. Random variables and distributions. Expectation, variance, covariance and correlation. Some special distributions.

STAT 202 Introduction to Probability and Statistics II (3-0)3
Random samples. Sample mean and variance. Chebychev's inequality. Law of large numbers. Central limit theorem. Estimation. Maximum likelihood, unbiased, minimum variance unbiased, consistent and efficient estimators. Sufficiency. Confidence intervals. Hypothesis testing. Introduction to nonparametric methods. Regression and analysis of variance.
Prerequisite: STAT 201

STAT 221 Fundamentals of Statistics (3-0)3
Introduction to probability. Finite sample spaces. Conditional probability and independence. Discrete and continuous random variables. Random sample and statistics. Statistical inference, estimation and tests of hypotheses. Simple linear regression.
Prerequisite: MATH 120

STAT 256 Numerical Methods (3-2)4
Accuracy in numerical computations. Numerical solution of linear and nonlinear algebraic equations. Finding eigen-values and eigenvectors. Finite difference calculus. Interpolation and extrapolation. Numerical differentiation and integration. Numerical approximation methods.
Prerequisites: STAT 291 or STAT 292, MATH 260

STAT 271 Mathematical Statistics I (3-2)4
Common theoretical distributions. Sampling distributions. Principles of point estimation. Techniques of estimation .Properties of point estimators. Optimality criteria in estimation. Selected topics from robust inference. Bayesian inference.
Prerequisites: STAT 154 or consent of the department and MATH 120.

STAT 272 Mathematical Statistics II (3-2)4
Region (interval) estimation. Hypothesis testing. Optimality properties for hypothesis testing. Likelihood ratio tests. Sequential tests.
Prerequisite: STAT 271

STAT 291 Statistical Computing I (3-2)4
Introduction to statistical techniques in statistical software. Managing and analyzing data using statistical database packages. Introduction to MATLAB with applications to matrix algebra.
Prerequisites: CENG 230, STAT 156

STAT 292 Statistical Computing II (3-2)4
Introduction to programming and computation. Introduction to computer organization and basic data structures. An advanced programming language with applications to statistical procedures.
Prerequisite: CENG 230

STAT 356 Statistical Data Analysis (3-2)4
Types of data. Graphical and tabular represantation of data. Approaches to finding the unexpected in data. Exploratory data analysis for large and high-dimensional data. Analysis of categorical data. Elements of robust estimation. Handling missing data. Smoothing methods. Data mining.
Prerequisites: STAT 156, STAT 291

STAT 361 Computational Statistics (3-2)4
Random number generation. Generating from other distributions. Monte Carlo methods for inferential statistics. Resampling. Data partitioning. Cross-validation. Bootstraping. Jackknifing. Tools for exploratory and graphical data analysis. Nonparametric probability density estimation.
Prerequisite: STAT 291

STAT 363 Linear Models I (3-2)4
Simple and Multiple Linear Regression Models. Estimation, interval estimation and test of hypothesis on the parameters of the models. Model Adequecy Checking. Multicollinearity. Transformation.
Prerequisites: MATH 260, STAT 156

STAT 364 Linear Models II (3-2)4
Simple nonlinear models, Less than full rank models : One-way , Two-way ANOVA models, Multiple comparison tests, Analysis of Covariance (ANCOVA) Models, Introduction to generalized linear models (GLM), Poisson regression, Logistic regression.
Prerequisite: STAT 363

STAT 365 Survey Sampling Techniques (3-2)4
Introduction to survey sampling. Probability sampling techniques. Simple random sampling. Stratified element sampling. Systematic sampling. Equal sized cluster sampling. Unequal sized cluster sampling. PPS selection techniques. Sampling errors.
Prerequisite: STAT 156 or equivalent for non-statistics majors.

STAT 366 Survey Research Methods (3-0)3
Introduction to survey research. Survey research methods. Planning of sample surveys. Survey designs. Methods of data collection. Questionnaire design techniques. Fieldwork organization methods. Survey designs over time. Multiplicity survey designs. Establishment survey designs. Components of total survey error. Survey research project.
Prerequisite: STAT 365 or consent of department for non-statistics majors.

STAT 376 Stochastic Processes (3-2)4
Random walk. Markov chains, martingales. Discrete and continuous parameter Markov processes. Branching processes. Birth and death processes. Renewal processes. Queuing processes. Applications.
Prerequisite: STAT 391

STAT 391 Probability Theory (2-2)3
Sigma-algebra of events. Probability measure. Axioms of probability. Conditional probability and independence. Combinatorial problems. Random variables and their distributions. Functions of random variables. Distribution functions. Expectation. Conditional expectation. Moments and characteristic functions. Convergence of random variables. Central limit theorem. Laws of large numbers.
Prerequisite: STAT 154 or Consent of the department.

STAT 444 Advanced Statistical Computing (3-0)3
Reading raw data files and Statistical Analysis Software (SAS) data sets, and writing the results to SAS data sets; subsetting data; combining multiple SAS files; creating SAS variables and recoding data values; creating listing and summary reports
Prerequisite: STAT 156 or consent of the department.

STAT 457 Statistical Design of Experiments (3-2)4
Strategies for experimentation, Randomized complete and balanced incomplete block designs, Latin squares. General, two-level and fractional factorials. Blocking and confounding in two-level factorials. Three and mixed level factorial and fractional factorials. Introduction to response surface methodology. Second-order experimental designs. Nonnormal responses. Unbalanced data in factorials. Split-plot designs, Nested designs, Random effect models. Repeated measures.
Prerequisite: STAT 363 or consent of the department.

STAT 460 Nonparametric Statistics (3-0)3
Review of basic statistics. Distribution-free statistics, ranking statistics, U statistics. Large sample theory for U statistics. Tests based on runs. Asymptotic relative efficiency of tests. Hypothesis testing, point and interval estimation. Goodness of fit, rank-order (for location and scale), contingency table analysis and relevant models. Measures of association, analysis of variance.
Prerequisite: Consent of department

STAT 461 System Simulation (3-2)4
Introduction to discrete-event system simulation and simulation software. Statistical models in simulation. Queuing models. Input data modeling. Variance reduction techniques. Verification and validation of simulation models. Output analysis for a single model. Comparison and evaluation of alternative system design.
Prerequisite: STAT 156 and STAT 292

STAT 462 Biostatistics (3-2)4
Populations and samples. Types of biological data. Data transformations. Survival data analysis. Life tables. Sample size determination in clinical trials. Measures of association. The odds ratio and some properties. Application of generalized linear models and logistic regression to biological data. Analysis of data from matched samples.
Prerequisite: STAT 156

STAT 463 Reliability (3-0)3
Reliability studies. Statistical failure models. Censoring and truncation and their types. Useful limit theorems in reliability. Inference procedures for lifetime distributions. System reliability. Bayesian methods. Accelerated life testing.
Prerequisite: STAT 272

STAT 464 Operations Research (2-2)3
Basic operations research methodology. Basic models such as network flow models, project scheduling, dynamic programming, and production and inventory control. LP and game theory. Two person zero-sum games and mixed strategies.
Prerequisite: MATH 260

STAT 465 Multivariate Analysis I (3-2)4
Vectoral representation of multivariate data. Sample mean vector and sample covariance matrix. Multivariate distributions, multivariate normal distribution, some other multivariate distributions. Parametric estimation. Hypothesis testing. Reduction of dimensionality.
Prerequisites: MATH 260, STAT 156

STAT 466 Multivariate Analysis II (3-2)4
MANOVA. Principal components, factor analysis. Multivariate classification and clustering. Canonical correlation.
Prerequisite: STAT 465

STAT 472 Statistical Decision Analysis (3-2)4
Introduction to decision making and types of decision situations. Bayes theorem and Bayesian decision theory. Prior, posterior and conjugate prior distributions. Loss functions. Empirical Bayesian approach. Utility theory for decision making. Value of information. Sequential decision procedures. Multidecision problems.
Prerequisite: STAT 154

STAT 477 Statistical Quality Control (2-2)3
Introduction to concepts of quality and total quality management. Basic principles of teamwork and learning. Probability in Quality Control. Methods and Philosophy of Statistical Process. Control Charts for variables and attributes. Cumulative-Sum and Exponentially Weighted Moving-Average Control Charts. Process Capability Analysis. Introduction to Experimental Design and Factorial Experiments. Taguchi Method, Lot-by-Lot Acceptance Sampling for attributes and by variables.
Prerequisite: STAT 156

STAT 479 Linear Programming (2-2)3
Introduction to Linear Programming (LP). The simplex method. Transportation, assignment and transshipment problems. Sensitivity testing, duality theory and its applications. Advanced methods in LP and revised simplex algorithm.
Prerequisite: MATH 260

STAT 480 Application of Statistical Techniques in Socio-Economic Research (3-2)4
Prinicipals of empirical socio-economic research. Formulation of research problems, determination of research design, application of sampling design. Strategies of field work, collection of data, improving data quality, selecting appropriate statistical methods. Evaluation of test of hypothesis and interpretation of findings. Preparation and presentation of a research proposal and report.
Prerequisite: STAT 356

STAT 482 Categorical Data Analysis (3-2)4
Probability distributions and measures of association for count data. Inferences for two-way contingency tables. Generalized linear models, logistic regression and loglinear models. Models with fixed and random effects for categorical data. Model selection and diagnostics when response is categorical. Classification trees.
Prerequisite: STAT 272

STAT 487 Insurance and Actuarial Analysis (3-0)3
Basic definition of insurance. Historical background. Insurance applications in government and private sector, regulations and legislation in insurance. Fundamentals of insurance. Types of insurance, disaster insurance and risk menagement applications around the world. Turkish catastrophe insurance pool. Definition of risk, probability aspect of risk. Utility theory, claim processes, distribution of claim processes.
Prerequisite: Consent of the department.

STAT 493 New Horizons in Statistics (3-0)3
New advances in the field of statistics.
Prerequisite: Consent of department

STAT 495 Applications in Statistics (2-2)3
Applications of different statistical methods in various disciplines such as medicine, science, engineering and social sciences. Presentation of projects involving these applications as group studies.
Prerequisite: STAT 156

STAT 497 Applied Time Series Analysis (3-2)4
Time series as a stochastic process. Means, covariances, correlations, stationarity. Moving averages and smoothing. Stationary and nonstationary parametric models. Model specification. Estimation and testing. Seasonality. Some forecasting procedures. Elementary spectral domain analysis. Exponential smoothing methods. Unit root tests.
Prerequisite: Consent of the department.

STAT 499 Undergraduate Research (1-4)3
This course is intended to improve the research capabilities of graduating students. Each student will be given a project and an academic advisor; lectures will be given on research design, data evaluation and report writing. A final report and/or seminar is required at the end of the semester.
Prerequisite: Consent of the department.

GRADUATE PROGRAMS AT THE DEPARTMENT OF STATISTICS

GRADUATE CURRICULUM

PROGRAMS OFFERED

M.S. degree in Statistics is offered in two different areas (options). These are *M.S. in Statistics* and *M.S. in Interdisciplinary Statistics* programs. At the Doctorate level, there is only one program, *Ph.D. in Statistics*, applied in two tracks: *admission by M.S. degree* and *admission by B.S. degree.*

M.S. in Statistics

Option I. Statistics

STAT	500	M.S. Thesis	NC
STAT	501	Statistical Theory I	(3-0)3
STAT	502	Statistical Theory II	(3-0)3
STAT	542	Seminar I	(0-2) NC
STAT	543	Seminar II	(0-2) NC
STAT	544	Graduate Seminar I	(0-2) NC
STAT	8XX	Special Studies	(4-2) NC

Elective Courses
Students are required to take five elective courses from the list of graduate (M.S. or Ph.D.) elective courses offered or approved by the Department. This list may be subject to the modification by the Department.

Total minimum credit: 21
Minimum number of courses with credit: 7

Option II. Interdisciplinary Statistics

STAT	500	M.S. Thesis	NC
STAT	551	Probability and Statistics I	(3-0)3
STAT	552	Probability and Statistics II	(3-0)3
STAT	542	Seminar I	(0-2) NC
STAT	543	Seminar II	(0-2) NC
STAT	544	Graduate Seminar I	(0-2) NC
STAT	8XX	Special Studies	(4-2) NC

Elective Courses
Students are required to take five elective courses subject to the restriction that one is ***Computing Elective Course***, one is ***Modeling Elective Course***, and one is ***Other Elective Course*** offered or approved by the Department. This list may be subject to the modification by the Department.

Total minimum credit: 21
Minimum number of courses with credit: 7

Ph.D. in Statistics

Track 1. If admitted by M.S. degree:

STAT	600	Ph.D. Thesis	NC
STAT	601	Advanced Probability Theory I	(3-0)3
STAT	602	Advanced Probability Theory II	(3-0)3
STAT	603	Advanced Theory of Statistics I	(3-0)3
STAT	604	Advanced Theory of Statistics II	(3-0)3
STAT	642	Seminar in Statistics I	(0-2)NC
STAT	643	Seminar in Statistics II	(0-2)NC
STAT	644	Graduate Seminar II	(0-2)NC
STAT	9XX	Special Studies	(4-0) NC

Elective Courses
Students are required to take four elective courses from the list of graduate (M.S. or Ph.D.) elective courses offered or approved by the Department. This list may be subject to the modification by the Department.

Total minimum credit: 24
Minimum number of courses with credit: 8

Track 2. If admitted by B.S. degree:

STAT	501	Statistical Theory I	(3-0)3
STAT	502	Statistical Theory II	(3-0)3
STAT	600	Ph.D. Thesis	NC
STAT	601	Advanced Probability Theory I	(3-0)3
STAT	602	Advanced Probability Theory II	(3-0)3
STAT	603	Advanced Theory of Statistics I	(3-0)3
STAT	604	Advanced Theory of Statistics II	(3-0)3
STAT	642	Seminar I	(0-2) NC
STAT	643	Seminar II	(0-2) NC
STAT	644	Graduate Seminar II	(0-2) NC
STAT	9XX	Special Studies	(4-0) NC

Elective Courses
Students are required to take nine elective courses from the list of graduate (M.S. or Ph.D.) courses offered or approved by the Department. The list may be subject to the modification by the Department.

Total minimum credit: 45
Number of courses with credit (min): 15

GRADUATE COURSES

LIST OF M.S. COURSES

Required Courses

STAT 500 M.S. Thesis NC
STAT 501 Statistical Theory I (3-0) 3
STAT 502 Statistical Theory II (3-0) 3
STAT 551 Probability and Statistics I (3-0) 3
STAT 552 Probability and Statistics II (3-0) 3
STAT 542 Seminar I (0-2) NC
STAT 543 Seminar II (0-2) NC
STAT 544 Graduate Seminar I (0-2) NC
STAT 8XX Special Studies (4-2) NC

Computing Elective Courses

STAT 554 Computational Statistics (3-0) 3
STAT 555 Advanced Computational Statistics (3-0) 3
STAT 556 Advanced Computing Methods in Statistics (3-0) 3

Modeling Elective Courses

STAT 503 Linear Statistical Models (3-0) 3
STAT 525 Regression Theory and Methods (3-0) 3
STAT 557 Statistical Modeling I (3-0) 3
STAT 558 Statistical Modeling II (3-0) 3
STAT 559 Applied Multivariate Analysis (3-0) 3
STAT 560 Logistic Regression Analysis (3-0) 3
STAT 561 Panel Data Analysis (3-0) 3
STAT 562 Univariate Time Series Analysis (3-0) 3
STAT 563 Multivariate Time Series Analysis (3-0) 3

Other Elective Courses

STAT 504 Non-Parametric Statistical Inference and Methods (3-0) 3
STAT 505 Sampling Theory and Methods (3-0) 3
STAT 509 Applied Stochastic Processes (3-0) 3
STAT 518 Statistical Analysis of Design Experiments (3-0) 3
STAT 553 Actuarial Analysis and Risk Theory (3-0) 3
STAT 564 Advanced Statistical Data Analysis (3-0) 3
STAT 565 Decision Theory and Bayesian Analysis (3-0) 3
STAT 566 Reliability Theory and Methods (3-0) 3
STAT 567 Biostatistics and Statistical Genetics (3-0) 3
STAT 568 Statistical Consulting (3-0) 3

LIST OF Ph. D. COURSES

Required Courses

STAT 600 Ph. D. Thesis NC
STAT 601 Advanced Probability Theory I (3-0) 3
STAT 602 Advanced Probability Theory II (3-0) 3
STAT 603 Advanced Theory of Statistics I (3-0) 3
STAT 604 Advanced Theory of Statistics II (3-0) 3
STAT 642 Seminar in Statistics I (0-2) NC
STAT 643 Seminar in Statistics II (0-2) NC
STAT 644 Graduate Seminar I (0-2) NC
STAT 9XX Special Topics (4-0) NC

Modeling Elective Courses

STAT 605 Theory of Linear and Nonlinear Statistical Models (3-0) 3
STAT 608 Probability Models and Stochastic Processes (3-0) 3
STAT 611 Multivariate Analysis (3-0) 3
STAT 612 Advanced Topics in Time Series Analysis (3-0) 3
STAT 618 Mathematical Models and Response Surface Methodology (3-0) 3
STAT 619 Advanced Topics in Regression and Analysis of Variance (3-0) 3
STAT 622 Discrete Multivariate Analysis (3-0) 3
STAT 623 Spatial Statistics (3-0) 3

Other Elective Courses

STAT 606 Theory of Experimental Designs (3-0) 3
STAT 607 Nonparametric Theory of Statistics (3-0) 3
STAT 609 Statistical Decision Theory (3-0) 3
STAT 610 Sequential Analysis (3-0) 3
STAT 613 Advanced Topics in Life Testing and Reliability (3-0) 3
STAT 614 Interpretation of Data I (3-0) 3
STAT 615 Interpretation of Data II (3-0) 3
STAT 616 Applications of Statistics in Industry (3-0) 3
STAT 617 Large Sample Theory of Statistics (3-0) 3
STAT 620 Bayesian Inference (3-0) 3
STAT 621 Robust Statistics (3-0) 3
STAT 630 Advanced Topics in Statistical

Inference	(3-0) 3	STAT 634 Theory of Stationary Random Functions	(3-0) 3
STAT 632 Inference for Stochastic Processes	(3-0) 3	STAT 7xx Special Topics in Statistics	(3-0) 3

DESCRIPTION OF GRADUATE COURSES

STAT 500 M.S. Thesis NC

Program of research leading to M.S. degree arranged between student and faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

STAT 501 Statistical Theory I (3-0)3
Probability, random variables, expectations, joint distribution functions, conditional distributions, distribution functions, moment generating functions, order statistics, censoring, limit theorems, multivariate normal distribution.

STAT 502 Statistical Theory II (3-0)3
Likelihood theory, sufficiency, point estimation, methods of estimation, unbiasedness, Delta method, hypothesis testing, interval estimation, asymptotic theory, Bayesian statistics, loss function, inference for bivariate distributions.

STAT 503 Linear Statistical Models (3-0)3
Generalized and conditional inverses, derivatives of quadratic and linear forms, expectation of a matrix. Distributions of quadratic forms. Theory of general linear hypothesis, theory of least squares, full rank and less than full rank models, design models, components of variance models, estimation, hypothesis testing and correlation analysis. Applications to ANOVA and regression.

STAT 504 Nonparametric Statistical Inference and Methods (3-0)3
Use of order statistics and other distribution-free statistics for estimation and hypothesis testing, exact non-parametric tests and measures of rank correlation. Relative efficiency, asymptotic relative efficiency and normal-score procedures. Test of goodness of fit. CCH:(1-0) 1. *Prerequisite: STAT 501*.

STAT 505 Sampling Theory and Methods (3-0)3
General randomization theory of simple and multistage sampling, sampling with and without replacement and with equal and unequal probabilities, ratio and regression estimates, analytical studies and multiframe problems in relation to stratification, systematic sampling, clustering and double sampling. CCH: (1-0) 1. *Prerequisite: equivalent of STAT 351-352.*

STAT 509 Applied Stochastic Processes (3-0)3
Markov chains, discrete and continuous Markov processes and associated limit theorems. Poisson and birth and death processes. Renewal processes, martingales, Brownian motion, branching processes. Weakly and strongly stationary processes, spectral analysis. Gaussian systems. CCH:(1-0)1. Prerequisite: Advanced Calculus, Probabilitiy Theory and equivalent of STAT 271-272.

STAT 518 Statistical Analysis of Designed Experiments (3-0)3
Randomization theory of experimental design. Principles of blocking. General analysis of experimental design models. Construction and analysis of balanced and partially balanced complete and incomplete block designs. Factorial design: confounding, aliasing, fractional replication. Designs for special situations. CCH: (1-0)1. *Prerequisite: STAT 501 and STAT 503.*

STAT 525 Regression Theory and Methods (3-0)3
General regression models, residual analysis, selection of regression models, response surface methods, nonlinear regression models, experimental design and analysis of covariance models. Least squares, Gauss-Markov theorem. Confidence, prediction and tolerance intervals. Simultaneous inference, multiple comparison procedures. CCH: (1-0)1.

STAT 542 Seminar I (0-2)NC
Seminar course for M.S. students in Statistics.

STAT 543 Seminar II (0-2)NC
Seminar course for M.S. students in Statistics.

STAT 544 Graduate Seminar I (0-2)NC
M.S. students prepare and present a seminar in their thesis topic.

STAT 551 Probability and Statistics I (3-0)3

Probability, combinatorics, random variables, expectations, joint distribution functions, conditional distributions, distribution functions, moment generating functions, limit theorems.

STAT 552 Probability and Statistics II (3-0)3

Order statistics, exponential families, sufficiency, point estimation, hypothesis testing, interval estimation, confidence intervals.

STAT 553 Actuarial Analysis and Risk Theory (3-0)3

Basics of insurance; Basics of reinsurance; Non-life insurance mathematics; Insurance economics; Risk theory; Individual and collective risk models; Ruin theory; Credibility theory and applications.

STAT 554 Computational Statistics (3-0)3

Overview of statistical distributions, generating random variables, exploratory data analysis, Monte Carlo (MC) method for statistical inference, data partitioning, resampling, bootstrapping, nonparametric density estimation.
Prerequisite: Consent of Department.

STAT 555 Advanced Computational Statistics (3-0)3

Bivariate and multivariate smoothing, discovering structure in data, nonparametric regression, Markov Chain Monte Carlo (MCMC), statistical pattern recognition: classifiers and clustering.

STAT 556 Advanced Computing Methods in Statistics (3-0)3

This course introduces a range of computational techniques that are important to Statistics. The topics covered include introduction to statistical computing, computer arithmetic, numerical linear algebra, regression computations, eigenproblems, numerical optimization, numerical approximations, numerical integration, expectation-maximization (EM) algorithm, basic simulation methodology, Monte Carlo (MC) integration, MC Markov Chain (MCMC) methods.

STAT 557 Statistical Modeling I (3-0)3

Introduction to the general theory of linear models, least squares and maximum likelihood estimation. Introduction to non-linear, log-linear and generalized linear models. Logistic and Poisson regression, ordinal and multinomial logit models. ANOVA. Causation versus association. Introduction to special Statistical Models, such as Time Series Models, Actuarial Models, Survival Models, Reliability Models.
Prerequisite: Consent of Department.

STAT 558 Statistical Modeling II (3-0)3

Bayesian models, hierarchical modeling, nonparametric regression models, semi- parametric models, random and mixed models, response surface methods, residual analysis, correlation analysis, experimental design and analysis of covariance models.
Prerequisite: Consent of Department.

STAT 559 Applied Multivariate Analysis (3-0)3

Characterizing and displaying multivariate data, multivariate distributions, tests of mean vectors and covariate matrices, discriminant analysis, classification and pattern recognition, canonical correlation, principle component analysis, factor and cluster analysis, multivariate linear, random and mixed models, multidimensional scaling.

STAT 560 Logistic Regression Analysis (3-0)3

Introduction to categorical response data. Fitting logistic regression models. Interpretation of coefficients. Maximum likelihood estimation. Hypothesis testing. Model building and diagnostics. Polytomous logistic regression. Interaction and confounding. Logistic regression modelling for different sampling designs: case-control and cohort studies, complex surveys. Conditional logistic regression. Exact methods for small samples. Power and sample size. Recent developments in logistic regression approach.

STAT 561 Panel Data Analysis (3-0)3

Introduction to longitudinal / panel data. Missing cases in panel data. Exploratory longitudinal data analysis. Marginal models, transition models, random effects models, multilevel (hierarchical) models. Estimation methods for this type of data.

STAT 562 Univariate Time Series Analysis (3-0)3

Fundamental concepts in univariate time domain analyses, properties of autocovariance and autocorrelation of time series, stationary and nonstationary models, difference equations, autoregressive integrated moving average processes, model identification, parameter estimation, model selection, time series forecasting, seasonal time series models, testing for a unit root, intervention analysis, outlier detection, handling missing observations in time series, Fourier series, spectral theory of stationary processes and the estimation of the spectrum.

STAT 563 Multivariate Time Series Analysis (3-0)3

Transfer function models and cross-spectral analysis, time series regression and GARCH models, vector time series models, error-correction

models, cointegration and causality, state space models and Kalman filter, long memory processes, nonlinear processes, temporal aggregation and disaggregation.

STAT 564 Advanced Statistical Data Analysis (3-0)3
Introduction to methods for analyzing experimental and observational data. Useful display of univariate and multivariate data. Exploratory data analysis. Transforming data. Detecting and handling outliers. Examining residuals. Resistant lines. Robust estimation. Approaches to handling missing data. Analysis of categorical data. Data mining.

STAT 565 Decision Theory And Bayesian Analysis (3-0)3
Introduction to decision making. Subjective and frequentist probability. Bayes theorem and Bayesian decision theory. Advantages of using a Bayesian approach. Likelihood principle, prior and posterior distributions, conjugate families. Inference as a statistical decision problem. Bayesian point estimation, Tests and confidence regions, model choice, invariance, equivariant estimators, hierarchical and empirical Bayes extensions, robustness and sensitivity, utility and loss, sequential experiments, Markov Chain Monte Carlo Methods, Metropolis-Hastings Algorithm, Gibbs Sampling, The E-M Algorithm.

STAT 566 Reliability Theory in Methods (3-0)3
Introduction to reliability, order statistics, censoring and likelihood, nonparametric estimation, extreme value theory, failure time distributions, parametric likelihood concepts, simulation-based methods, testing reliability hypothesis, system reliability, failure-time regression analysis, accelerated life testing.

STAT 567 Biostatistics and Statistical Genetics (3-0)3
Introduction to use of statistical methodology in health related sciences. Types of health data. Odds ratio, relative risk. Prospective and retrospective study designs. Cohort, case-control, matching case-control, case-cohort, nested case-control studies. Analysis of survival data. Kaplan-Meier, life tables, Cox's proportional hazards model. Analysis of case-control data. Unconditional, conditional, polytomous logistic regression. Introduction to genetic epidemiology. Testing Hardy-Weinberg law. Linkeage analysis. Analysis of microarray data. Association studies. Sample size and power. Recent developments in biostatistics and genetic epidemiology.

STAT 568 Statistical Consulting (3-0)3
Key aspects of statistical consulting and data analysis activities. Formulation of statistical problems from client information. Analysis of complex data sets. Case studies. Writing and presenting reports.

STAT 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

STAT 601 Advanced Probability Theory I (3-0)3
Notions of measure theory. General concepts and tools of probability theory. Independence; convergence; laws of large number. Random walks.
Prerequisite: Consent of Department.

STAT 602 Advanced Probability Theory II (3-0)3
Concept of conditioning. From independence to dependence. Ergodic theorems. Martingales and decomposability. Brownian motion and limit distributions.
Prerequisite: Consent of Department.

STAT 603 Advanced Theory of Statistics I (3-0)3
Advanced topics in linear and non-linear statistical estimation.
Prerequisite: Consent of Department.

STAT 604 Advanced Theory of Statistics II (3-0)3
Advanced topics in statistical hypothesis testing.
Prerequisite: Consent of Department.

STAT 605 Theory of Linear and Nonlinear Statistical Models (3-0)3
General linear and nonlinear models. Topics related to the statistical inference in model building.
Prerequisite: Consent of Department.

STAT 606 Theory of Experimental Designs (3-0)3
Balanced and partially balanced incomplete block designs. Mixture designs. Factorial designs. Response surfaces. Optimal allocation of observations.
Prerequisite: Consent of Department.

STAT 607 Nonparametric Theory of Statistics (3-0)3
Rank testing and estimation procedures. Locally most powerful rank tests. Criteria for unbiasedness. Exact and asymptotic distribution theory. Asymptotic efficiency. Rank correlation. Sequential procedures.
Prerequisite: Consent of Department.

STAT 608 Probability Models and Stochastic Processes (3-0)3
Discrete and continuous time Markov chains and Brownian motion. Gaussian processes, queues, epidemic models, branching processes, renewal processes.
Prerequisite: Consent of Department.

STAT 609 Statistical Decision Theory (3-0)3
Decision theoretic approach to statistical problems. Complete class theorems. Bayes and minimax procedures. Multiple, sequential, invariant statistical decision problems.
Prerequisite: Consent of Department.

STAT 610 Sequential Analysis (3-0)3
Sequential probability ratio test. Approximations for stopping boundaries. Power curve and expected stopping time. Wald's lemmas. Bayes character of SPRT. Composite hypothesis. Ranking and selection CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 611 Multivariate Analysis (3-0)3
Advanced topics in multivariate statistical analysis. CCH: (1-0)1
Prerequisite: Consent of Department.

STAT 612 Advanced Topics in Time Series Analysis (3-0)3
Univariate and multivariate time series analysis. Estimation and hypothesis testing in the time and frequency domains. CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 613 Advanced Topics in Life Testing and Reliability (3-0)3
Advanced topics in life models, reliability and hazard functions. Decision making in life testing. Design of experiments in life testing. CCH:(1-0)1.
Prerequisite: Consent of Department.

STAT 614 Interpretation of Data I (3-0)3
Application of statistical theory and procedures to various types of data. Use of computers and numerical methods are emphasized.
CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 615 Interpretation of Data II (3-0)3
Continuation of STAT. 614 CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 616 Applications of Statistics in Industry (3-0)3
A strong background in control charts including adaptations, acceptance sampling for attributes and variables data. Acceptance plans. Statistics of combinations. CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 617 Large Sample Theory of Statistics (3-0)3
Large sample properties of tests and estimates. Problems of consistency and various forms of asymptotic efficiencies. Irregular estimation problems. Inference from stochastic processes. CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 618 Mathematical Models and Response Surface Methodology (3-0)3
Two level factorial and fractional factorial designs, blocking, polynomial models, first order and second order designs, several responses, determination and optimum conditions, design criteria involving variance and bias. CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 619 Advanced Topics in Regression and Analysis of Variance (3-0)3
Development of linear classification models, components of variance for balanced designs, polynomial models, harmonic regression, crossed models for combined qualitative and quantitative factors. Analysis of variance for fixed, random and mixed effects models. Randomization. Violation of assumptions. CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 620 Bayesian Inference (3-0)3
Sampling theory, subjective probability, likelihood principles. Bayes theorem, Bayesian analysis of normal theory, inference problems, assessment of model assumptions, robustness of inference, analysis of variance, some aspects of multivariate problems. Bayesian aspects of statistical modeling. CCH: (1-0) 1.
Prerequisite: Consent of Department.

STAT 621 Robust Statistics (3-0)3
Transforming data. More refined estimators. Comparing location estimators. M and L estimators. Robust scale estimators and confidence intervals. Relevance to hypothesis testing.
CCH: (1-0)1.

Prerequisite: Consent of Department.

STAT 622 Discrete Multivariate Analysis (3-0)3
Structural models for counted data, maximum likelihood estimates for complete tables, formal goodness of fit; summary statistics and model selection, maximum likelihood estimates for incomplete tables, estimating the size of a closed population, models for measuring change, analysis of square tables; symmetry and marginal homogeneity, measures of association and agreement, Pseudo-Bayes estimates of cell probabilities, asymptotic methods. CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 623 Spatial Statistics (3-0)3
Purely spatial processes. Spatial autocorrelation. Distribution theory for spatial statistics. Analysis for point patterns. Parametric spatial models. Estimation and testing procedures. CCH: (1-0)1.
Prerequisite: Consent of Department.

STAT 630 Advanced Topics in Statistical Inference (3-0)3
Several advanced topics of statistical inference suited to the needs of researcher.
Prerequisite: Consent of Department.

STAT 632 Inference for Stochastic Processes (3-0)3
Special models. Large sample theory for discrete and continuous parameter stochastic processes. Optimal testing. Bayesian, nonparametric and sequential inference for stochastic processes. Martingales. Stochastic differential equations.
Prerequisite: Consent of Department.

STAT 634 Theory of Stationary Random Functions (3-0)3
Second moment models of random variables and vectors. Correlation theory of random processes in the time and frequency domains. Theory of random fields in the time and frequency domains. Crossings and extremes of random functions. Applications.
Prerequisite: Consent of Department.

STAT 642 Seminar in Statistics I (0-2) NC
Seminar course for Ph.D. students in Statistics.

STAT 643 Seminar in Statistics II (0-2) NC
Seminar course for Ph.D. students in Statistics.

STAT 644 Graduate Seminar II (0-2) NC
Ph.D. students prepare and present a seminar in their thesis topic.

STAT 7XX Special Topics in Statistics (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge.

STAT 8XX Special Studies (4-2) NC
M.S. students chose and study a topic under the guidance of a faculty member normally his/her advisor.

STAT 9XX Advanced Studies (4-0) NC
Graduate students as a group or a Ph.D. Student choose and study advanced topics under the guidance of a faculty member normally his/her supervisor.

FACULTY OF ECONOMIC AND ADMINISTRATIVE SCIENCES

Dean: ÖZVEREN, Eyüp; Prof. Dr.;
B.S., Middle East Technical University, M.A., Ph.D., State University of New York University.
Associate Dean: TANRISEVER,Oktay; Prof. Dr. ;
B.S., M.S., Middle East Technical University; Ph.D., University of London.
Associate Dean: YILMAZ,Özlem; Assoc. Prof. Dr.;
B.S., Middle East Technical University; M.S., Ph.D. , Texas Tech University

GENERAL STATEMENT AND PROGRAMS OF STUDY

Founded in 1957, the Faculty of Economics and Administrative Sciences (FEAS) was conceived as a model for a faculty where there would be continuous interaction across the highly permeable disciplinary boundaries of the then nascent undergraduate programs. As the disciplinary programs crystallized over time, the exchanges between different departments were gradually reduced yet remained in effect. As such, FEAS remains to this day a functional faculty that is more than the concentration under a single roof of otherwise disparate departments. Alphabetically listed, FEAS now consists of four departments: Department of Business Administration, Department of Economics, Department of International Relations, and the Department of Political Science and Public Administration. These departments were originally constituted to give high quality undergraduate education that would be of service to both the public and private sectors as well as providing their graduates with a strong academic basis to pursue graduate study in case they wished to do so. In the course of time, these departments have developed their own graduate programs towards master's and doctoral degrees.

By extending its physical premises and academic staff, FEAS remains host to a number of interdisciplinary programs such as Eurasian Studies, European Integration, European Studies, Gender and Women's Studies, Media and Cultural Studies, Urban Policy Planning and Local Governments that have flourished in the interstices of various departments under the auspices of the Graduate School of Social Sciences. As the relative weight of graduate programs has increased in FEAS, it is no coincidence that several research centers have also come into existence. Each department now has a research center that coincides with its field of specialization. In addition, there is the Center for European Studies that is placed directly under the umbrella of FEAS that has quickly emerged as one of the foremost institutions of research in its field in Turkey. FEAS also has been home to an academic journal that has by now become a tradition in its own right, namely, *METU Studies in Development.* This journal is multidisciplinary in coverage linguistically hybrid.

FEAS now prides itself in having an increasingly internationalized academic staff as well as students, both assisted by eager administrative personnel and state of the art facilities. FEAS is now a leading exemplary institution on the Turkish academic scene that seeks continuously to take part in and to contribute to the regional, European and global networks of international academic exchange. In this context, the two joint programs with State University of New York of the Department of Business Administration, and the Department of Political Science and Public Administration together with the Department of International Relations deserve mention. Last but not least, FEAS extends academic assistance to programs in economics and administrative sciences at the rapidly developing Northern Cyprus Campus of our university.

DEPARTMENT OF BUSINESS ADMINISTRATION

PROFESSORS

ACAR, Ahmet ***(President of METU)***: B.C.P., METU; MBA, Ph.D., University of Pennsylvania.
AŞCIGİL, Semra: B.A., Boğaziçi University; MBA, Ph.D., METU.
GÜNER, Z. Nuray: B.S., METU; MBA, Ph.D., University of North Carolina at Chapel Hill.
ÖZDEMİR YILMAZ, , Özlem B.S., METU; M.S., Ph.D., Texas Tech University.
SARI, Ramazan: B.S. Hacettepe; M.S., Ph.D., Texas Tech University.
SOYTAŞ, Uğur: B.S., METU; MBA, Ph.D., Texas Tech University.
WASTİ PAMUKSUZ, S. Nazlı: B.S., METU; M.S., University of Missouri-Rolla; M.S., Ph.D., University of Michigan.
YILMAZ, Cengiz ***(Department Chair)***: B.S., Hacettepe University; M.S., Ph.D., Texas Tech University.

ASSOCIATE PROFESSORS

ACAR, F. Pınar: B.S., METU, MBA, Bilkent University; Ph.D., Texas Tech University.
GÖNÜL, M. Sinan ***(Vice Chair)***: B.S., METU; MBA, Ph.D., Bilkent University; Post-doc., Glasgow Caledonian University.
KÜÇÜKKAYA, H. Engin: B.S., MBA, METU; Ph.D., University of South Florida.
ONAY, Zeynep: B.S., Ph.D., Nottingham University.
ORAN, Adil: B.S., METU; M.S., Ph.D., Texas Tech University.

ASSISTANT PROFESSORS

.
DANIŞOĞLU, Seza: B.S., METU; M.S., Ph.D., Texas Tech University.
KARABABA, Eminegül ***(Vice Chair)***: B.S., M.S., METU; MBA, Ph.D., Bilkent University.
TOPAL, Çağrı: B.S., M.S., METU; Ph.D. University of Alberta.

INSTRUCTORS

AYAYDIN HACIÖMERÖĞLU, Hande: B.S., M.S., METU; Ph.D., The University of Manchester.
AYDIN, Hamdi: B.A., Academy of Economics and Commercial Sciences, Ankara; MBA, Michigan State University, Ph.D., Uludağ University.

GENERAL INFORMATION: Over 6000 students have graduated from the Department of Business Administration, which was established in 1957, and over 600 undergraduate and 100 graduate students are enrolled in its programs currently. Admission to the Department is based on the Equally Weighted Score obtained in the nationwide Student Selection/Placement Examination. The Department is a first choice for many high school graduates taking this admission examination. Students admitted to the program are among the top 1500 students of approximately 1.8 million students who sit for the exam every year. The Department also has a dual-diploma Bachelor's program with the State University of New York (SUNY) Binghamton Campus. Along with the undergraduate programs, the Department also offers a Master's Program in Business Administration (MBA), an Executive Master of Business Administration (EMBA), and a Doctoral Program in Accounting and Finance (Ph.D.)

The Department of Business Administration places special emphasis on the use of contemporary approaches and modern technology in its curriculum. A variety of computational, audiovisual and multimedia equipment is available to enrich and assist instruction.

The graduating students of the Department have a choice of accepting excellent job opportunities or continuing with graduate or post-graduate studies. Each year between April and June, a large number of private and public companies, including the largest and best-known national and multinational companies visit the Department to meet with and interview students.

UNDERGRADUATE PROGRAM: The purpose of the program offered by the Department of Business Administration is to prepare its graduates to perform effectively in staff and line positions in industry and government. A specific emphasis on innovativeness and entrepreneurial values constitute the core of the Department's education philosophy.

The curriculum draws upon the fundamental principles of strategic and change management, organization theory and practice, production and operations management, economics, finance, accounting, marketing, management science, human resources management, business communication, interpersonal relations and management information systems. Teaching methods are designed to develop in students a general problem solving approach to the activities of the firm and its environment. The analytical tools and concepts used in the solution of problems form the core of the Department of Business Administration Program. The Department also offers minor programs in collaboration with various departments in the University.

SUNY-METU Dual-Diploma Bachelors Degree in Business Administration: This program offers students at Department of Business Administration a package of interdisciplinary study in marketing, operations management, finance, management information systems, human resource management, business communication, interpersonal relations and other fields yielding a high level of substantive knowledge and analytical skills for careers requiring global perspectives on managerial issues of various kinds. This four-year program includes full-time enrollment for four semesters each at both institutions: first and second, and fifth and sixth semesters at METU, and third and fourth, and seventh and eighth semesters at SUNY Binghamton University. In order to continue their third year curriculum at METU, students are required to take second year must courses from SUNY curriculum. Students of this dual-diploma program must meet all of the requirements for a Bachelor of Science degree at Binghamton University's School of Management, and for a Bachelor of Science degree at METU; however, these diplomas refer to the degree in the same manner, and are only awardable upon successful completion of all the requirements at both institutions.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

BA	1101	Fundamentals of Business	(3-0)3
BA	1103	Business Practice Workshop	(0-2)1
BA	1201	Principles of Behavioral Sciences	(3-0)3
BA	1401	Financial Accounting	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
MATH	117	Calculus I	(4-2)5
TURK	101	Turkish I	(2-0)NC
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

BA	1306	Information Systems and Programming	(3-0)3
BA	1308	Business Computing Laboratory	(0-2)1
BA	1502	Business Statistics	(3-0)3
ADM	102	Introduction to Law	(3-0)3
ECON	122	Principles of Macroeconomics	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	(2-0)NC

SECOND YEAR

Third Semester

BA	2101	Managerial Skills Laboratory I	(0-2)1
BA	2203	Organizations	(3-0)3
BA	2601	Operations Management	(3-0)3
BA	2701	Principles of Marketing	(3-0)3
BA	2801	Microeconomics for Business	(3-0)3
Free Elective			(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

BA	2102	Business Communication I	(3-0)3
BA	2204	Human Resource Management	(3-0)3
BA	2802	Principles of Finance	(3-0)3
Free Elective			(3-0)3
Free Elective			(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

BA	3103	Business Communication II	(3-0)3
BA	3301	Information Systems	(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3

Sixth Semester

BA	3504	Management Science	(3-0)3
Departmental/Non-Departmental Elective			(3-0)3
Departmental/Non-Departmental Elective			(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3

FOURTH YEAR

Seventh Semester

BA	4103	Strategic Management	(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3

Eighth Semester

BA	4106	Business Law	(3-0)3
BA	4104	Managerial Skills Laboratory II	(0-2)1
Departmental/Non-Departmental Elective			(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3
Departmental Elective			(3-0)3

ELECTIVE COURSES

The list of electives offered is announced by the Department each semester. Below is a sample of elective courses offered on different subjects. Not all courses are offered every semester.

BA	0280	Summer Internships	NC
BA	4091-	Independent Study in Management Science	(3-0)3
BA	4092	Independent Study in Organizations	(3-0)3
BA	4093	Independent Study in Human Resource Management	(3-0)3
BA	4094	Independent Study in Strategic Management	(3-0)3
BA	4096	Independent Study in Microeconomics for Business	(3-0)3
BA	4097	Independent Study Laboratory	(0-2)1
BA	4098	Honor's Seminar	(3-0)3
BA	4099	Independent Study	(3-0)3
BA	5555	International Student Practice	NC

Courses Offered in the Business, Management and Strategy Area

BA	0401	Fundamentals of Entrepreneurship (for non-Management Majors)	(3-0)3	BA	4129	Strategic Games for Managers	(3-0)3
BA	0402	Fundamentals of Negotiation (for non-Management Majors)	(3-0)3	BA	4130	Managerial Judgment and Decision Making	(3-0)3
BA	4111	Managing Technology and Innovation	(3-0)3	BA	4132	Cases in Quality Management	(3-0)3
BA	4115	Business Ethics,	(3-0)3	BA	4133	Corporate Governance and Social Responsibility	(3-0)3
BA	4116	Organization, Work and Society	(3-0)3	BA	4135	Leadership Theory and Application	(3-0)3
BA	4120	Analysis of Turkish-EU Relations	(3-0)3	BA	4136	Current Issues in Business	(3-0)3
BA	4121	International Business	(3-0)3	BA	4137	Entrepreneurship	(3-0)3
BA	4122	Self-Assessment for Quality Management	(3-0)3	BA	4138	European Economic Integration	(3-0)3
BA	4123	Turkish Tax System	(3-0)3	BA	4140	Strategic Behavior and Experiments	(3-0)3
BA	4124	Turkish Tax Law	(3-0)3	BA	4141	Competition Law and Practice in Turkey	(3-0)3
BA	4125	Turkish Business Environment	(3-0)3	BA	4142	Family Business	(3-0)3

Courses Offered in the Organization and Human Resource Management Area

BA	4213	Selected Topics in Organizational Behavior	(3-0)3	BA	4218	Organizational Influence Processes	(3-0)3
BA	4215	Organizational Culture	(3-0)3	BA	4219	Organizational Development	(3-0)3
BA	4216	Cross-Cultural Studies in Organizations	(3-0)3	BA	4222	Negotiation Process	(3-0)3
BA	4217	Cases in Human Resources Appraisal and Management	(3-0)3	BA	**4226**	**Managing Organizational Change**	(3-0)3

Courses Offered in the Information Systems Area

BA	4312	Topics in MIS	(3-0)3	BA	4316	E-Technologies and Managerial Applications	(3-0)3
BA	4314	Computer Application in Management	(3-0)3	BA	4317	IT Strategy and Governance	(3-0)3

Courses Offered in the Accounting Area

BA	4411	Auditing	(3-0)3	BA	4414	Special Topics in Accounting	(3-0)3
BA	4412	Cost Accounting	(3-0)3	BA	4415	Accounting Theory	(3-0)3
BA	4413	Advanced Management Accounting	(3-0)3	BA	4416	Managerial Accounting	(3-0)3
				BA	4417	Intermediate Accounting	(3-0)3
				BA	4418	Tax Audit	(3-0)3

Courses Offered in the Quantitative Methods Area

BA	4510	Introductory Econometrics for Finance	(3-0)3	BA	4514	Risk Management	(3-0)3
BA	4511	Business Forecasting	(3-0)3	BA	4515	Knowledge Management	(3-0)3

BA 4516 Knowledge Management and Organizational Learning (3-0)3
BA 4517 Decision Analysis: Tools and Methods (3-0)3
BA 4518 Decision Analysis: Behavioral and Psychological Perspective (3-0)3

Courses Offered in the Operations Management Area

BA 4616 Services Management (3-0)3
BA 4618 Project Management (3-0)3
BA 4621 Supply Chain Management (3-0)3
BA 4622 ERP Applications (3-0)3

Courses Offered in the Marketing Area

BA 3702 Introduction to Marketing (3-0)3
BA 4713 Promotion Management (3-0)3
BA 4714 Consumer Behavior (3-0)3
BA 4715 Advertising Practice (3-0)3
BA 4716 Advertising Campaign Practice (3-0)3
BA 4717 Marketing Research (3-0)3
BA 4718 International Marketing (3-0)3
BA 4719 Marketing Channels (3-0)3
BA 4720 Professional Selling (3-0)3
BA 4721 Retailing (3-0)3
BA 4722 Marketing Strategy (3-0)3
BA 4723 Principles of Advertising (3-0)3
BA 4724 Advanced Marketing Research (3-0)3
BA 4725 Brand Management (3-0)3
BA 4726 Understanding Consumption in Context (3-0)3
BA 4727 Global and Intercultural Marketing (3-0)3
BA 4728 Marketing and Culture (3-0)3

Courses Offered in the Finance and Economics Area

BA 4811 Corporate Finance (3-0)3
BA 4814 Investment Management (3-0)3
BA 4815 Project Evaluation and Financing (3-0)3
BA 4817 International Finance (3-0)3
BA 4818 Analysis of Financial Statements (3-0)3
BA 4819 Financial Institutions and Markets (3-0)3
BA 4820 Portfolio Management (3-0)3
BA 4821 Bank Management (3-0)3
BA 4825 Financial Derivatives (3-0)3
BA 4826 Industrial Organization (3-0)3
BA 4827 Fixed Income Analysis (3-0)3
BA 4828 Trade and Project Financing (3-0)3
BA 4829 Valuation, Models and Applications (3-0)3
BA 4830 Special Topics in Finance (3-0)3
BA 4832 Current Issues in Turkish Capital Markets (3-0)3
BA 4833 Central Banking (3-0)
BA 4834 Financial Issues in Corporate Governance (3-0)3
BA 4835 Microfinance; an Overview of Inclusive Financial Systems (3-0)3
BA 4836 Real Estate Finance (3-0)3
BA 4838 Venture Capital (3-0)3
BA 4839 Financial Modeling with Spreadsheets (3-0)3

MINOR PROGRAM IN GENERAL MANAGEMENT

Minor in General Management aims to provide students of other disciplines with a perspective in management thinking and a basic understanding of the fundamentals of management. The program consists of two core courses (BA 1101 and BA 2203) and five courses on various functional areas of management. Upon completion of the program, students are expected to develop a basic familiarity with most common managerial issues, develop sound interest in certain specialized topics, and have the skills to plan their future studies in the area of Management.

Compulsory courses

BA	1101	Fundamentals of Business	(3-0)3
BA	1103	Business Practice Workshop	(0-2)1
BA	1401	Financial Accounting	(3-0)3
BA	2101	Managerial Skills Lab. I	(0-2)1
BA	2203	Organizations	(3-0)3
BA	2204	Human Resource Management	(3-0)3
BA	2601	Operations Management	(3-0)3
BA	2701	Principles of Marketing	(3-0)3
BA	2802	Principles of Finance	(3-0)3

MINOR PROGRAM IN CORPORATE FINANCE

Minor in Corporate Finance aims to develop a basic background in business and allow specialization in financial management for students of other disciplines. The program starts with two courses (BA 1101 and BA 2203) to familiarize the students with business administration topics. The minor has two core courses (BA 1402 and BA 2802), followed by 3 electives. Students are expected to have a sound understanding of accounting, finance, and financial decision making at the end of the program.

Compulsory courses

BA	1101	Fundamentals of Business	(3-0)3
BA	1103	Business Practice Workshop	(0-2)1
BA	1401	Financial Accounting	(3-0)3
BA	2101	Managerial Skills Lab I	(0-2)1
BA	2203	Organizations	(3-0)3
BA	2802	Principles of Finance	(3-0)3
BA	48xx	Finance Elective	(3-0)3
BA	48xx	Finance Elective	(3-0)3
Departmental Elective			(3-0)3

MINOR PROGRAM IN ENTREPRENEURSHIP

The Minor Program in Entrepreneurship aims to help students develop their own ideas for starting up a new business and create employment opportunities for themselves and other people. The program starts with the course BA 1101, in order to familiarize the students with the business administration topics in general. The program has two core courses, BA 0401 and BA 4137, which aim to give the students an understanding of the concept of entrepreneurship. The program also includes courses like Business Communication and Principles of Marketing, which represent crucial values for an entrepreneur to possess and apply when starting up his/her own business. These courses are followed by one elective, which can be selected among courses such as Business Ethics, Managing Technology and Innovations and Human Resources Management. At the end of the program, students are expected to have a strong knowledge in different aspects of entrepreneurship.

Compulsory courses:

BA	1101	Fundamentals of Business	(3-0)3
BA	0401	Fundamentals of Entrepreneurship	(3-0)3
BA	2102	Business Communication I	(3-0)3
BA	2701	Principles of Marketing	(3-0)3
BA	4137	Entrepreneurship	(3-0)3
Departmental Elective			(3-0)3

INTERNATIONAL JOINT PROGRAM ON BUSINESS ADMINISTRATION

FIRST YEAR
(METU)

First Semester

BAS	100	Seminar in BA	(2-0)NC	ENG	101	English for Academic Purposes I	(4-0)4
BAS	111	Fundamentals of Business	(3-0)3				
BAS	121	Principles of Behavioral Sciences	(3-0)3	ENG	105	Toefl IBT Prepration I	NC
				TURK	101	Turkish I	(2-0)NC
ECON	122	Principles of Macroeconomics	(3-0)3	IS	100	Introduction to Information Technologies and Applications	NC
MATH	117	Calculus I	(3-2)5	HIST	2201	Principles of Kemal Atatürk I	NC

Second Semester

BAS	132	Information Systems and Programming	(3-0)3	ENG	102	English for Academic Purposes II	(4-0)4
BAS	134	Business Computing Lab	(0-2)1	ENG	106	Toefl IBT Prepration II	NC
BAS	142	Financial Accounting	(3-0)3	TURK	102	Turkish II	(2-0)NC
BAS	151	Business Statistics	(3-0)3	HIST	2202	Principles of Kemal Atatürk II	NC
BAS	182	Microeconomics for Business	(3-0)3				

SECOND YEAR
(SUNY Binghamton University)

Third Semester			Fourth Semester	
MIS311	Information Systems	(4-0)4	BLS 111	Legal Environment of Management (4-0)4
OPM311	Operations Management	(4-0)4		
CQS 311	Advanced Computer Tools	(2-0)2	ACCT 212	Managerial Accounting (4-0)4
Elective (A)		(4-0)4	Elective (Gen Ed P or G)	(4-0)4
Elective (H)		(4-0)4	Elective	
Elective (Y, S or B)		(0-2)1	Elective (S or B)	(4-0)4

THIRD YEAR
(METU)

Fifth Semester				Sixth Semester			
BAS	321	Organizational Behavior	(3-0)3	BAS	311	Business Communication	(3-0)3
BAS	324	Human Resources Management	(3-0)3	BAS	314	Business Law	(3-0)3
				BAS	322	Organization Theory	(3-0)3
				Departmental Elective			(3-0)3
BAS	352	Management Science	(3-0)3	Departmental Elective			(3-0)3
BAS	371	Principles of Marketing	(3-0)3				
BAS	381	Principles of Finance	(3-0)3				

FOURTH YEAR
(SUNY Binghamton University)

Seventh Semester				Eighth Semester			
MGMT	411	Global Strategic Management	(4-0)4	BAS	xxx	Business Elective	(4-0)4
				BAS	xxx	Business Elective	(4-0)4
IBUS	311	World of Business	(4-0)4	BAS	xxx	Business Elective	(4-0)4
BAS	xxx	Business Elective	(4-0)4	Elective (Gen Ed P or G)			(4-0)4
Elective			(4-0)4	Management Elective			(3-0)3
Elective			(0-2)1	Management Elective (3-0)3			

A	Arts	***Equivalence of Courses Offered at BA/METU***
B	Physical Education	BAS 111 = BA 1101
C	Written Communication	BAS 151 = BA 1501
		BAS 121 = BA 1201
G	Global Interaction	BAS 132 = BA 1306
H	Humanities	BAS 134 = BA 1308
L	Earth Sciences	BAS 142 = BA 1402
M	Mathematics	BAS 182 = BA 2801
N	Social Sciences	BAS 311 = BA 2102+BA 3103
O	Oral Communication	BAS 314 = BA 4101
P	Plurality	BAS 321 & BAS 322
S	Physical Education	*(See Description of Courses)*
Y	Physical Education	BAS 381 = BA 2802
		BAS 324 = BA 2204
		BAS 352 = BA 3504
		BAS 371 = BA 3701

DESCRIPTION OF COURSES

Courses Offered in the General Area

BA 4091 Independent Study in Management Science (3-0)3
An independent Study in Operations Research/Management Science area under the supervision of a faculty member. Permission of the Department is required

BA 4092 Independent Study in Organizations (3-0)3
This course focuses on the behavioral and structural aspects of organizations. It aims: (a) to familiarize participants with the basic concepts, models, and theories of organization; (b) to develop a better understanding of individual and group behavior, and processes in organizations; (c) to understand the relationship between organizational structure, design, and behavior within the organization, and (d) to provide a conceptual foundation upon which theoretical knowledge can be applied to organizational and managerial problems. The material to be covered in the course comes from books, articles and videos

BA 4093 Independent Study in Human Resource Management (3-0)3
The course is designed to provide students with broad perspective of human resource management. Emphasis will be given to the process of strategic human resource management, recruitment and selection, career development and compensation. Application potential of some of these topics will be explored. Cases and exercises from real word situations related to human resources at different organizations will also be discussed.

BA 4094 Independent Study in Strategic Management (3-0)3
The course will cover two key components of strategic management. First, strategy analysis: analysis of the external environment of the firm—concentrating upon industry analysis and analysis of the firm's resources and capabilities. Then, we will explore various strategic issues at the business- and corporate-levels.

BA 4095 Independent Study in Finance (3-0)3
Students interested concentrating in the field of finance should view this course as a critical foundation for future studies and work in corporate finance, financial markets, international financial markets or other financial institutions. Students who do not pursue a career in finance-related area will gain an understanding of responsibilities, concerns and methods of analysis used by corporate finance managers. This coursework will examine not only the principles and theories of finance but

specifically how these techniques are applied in practice.

BA 4096 Independent Study in Microeconomics for Business (3-0)3
This Course is a comprehensive application of economic theory and methodology to business and managerial decision making; integrating the study of demand, production, cost, pricing, profit and firm size; market structure analysis; pricing theory and practices

BA 4097 Independent Study Laboratory (0-2)
An independent laboratory study under the supervision of a faculty member. Permission of the Department is required.

BA 4098 Honor's Seminar (3-0)3
An independent study under the supervision of a faculty member. Open only for those students with a CGPA greater than 3.00.

BA 4099 Independent Study (3-0)3
An independent study under the supervision of a faculty member. Permission of the Department is required.

Courses Offered in the Business, Management and Strategy Area

BA 0401 Fundamentals of Entrepreneurship (3-0)3
For Non-Business Administration students only.

This course aims to provide the graduating students, i.e. potential entrepreneurs, with the basics they need in order to set up their own businesses, or become *intrapreneurs*, alias organizational entrepreneurs, within their own organizational framework. The course content includes introductory information into the concept of entrepreneurship, entrepreneurial perspectives, developing the entrepreneurial plan, marketing research, financial preparation, developing an effective business plan, assessment and evaluation of entrepreneurial opportunities, Turkish legal requirements, sources of capital, managing entrepreneurial growth, valuation of business ventures, and intrapreneurship.

BA 0402 Fundamentals of Negotiation (3-0)3
For Non-Business Administration students only.

This course provides a conceptual framework to diagnose problems and promote agreements, both outside and inside organizations. It provides students with the opportunity to learn how to analyze negotiations at a more sophisticated level. It will give them an opportunity to identify their strengths as a negotiator and to work on their weaknesses.

BA 1101 Fundamentals of Business (3-0)3
Basic concepts and principles of Management; the functions of planning, organizing, staffing, directing and controlling, and their relationships to key issues in Management practice such as leadership, motivation, and communication.

BA 1103 Business Practice Workshop (0-2)1
The workshop aims to improve the students' knowledge of the material covered in BA 1101 with the help of computerized business games.
Stock and Bond Trading, Executive Decision Making, Balance Sheet and Income Statement Preparation, Product Design, Marketing Design games are played.

BA 2101 Managerial Skills Laboratory I (0-2)1
This course focuses on learning from experience. Students participate in exercises that illustrate the factors involved in a number of areas important to Management such as team work, motivation, problem solving, inter-group conflict, giving and receiving feedback and decision making styles.

BA 2102 Business Communication I (3-0)3
This course aims to provide better understanding of purposes and processes of communication in business. Cases and projects improving students' skills in a collaborative communication are provided. With the help of exercises, including videotaping, students have opportunities to improve and evaluate their communication skills, especially oral.

BA 3103Business Communication II (3-0)3
This course aims to provide a better understanding of purposes and processes of communication in business. Cases and projects improving students' skills in collaborative communication are provided. With the help of exercises and projects, students have opportunities to improve and evaluate their oral and written communication skills, as well as their knowledge of the basics of international trade and negotiation.

Prerequisite: BA 2102

BA 4103 Strategic Management (3-0)3

For Business Administration students only.

This is a capstone course aimed at providing an opportunity for Business Administration students to integrate materials covered in their previous core and supporting courses. The course focuses on the development of skills in identifying, analyzing, and solving realistic business problems.

BA 4104 Managerial Skills Laboratory (0-2)1

This course aims to enhance the student's ability to secure a job that matches his or her values, interests and skills. The course also focuses on developing job interviewing and presentation skills.

BA 4106 Business Law (3-0)3

This is an introductory course on the legal environment of business. The course covers such subjects as: merchants, their rights and obligations; contract agency; legal forms of business; negotiable instruments; insurance law; maritime law.

BA 4111 Managing Technology and Innovation (3-0)3

The objective of this course is to provide prospective managers with the practical and theoretical backgrounds with which to design and evaluate strategies for innovating, acquiring and integrating new technologies into the workplace, and enhancing employee creativity. The material to be covered in the course comes from a variety of sources, including books, articles and, if possible, guest speakers.

BA 4115 Business Ethics (3-0)3

This course provides an in-depth analysis of the moral responsibilities of a corporation and its employees. It analyzes the relationship between individual rights and the free market. The nature of a corporation, its structure, governance, ownership and social responsibilities are emphasized considering the living ethic of our own culture.
Prerequisite: BA 2701, BA 2203

BA 4116 Organization, Work and Society (3-0)3

This course is concerned with the social-cultural-ethnic context of work in business organizations, focusing on the business environment as affecting social behavior and applying OB concepts in diverse cultural settings. It overviews relevant topics in Human Relations area, focusing on selective human issues and topics that have must been covered in the previous courses, introduces OB in a global context in parallel with the developments in the larger world context, and tries to help students to integrate social-cultural-ethnic concepts in the light of changing world-order. Topics include the individual, the group (within and between) and the organization system, with a specific emphasis on thought-provoking ideas to stimulate interest and discussions.
Prerequisite: BA 2701, BA 2203.

BA 4120 Analysis of Turkish-EU Relations (3-0)3

The European Union; institutions, micro-economic policies, tariff/non-tariff barriers, the common market, foreign trade relations, and Customs Union with Turkey and its effect on the Turkish economy and businesses, the future of the economic and political union in Europe; projections and discussions are covered in the course.

BA 4121 International Business (3-0)3

The objective of the course is to introduce the Business Administration students to the main aspects of the international economy that one typically faces when conducting business at the international level. Specifically, the course aims at introducing the students to a manager's perspective in the field of international investment and international trade.

BA 4122 Self-Assessment for Quality Management (3-0)3

Concepts of quality improvement as developed by Deming, Juran, Imai and others are covered in depth. Concepts of achieving company-wide quality control, total quality management, continuous quality improvement are among the topics stressed in this course. Recent developments in quality management theories are studied. Similarities and differences between philosophies, approaches and tools of quality management are pointed out.
Prerequisite: BA 2204, BA 2701, BA 2203.

BA 4123 Turkish Tax System (3-0)3

This course introduces the basic concepts and principles that are valid for all types of taxes. After a review of the history, current tax system and taxes will be studied.

BA 4124 Turkish Tax Law (3-0)3

The course covers basic concepts of Turkish Tax Law. Subjects include time limits in tax law, tax penalties, tax audits, amortization, valuation, and arbitration process.

Prerequisite: BA 4123

BA 4125 Turkish Business Environment (3-0)3

This course analyzes the main parameters of the environment within which business takes place in Turkey. To this end, it aims at understanding the historical background as well as the current context that Turkish firms have been operating in, as well as assessing the environment-related factors that cause firms to create, sustain, or lose competitive advantage.
Prerequisite: ECON 122

BA 4129 Strategic Games for Managers (3-0)3

Game theory is an analytical tool used in modeling strategic interactions where an action by an agent influences the payoffs to other agents. Hence, game theory studies cooperative and competitive behavior in conflict situations. The applicability of game theory extends from economics, management science, bargaining, and conflict resolution to political science and theoretical biology. This course provides the students with the standard taxonomy and solution concepts necessary in formulating games, identifying optimum strategies, and predicting the outcomes of such games. Tools of game theory will be developed through lectures, readings, exercises, class discussions, and applications (business and economic). The course is mathematical in the sense that it requires logical thinking.
Prerequisite: BA 2801 or ECON 101, MATH 119

BA 4130 Managerial Judgment and Decision Making (3-0)3

The goal of this course is to introduce essential facts and skills from behavioral and rational analyses to make students into more competent and confident decision makers. By providing necessary insights and tools, this course will enable students to support and improve their own decision making as well as to understand the decision making of others.

BA 4132 Cases in Quality Management (3-0)3

The potential of quality management for significant performance improvement cannot be ignored. Confronted with growing intensity of global competition, business managers are trying to figure out how to do it, while academicians are working on definitions of the construct. Excellence of quality management targets and improvements based on continuous review and development should become a regular activity in any firm. The objective of this course is to go beyond total quality management through learning about themes and concepts while analyzing best practices. The practices of best-in-class companies will be reviewed towards learning how companies achieve excellence. Invited guest speakers from award winning companies will share their unique experience with students throughout the semester.

BA 4133 Corporate Governance and Social Responsibility (3-0)3

This course aims to address corporate social responsibility and governance which are major concerns in business today. The major components of social responsibility and governance will be discussed to build the foundation of these issues. The manifestations of problems in terms of complaints as to the responsibilities of a firm and managerial accountability, ineffective and complacent boards, and excessive managerial compensation will be major issues to be highlighted. How we have gotten to the point where we are today will be arguments to be brought within the content of the course. Lastly, what actions are being taken and may be taken to address these issues will be discussed.
Prerequisite: BA 2701, BA 2203.

BA 4135 Leadership Theory and Application (3-0)3

This course is designed to equip students with the knowledge and skills necessary to work more effectively with individuals and groups in contemporary organizations. Some examples of topics covered include using power to influence followers and others, delegating effectively, dyadic role making theories, contingency theories of leadership, leading change, strategic leadership and managing diversity.

BA 4136 Current Issues in Business (3-0)3

This course requires that students examine current business issues from the business press in the light of theories and models that they have learned throughout their university education. As a result, by using what they learned so far, students will be able to identify the major parties involved in the issues, their driving forces and possible directions that this may take. This analysis will help students sharpen important analytical skills that they will need to be successful in the business world.

BA 4137 Entrepreneurship (3-0)3

This course is designed to provide students with broad perspective of the topics of entrepreneurship, and the structure, development and management of

family firms and their specific characteristics. The complex relationship between family, business and ownership are examined. Leadership, corporate culture and ethics of family firms and the reasons behind their short survivals are also analyzed. Other topics to be covered include responding to change, institutionalization of family business and corporate strategy and policy in transition to professional management.

BA 4138 European Economic Integration (3-0)3

This course covers economic and monetary integration within the European Union (EU). Topics include regional economic integration types, economic integration of EU, trade policy instrument, EU Budget, common policies of EU, exchange rate regimes, theory of optimum currency areas and relevant institutions in EU.

BA 4140 Strategic Behavior and Experiments (3-0)3

The course aims to present some theoretical and empirical rules (although no single rule can be employed at all times) that managers, actually all decision makers, can and do use to help make decisions. For that purpose, the theoretical framework of managerial economic decision making will be presented through conducting samples of experiments/games in the classroom (e.g., winner's curse, bias in assessing risks) in decision making (particularly decisions in marketing and finance). The students will experience situations that they have to make many decisions of their own that will also give them the opportunity to evaluate their own decision making process through a series of classroom experiments. *Prerequisite:* BA 2801.

BA 4141 Competition Law and Practice in Turkey (3-0)3

The course is aimed to cover Turkish Competition Law and the practices of the law, mainly executed by Turkish Competition Authority.

BA 4142 Family Business (3-0)3

The purpose of this course is to understand the compelling power of organizations that combines families and work. Being a family firm affects all participants. The course focuses on the 'specialness' of these businesses and the family dynamics intruding the business relationship. It provides the students with a theoretical as well as practical background in this specific type of business organization.

Courses Offered in the Organization and Human Resource Management Area

BA 1201 Principles of Behavioral Sciences (3-0)3

The human element is a fundamental component of management. This course introduces students to the fundamental concepts and research in social psychology. The course thus focuses on how social factors influence individual behavior. Topics include basic research methods, causes and effects of biases, attribution, happiness, depression, individualism, collectivism, conformity, gender, corruption, communitarianism, persuasion, groups and productivity, diversity and prejudice, and conflict. The implications for managers in these areas are a major focus for this course.

BA 2203 Organizations (3-0)3

This course aims to investigate areas of organizational behavior and organizational theory. Emphasis is on the analysis of the fit between the organization, its people and their work, its environment and internal systems; analysis of the interaction of organizational design and various performance measures; awareness of contemporary views of best practice in the structuring of organizations and the management of the people that comprise them.

BA 2204 Human Resource Management (3-0)3

Management of human resources in complex organizations, personnel recruitment and selection; increasing employee effectiveness, employee and management development, performance evaluation, motivation communication, employee morale, labor management relations, grievance and disciplinary actions, incentives and security are major areas covered in the course.

BA 4213 Selected Topics in Organizational Behavior (3-0)3

This course is about organizational and human dynamics and the management of these dynamics. It is designed to overview the relevant issues in human aspects of organization, focusing on selection of topics that have been included in the previous Organizational Behavior related courses. *Prerequisite: BA 2203*

BA 4215 Organizational Culture (3-0)3

The course aims to strengthen understanding of various concepts of organizational culture, enhance skills at discovering the central factors at play in a given environment that determine an organization's culture, and investigate how management practice is shaped by different organizational cultures.
Prerequisite: BA 2203.

BA 4216 Cross-Cultural Studies in Organizations (3-0)3
This course aims to broaden the approach to organizational behavior that has been primarily taught with a U.S. based understanding. Variations across cultures and their impact on organizations are discussed.
Prerequisite: BA 2203,BA 2204. .

BA 4217 Cases in Human Resources Appraisal and Management (3-0)3
The course is designed to provide students with experiences from real world problems related to people in different organizations. Cases and exercises related to manpower planning, selection, recruitment, career development, and training in different environments such as government, private firms, hospitals and universities will be analyzed.
Prerequisite: BA 2204.

BA 4218 Organizational Influence Processes (3-0)3
Influence processes that individuals go through within organizations in order to accomplish personal and/or organizational goals are analyzed in this course. Topics include formal versus informal organization; authority versus power; individual and organizational sources of power; organizational politics, methods of influence, strategies and tactics for acquiring, increasing and using power, and ethics of political behavior.
Prerequisite: BA 2203

BA 4219 Organizational Development (3-0)3
The course introduces the student to the field of organizational development and provides a basis in OD theory and application. It aims to: 1) introduce the student to the advances in theory and practice that have given rise to OD, 2) evaluate various models for organizational change, 3) review the basic elements of diagnosis and research in OD and, 4) help students to understand the benefits and limitations on current popular movements in OD. To illustrate the connection between OD theory and practice, concepts will be reviewed and applied to cases throughout the course.
Prerequisite: BA 2203.

BA 4222 Negotiation (3-0)3
The viewpoint that the manager is a negotiator is emphasized. Negotiation structure, planning for negotiation, aggressive,, consultative,, distributive and negative negotiations are analyzed, and various heuristics are developed. Cases and exercises in this area are used to build the necessary understanding and skills.

BA 4226 Managing Organizational Change (3-0)3
The course explores theories of organizational change and their implications in organizational practice. Specifically this course examines the question of why and how organizations change and what changes in organizations as a result of human initiatives or conditional necessities. Other topics covered are how we can understand organizational change is needed and how we can promote and sustain organizational change in the face of resistance from organizational members.

Courses Offered in the Information Systems Area

BA 1306 Information Systems and Programming (3-0)3
The course covers advanced features of word processors, spreadsheets, and data base management systems, internet applications, web page design with html tags, introduction to algorithms and structured programming, with VB.NET.Modular programming: functions and procedures, text files, one-dimensional arrays.

BA 1308 Business Computing Laboratory (0-2)1
The course covers advanced features of word processing: writing equations; creating newspaper columns; use of templates; working with objects; creating html documents; mail merge. Spreadsheets: addressing modes and their uses; solving equations; matrix operations; recording macros. Designing and using a data base system: report generation and query design. Introduction to SQL, Programming with Pascal: writing expressions; assignment, selection, and looping statements, built-in functions, functions and procedures, one-dimensional arrays.

BA 3301 Information Systems (3-0)3
This course stresses the value of information as an organizational resource; and covers system development methodologies, systems analysis, design, implementation and evaluation,

prototyping, data communications and database management.

BA 4312 Topics in MIS (3-0)3
The course provides a practical understanding of the concepts and theories involved in the development and implementation of Management information systems. The identification of various information subsystems, the initiation of and responsibility for the MIS project, the strategies for the determination of the system requirements, methods and tools for the analysis and design of the new system, software and hardware selection criteria are among the topics discussed through various case studies.
Prerequisites: BA 3301.

BA 4314 Computer Applications in Business (3-0)3
This is a practical hands-on course on how to use the computer, especially the microcomputer as a business problem solving tool. Topics include computer hardware and software, operating systems (such as DOS, UNIX), and applications in word processing, electronic spreadsheets, database management and business graphics and networking.

Courses Offered in the Accounting Area

BA 1401 Financial Accounting (3-0)3
This course will provide students with a solid foundation in becoming a manager by giving them a fundamental understanding of accounting theory and practice both internationally and in Turkey. Students will be provided the basic tools they require from the field of Financial Accounting.

BA 2404 Financial Accounting II (3-0)3
(For Public Administration students only)
Prerequisite: BA 2403.

BA 2405 Principles of Financial Accounting (3-0)3
(For Economics students only)
This is a comprehensive introductory course on accounting principles, terminology and practices, with specific financial accounting applications for Turkey.

BA 4411 Auditing (3-0)3
This course covers auditing theory and practice applicable to manufacturing business organizations in general; auditing standards, procedures, rules of professional conduct, and related material of professional importance.
Prerequisites: BA 1402, BA 2402.

Prerequisites: BA 1302, BA 1306.

BA 4316 E-Technologies and Managerial Applications (3-0)3
The objectives of the course are to (i) introduce fundamentals of the internet and internet programming, (ii) discuss e-business concept/models and their contribution to a business environment, (iii) facilitate "hands-on" experience with the software tools required to develop web-based applications.

BA 4317-IT Strategy and Governance (3-0)3
The objectives of this course are to describe how information technologies are matched with business strategy; to explore the ways that the IT can contribute to the overall success of the organization; to explain the role of IT governance in organizations, the best practices of IT governance implementation; to describe the uses of COBIT, Val IT and Risk IT frameworks
Prerequisites: BA3301.

BA 4412 Cost Accounting (3-0)3
Cost concepts, CVP relationships; budgeting; job, process and operation systems; flexible budgets and standards; service department cost allocation; allocation of joint and byproduct cost; spoilage, waste, defective units and scrap; relevant-cost analysis; capital budgeting; decentralization and transfer pricing.
Prerequisites: BA 1402, BA 2402.

BA 4413 Advanced Management Accounting (3-0)3
This is a study of those accounting topics that lend themselves to the use of mathematical and statistical techniques of cost analysis, with emphasis on the internal needs of management.
Prerequisite: BA 4412.

BA 4414 Special Topics in Accounting (3-0)3
This course is designed to equip the students with knowledge on contemporary issues in accounting such as funds flow and cash flow analysis, leases, pension plans, tax problems, consolidations, intangibles, approbation of retained earnings, responsibility accounting for home office and branches, accounting problems created by price-level changes.
Prerequisites: BA 1402, BA 2402.

BA 4415 Accounting Theory (3-0)3
The basic intention of this course is to provide a general frame of reference for evaluating and developing accounting principles. The methodology, concepts and structure of accounting theory; income concepts for financial reporting; problems of asset measurement under conditions of changing prices; reporting problems of specific asset and liability groups will be discussed. Special emphasis will be given to the problems of accounting and depreciation, intangibles, lease commitment and pension cost.
Prerequisites: BA 1402, BA 2402.

BA 4416 Managerial Accounting (3-0)3
This course provides an analysis of management's use of cost and other quantitative data in managerial planning and control.
Prerequisites: BA 1402, BA 2402.

BA 4417 Intermediate Accounting (3-0)3
This course covers international accounting standards within the scope of intermediate accounting topics. Topics covered include financing and operating activities of companies, application of generally accepted accounting principles to those activities, and evaluation of financial statements.
Prerequisite: BA 1402 or BA 2402.

BA 4418 Tax Audit (3-0)3
The purpose of this course is to provide the rationale of global tax rules using the tax audit methodologies by focusing on the behaviours of local and multinational companies. In this context, the students taking this course should expect to become familiar with the tax concerns of the business life while discussing who can entitled to be a tax auditor, the reasons for the tax audits, the methodologies that can be used during tax audits. Accordingly the course also supports students to develop their ability to make analysis on the recorded ledgers together with their effects on the balance-sheet and income statement. Using the international auditing standards and consolidating them with the tax knowledge, the course will also recognize the principles of the tax audit reporting rules.

Courses Offered in the Quantitative Methods Area

BA 1502 Business Statistics (3-0)3
This is a course covering basic statistical concepts and methods useful in decision making in the business environment, emphasis on descriptive and inferential tools used in converting raw data into useful information, use of statistical computer packages and interpretation of statistical results. Topics include descriptive statistics, discrete and continuous probability distributions, sampling distributions, estimation, hypothesis testing, analysis of variance, simple linear regression, multiple-regression, multiple regression model building, time series analysis.

BA 3504 Management Science (3-0)3
This is an introductory course covering the most commonly used models/methods of Operations Research/Management Science. Topics include: linear, integer and goal programming, sensitivity analysis and simulation modeling.

BA 4510 Introductory Econometrics for Finance (3-0)3
This course focuses on the financial applications of statistical techniques. Econometrics helps you test theories in finance, estimate asset prices or returns, analyze the relationships between variables, forecast financial variables etc. At the end of the course the students will be able to understand, apply, and interpret the results of classical regression, univariate time series modeling, simultaneous equations models, vector auto regressions, long run modeling, ARCH/GARCH modeling etc. using the Eviews econometrics package. The applications will be from finance including CAPM, APT, efficient market hypothesis, term structure of interest rates.
Prerequisites: BA1502, BA 2802 or ECON205 and ECON 206

BA 4511 Business Forecasting (3-0)3
Introduction to quantitative and subjective forecasting methods. Evaluating forecast accuracy. Smoothing methods: Simple, Holt's and Winters' exponential smoothing techniques. Forecasting with Regression Methods: Forecasting with simple linear trend, using casual regression models, and forecasting with Multiple regression models. Time-series Decomposition models. Finding seasonal indexes, the long-term trend, and measuring cyclical component. Box-Jenkins (ARIMA) forecasting models. Introduction to simulation usage in forecasting. Combining Forecast results and Forecast Implementation are areas covered in the course
Prerequisites: BA 1501, BA 2504.

BA 4514 Risk Management (3-0)3
The aim of the Risk Management and Insurance course is to provide an introduction to the actuarial philosophy and the actuarial scientific method. All major areas in risk and insurance are treated in some depth, including basic concepts, fundamental legal principles, property and liability insurance, life and

health insurance, social insurance, the functional and financial operations of insurance companies, and the main features of the Turkish insurance market.
Prerequisites: BA 1501, BA 2504, STAT 0252.

BA 4515 Knowledge Management (3-0)3
Data Mining is a method of searching data with mathematical algorithms to identify trends and hidden patterns, profile customers, and then predicts how these trends or customers will behave in the future. The objective of this course is to provide an insight into data mining techniques, build predictive models and apply them in real business problems.

BA 4516 Knowledge Management and Organizational Learning (3-0)3
As an emerging discipline, Knowledge Management bridges social-organizational and technological-technical aspects of management and business administration in the Knowledge Economy and Society. Underlying interrelated issues of organizational and managerial learning, this Knowledge Management course will have a specific.

BA 4517 Decision Analysis: Tools and Methods (3-0)3
Decision analysis aims to provide a structured and systematic approach to guide the decision making activities in complex problems. This course attempts to convey the basic concepts and principles on the analytical methods, tools and techniques of decision analysis. Topics to be covered include Multi-Objective Decision Making (MODM), SMART, SMARTER, even swaps, AHP, Multi-Attribute Utility Theory(MAUT), influence diagrams, decision trees and scenario planning.
Prerequisites: BA 3504.

BA 4518 Decision Analysis: Behavioral and Psychological Perspective (3-0)3
Decision analysis is an interdisciplinary field that aims to provide a structured and systematic approach to guide the decision making activities in complex problems. At the same time, it attempts to understand the preliminary mechanisms underlying human judgment as well as the cognitive and psychological factors that affect the mental processes behind managerial decision making. The primary objective of this course is to provide an understanding on this perspective. Topics to be covered include rationality and managerial decision making, analysis of judgment, heuristics and biases, prospect theory, framing effects, the perception of risk and group decision making.

Courses Offered in the Operations Management Area

BA 2601 Operations Management (3-0)3
This course is an introduction to managerial problems in production and operations; design, planning and control of production and service systems. Topics covered are: Demand Management, Product Design, Process Selection, Job Design and Work Measurement, Capacity Planning, Facility Layout/Location Problems, Aggregate/Master Production Scheduling, Inventory Management, Operations Scheduling, MRP II, JIT and TOC.

BA 4616 Services Management (3-0)3
This course presents a study of the inherent characteristics of service organizations in the public and private sectors; the service package and service delivery system; service design and process selection; forecasting in services; location and layout of service firms; human resources management; capacity management and the quality challenge in services.
Prerequisites: BA 2601.

BA 4618 Project Management (3-0)3
The course provides a review of CPM and PERT models to cover cases with certain and uncertain activity times; project crashing and PERT/Cost analysis; GANTT charts and resource leveling decisions; use of simulation in connection with project scheduling; project control, revision and verification techniques; computer applications using commercial software.
Prerequisites: BA 1501, BA 3504.

BA 4621 Supply Chain Management (3-0)3
This course introduces the concepts, models, and solution tools that are needed in the design, control, and operation of supply chains. The discussion ranges from basic topics of inventory management, logistics network design, distribution systems, strategic alliances, buyer-supplier relationships, the value of information in the supply chain, utilizing readings, cases, and technical exercises.
Prerequisites: BA 2601.

BA 4622 ERP Applications (3-0)3
ERP (Enterprise Resource Planning) is an important tool utilized by organizations to streamline their operations, improve productivity and boost profits. This class focuses on the features, functions and benefits of the Oracle ERP e-Business Suite. In this course ORACLE Inventory, ORACLE Purchasing and ORACLE Order Management modules will be covered. Students will get the opportunity to understand operations in an organization from ERP perspective, visualize improvements and efficiencies.
Prerequisites: BA 2601, BA 3301.

Courses Offered in the Marketing Area

BA 2701 Principles of Marketing (3-0)3
This is the first exposure to the marketing discipline for BA students. Introduction to the nature of marketing; development of marketing thought over time; marketing research; consumer behavior; segmentation, targeting, positioning; product development and policies; pricing methods and practices; distribution decisions; integrated marketing communications; marketing management are topics covered in the course.

BA 3702 Introduction to Marketing (3-0)3
For Non-Business Administration students only.

The course is designed to introduce non-business students to the fundamental aspects of marketing as it relates to the whole business enterprise. It presents introductory coverage of major marketing concepts and decisions, and focuses on marketing's macro role in society and its micro role in business and other organizations.

BA 4713 Promotion Management (3-0)3
The course builds on the basic knowledge of marketing and focuses on the design and management of the promotion mix, assumes an integrated marketing communications perspective and covers advertising, sales promotion, personal selling, direct marketing, publicity, and public relations. Cases, practical application assignments, and term projects are employed to emphasize applications. *Prerequisites: BA 2701,.*

BA 4714 Consumer Behavior (3-0)3
This course centers on the role of the consumer in the marketing process, enables the student to understand why certain marketing strategies are more effective than others, how humans behave in the marketplace, and which social and cognitive mechanisms the consumer brings to the purchasing decisions. Strong managerial, psychological, and personal implications; individual, social, and marketing determinants of consumption behavior are covered in the course.
Prerequisites: BA 2701.

BA 4715 Advertising Practice (3-0)3
The course is designed to familiarize the student with various practice-oriented aspects of the advertising profession. Briefing, planning, budgeting, concept and copy creation, execution, and evaluation of advertising campaigns; advertising agency management are areas covered. It integrates theory with practice; cases, applications and campaign assignments are employed to enhance learning.
Prerequisites: BA 2701,

BA 4716 Advertising Campaign Practice (3-0)3
Continuation of BA 4715.
Prerequisites: BA 2701, BA 4715.

BA 4717 Marketing Research (3-0)3
This course provides a hands-on introduction to empirical methodology for market research applications. Problem formulation, research design, measure development, scaling techniques, attitude measurement, simple and applied multivariate analysis, report writing are topics covered. An extensive term project enables the student to put the course content into practice.
Prerequisites: BA 2701.

BA 4718 International Marketing (3-0)3

The course introduces the student to the global marketing environment including the global economy, cultural forces, and the political and regulatory climate, explores how managers analyze global opportunities, buyer behavior, competitors, and marketing research, describes global marketing strategies, foreign market entry options, and the global implications of managing the marketing mix.
Prerequisites: BA 2701.

BA 4719 Marketing Channels (3-0)3
Institutional and functional analysis of distribution channels; power in distribution channels; selecting and evaluating channel systems; distribution problems, tools, and decisions are topics presented in the course.
Prerequisites: BA 2701.

BA 4720 Professional Selling (3-0)3
The course is designed to be a hands-on introduction to selling and sales management. Speakers, films, role playing, group projects, and field trips are employed to enhance learning. The objective is to develop skills and abilities that allow the student to manage sales territories as their own business.
Prerequisites: BA 2701.

BA 4721 Retailing (3-0)3
The course aims to give the student an appreciation of the constant change and development in retailing. It introduces the student to basic qualitative and quantitative retail management concepts; provides the student with current examples of retailing concepts in action; improves the student's skills is analyzing competitive situations and marketing opportunities.
Prerequisites: BA 2701.

BA 4722 Marketing Strategy (3-0)3
The course is designed to integrate and extend fundamental marketing concepts and apply them to business problems. Focus is on studying strategic issues relating to selection of business and segments in which to compete and how to spread resources across products and elements of the marketing mix. Case and simulation methodologies are employed.
Prerequisites: *BA 2701.*

BA 4723 Principles of Advertising (3-0)3
The course aims to introduce the student to an overview of the world of advertising industry and provide the fundamentals for developing, creating and implementing advertising campaigns based on strategic marketing principles and planning. The idea of the course is to develop students' knowledge and understanding of the advertising process. By the end of the course students will grasp the role of advertising and get familiar with the basic concepts and terminology used in the business.
Prerequisites: BA 2701.

BA 4724 Advanced Marketing Research (3-0)3
This course aims to provide the students with an in-depth understanding of the research process and its practical applications in the marketplace. The course highlights the technical and academic concepts underlying business research, while at the same time attempting to develop a keen understanding of when, why, and how to use marketing research for more effective managerial decision-making.
Prerequisites: BA 4717.

BA 4725 Brand Management (3-0)3
The course provides a thorough understanding of branding processes in the 21st century. In the first part of the course, consumers and their behavior with regard to brands will be examined. Also, social role of brands as cultural, ideological, and political objects are discussed in the class. In the second part of the course, managerial concepts such as brand equity, brand identity, brand types, corporate branding, brand extensions, and brands and innovations are covered.
Prerequisites: BA 2701.

BA 4726 Understanding Consumption in Context (3-0)3
This module seeks to develop an interdisciplinary, theoretically informed understanding through an active piece of primary research into consumer behavior, consumer identities, and consumer experience. It aims to understand how consumers utilize consumption as a social process in their everyday lives. Various qualitative research methods are thought and conducted by students.
Prerequisites: BA 2701

BA 4727- Global and Intercultural Marketing (3-0)3

The purpose of this course is to provide knowledge on a number of different topics in relation to the central theme of the course: marketing in an intercultural context. A consequence of increasing interaction at the global level is the contact of different cultures at institutional and individual levels. Nationality is one way of dividing individuals into larger groups. However within a single nation, there are multiplicity of cultures exist.

Therefore this course extends the notion of international marketing and introduces an intercultural perspective to marketing. Specifically topics like culture, globalization, globalization, values, marketing in intercultural environment, and intercultural communications are considered.
Prerequisites: BA 2701

BA 4728- Marketing and Culture (3-0)3

The course aims to provide an understanding on the relations between society, culture(s), and markets. This course complements the management curriculum by providing a link between macro and micro approaches to marketing. In other words, rather than focusing on firm or consumer level understanding, course delineates the societal role of marketing and consumption practices. On the one hand, marketing's role as a cultural practice and social institution in our everyday social life is introduced to students. On the other, a critical look to the role of marketing in contemporary society is presented. To accomplish this goal, the course will introduce the concept of culture, development of modern culture, markets, and consumer culture, some of the key institutions of culture, and a sociocultural critique of marketing and consumption. The course aims to train students as prospective marketers, who are reflexive towards marketing and consumption.
Prerequisites: BA 2701

Courses Offered in the Finance and Economics Area

BA 2801 Microeconomics for Business (3-0)3
This course is a comprehensive application of economic theory and methodology to business and managerial decision making; integrating the study of demand, production, cost, pricing, profit and firm size; market structure analysis; pricing theory and practices.

BA 2802 Principles of Finance (3-0)3
This course addresses the theory and practice of financial management -the generation and allocation of financial resources. It provides students with grounding in the basic concepts of finance, including the time value of money, the role of financial markets, asset valuation, capital budgeting decisions, portfolio theory, asset pricing, and the risk-return tradeoff.
Prerequisites: BA 1401, or BA 2405 or BA 2801

BA 4811 Corporate Finance (3-0)3
This course is an introduction to the financial operations in business corporations and the related concepts like risk, rate of return, valuation. Topics covered: Risk, Rates of Return, Time Value of Money, Bond and Stock Valuation, Cost of Capital, Basics of Capital Budgeting, Cash Flow Estimation, Capital Structure and Leverage, Investment Banking and Securities Market.
Prerequisite: BA 2802, orECON 311or BA 5802 or IAM 521.

BA 4814 Investment Management (3-0)3
The purpose of this course is to introduce the student to the area of investment with emphasis upon why individuals and institutions invest and how they invest. Topics include measures of risk and return; capital and money markets; process and techniques of investment valuation; principles of fundamental analysis; technical analysis; analysis and management of bonds; analysis of alternative investments; portfolio theory and application.
Prerequisite: BA 2802 or BA 5802 or IAM 521 or ECON 311

BA 4815 Project Evaluation and Financing (3-0)3
This course mainly deals with the design and analysis of new investment projects. Project financing approaches; Leasing, Venture Capital and Build-Operate-and-Transfer are discussed in the context of Turkey.
Prerequisite: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4817 International Finance (3-0)3
The first part of the course aims at introducing the student to foreign exchange markets, exchange rate determination theories, forecasting and international trade financing. A project on Turkey will be assigned. The second part of the course deals with aspects of financial management for multinational corporations.
Prerequisite: BA 2802 or ECON 311 or BA 5802 or IAM 521.

BA 4818 Analysis of Financial Statements (3-0)3
The objective of the course is to provide the knowledge and the skills necessary to take full advantage of financial reports and analysis. Starting with an overview of financial accounting, the topics that will be covered include financial statements, ratio analysis, comparative analysis and the management of operating funds.
Prerequisite: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4819 Financial Institutions and Markets (3-0)3
This course is about analysis of financial intermediation and the determination of interest rates. Businesses, consumers, and governments in money and capital markets are observed with emphasis on financial instruments. International financial markets are discussed. The purposes and functions of central banking are studied with primary attention to monetary policy.
Prerequisite: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4820 Portfolio Management (3-0)3
The emphasis of the course is directed towards capital markets and portfolio management, and investments in securities. The discussions are basically about corporate securities and their valuation, and the organizations of the financial markets.
Prerequisite: ECON 311, IAM 521

BA 4821 Bank Management (3-0)3
This is a course on basic assets, liability, and capital management. Topics include primary lending functions, pricing techniques, risk management, and bank organization, and familiarization with international banking.
Prerequisite: BA 2802 or BA 5802 or IAM 521 or ECON 311

BA 4825 Financial Derivatives (3-0)3
This course is designed to provide a solid foundation in the principles of derivatives. It attempts to strike a balance between institutional details, theoretical foundations, and practical applications. Parallel to the already increasing attempts to integrate derivative securities and markets into the Turkish financial system, this course will fill a gap so that the students are exposed to a rather comprehensive coverage of theory and application in the derivatives area.
Prerequisite: BA 2802 or BA 3801 or ECON 311 or ECON 312.

BA 4826 Industrial Organization (3-0)3
The course analyzes structure, conduct and performance in imperfectly competitive markets. It considers strategic interaction between firms, and provides understanding of competition within and for the market place. Topics include monopoly, price discrimination, product selection, oligopoly, price competition, collusion, entry deterrence, reputation, limit pricing, and predation.
Prerequisite: BA 2801 or Econ 101, MATH 119.

BA 4827 Fixed Income Analysis (3-0)3
Fixed income securities are an important part of portfolios held by individual and institutional investors around the world. In countries like Turkey, where the stock market is fairly new and highly risky, and treasury securities offer very high real returns, investment in fixed income securities become even more important. Fixed income securities have characteristics that are quite different from equity investments. Therefore, investments in these securities are governed by completely different principles. Furthermore, there are wide varieties of fixed income securities with quite complex cash flow structures in developed markets. Therefore, the objectives of this course are to:

- provide a review of different types of fixed income securities available in Turkish and international markets and their characteristics
- introduce interest rate models and their usage in valuation of complex cash flow streams of fixed income securities, and
- present professional fixed income portfolio management and evaluation of portfolio performance.

Prerequisites: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4828 Trade and Project Financing (3-0)3
The course is designed to give detailed knowledge about trading with emphasis on export. It also includes project financing techniques and their applications. The course will help those seeking entrance into this most interesting field of finance by exploring problems that they may face in dealing in international trade and finance transactions on a daily basis. The course will deal with these subjects in the context of emerging markets rather than in the context of developed markets.
Prerequisites: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4829 Valuation Models and Applications (3-0)3
This course focuses on valuation of real and financial assets. The valuation methods covered are discounted cash flow approaches, multiples and real options. Students will learn how to calculate the value for various asset types and how to choose the appropriate method of valuation.
Prerequisite: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4830 Special Topics in Finance (3-0)3
This course is designed to deal with some special topics in finance. The purpose of the course is to extend knowledge of students beyond basic finance

topics and increase awareness of students on some key issues of finance. The topics covered include short term financial planning, leasing, mergers and acquisitions, international finance and derivative securities.
Prerequisite: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4832 Current Issues in Turkish Capital Markets (3-0)3
In this course we will provide an overview and analysis of the current issues in capital markets. We will examine the evolving structure and role of capital markets and institutions in the development of the economy. Attention will be given to Turkish capital markets in the context of intense global competition, increased capital mobility and global harmonization. The various evolving concepts in capital markets will be analyzed.
Prerequisites: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4833 Central Banking (3-0)3
The aim of this course is to give the students a broad overvievw of both the basic principles and the practical implementation of central banking as well as functioning of the financial markets in an attempt to better understand how central bank operations affect financial institutions and the monetary policy transmisision mechanism.
Prerequisites: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4834 Financial Issues in Corporate Governance (3-0)3
In the 20th century, modern corporations became one of the world's dominant institutions. Consequently, the way they do business is now under close scrutiny. The relationship between ownership structure, performance and the demands of society requires that companies exercise a high degree of diligence in their governance.
Prerequisites: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4835 Microfinance; an Overview of Inclusive Financial Systems (3-0)3
This course aims to give a substantive overview of microfinance and how microfinance institutions operate, measuring their efficiency as well as situation in Turkey and growth potential. In addition to that this course underlines how an inclusive financial system increases the depth of financial system overall.

BA 4836 Real Estate Finance (3-0)3
Introduction to real estate markets and financing alternatives for real estate investments. Topics on residential and commercial real estate and alternative ways of investing in real estate. Performance of real estate investments and their affect on the portfolios of investors.
Prerequisite: BA 2802 or ECON 311 or BA 5802 or IAM 521

BA 4838 Venture Capital (3-0)3
To be successful, Venture Capitalists must have a broad general knowledge of business and all its disciplines: marketing, management, finance, operations, accounting, and so on. In addition, most VCs must acquire specialized knowledge in one or more high-technology industries. However, it is not possible to cover all these areas in one course. This course focuses almost exclusively on finance, specifically on the valuation of high-technology investments.

BA 4839 Financial Modeling with Spreadsheets (3-0)3
Provide students with the knowledge to apply the theories they have learned using spreadsheets. The students who know the essentials of corporate finance theories should also be able to solve the financial models numerically in order to enhance their knowledge in the field. The lecture includes models in the area of corporate finance, financial statement analysis, portfolio theory and duration. These models will be explained and then the models will be implemented numerically by using spreadsheets. This lecture will help the undergraduate students to enhance their theoretical and practical knowledge related to financial modelling.

Courses Offered Uniquely in the SUNY-METU Program

BAS 100 Seminar in Business Administration (2-0)NC
This course is the first part of an orientation seminar for the first-year students. It provides information and help about the registration system, academic rules and regulations, and the organization of students' course schedules.

BAS 111 Fundamentals of Business (3-0)3
Basic concepts and principles of Management; the functions of planning, organizing, staffing, directing and controlling, and their relationships to key issues in Management practice such as leadership, motivation, and communication.

BAS 121 Principles of Behavioral Sciences (3-0)3

The human element is a fundamental component of management. This course introduces students to the fundamental concepts and research in social psychology. The course thus focuses on how social factors influence individual behavior. Topics include basic research methods, causes and effects of biases, attribution, happiness, depression, individualism, collectivism, conformity, gender, corruption, communitarianism, persuasion, groups and productivity, diversity and prejudice, and conflict. The implications for managers in these areas are a major focus for this course.

BAS 132 Information Systems and Programming (3-0)3

The course covers advanced features of word processors, spreadsheets, and data base management systems, internet applications, web page design with html tags, introduction to algorithms and structured programming, structure of a Pascal program, basic elements of Pascal: character set, identifiers, data types and declarations, constants, and expressions, selection and looping in Pascal, modular programming: functions and procedures, text files, one-dimensional arrays.

BAS 134 Business Computing Laboratory (0-2)1

The course covers advanced features of word processing: writing equations; creating newspaper columns; use of templates; working with objects; creating html documents; mail merge. Spreadsheets: addressing modes and their uses; solving equations; matrix operations; recording macros. Designing and using a data base system: report generation and query design. Introduction to SQL, Programming with Pascal: writing expressions; assignment, selection, and looping statements, built-in functions, functions and procedures, one-dimensional arrays.

BAS 142 Financial Accounting (3-0)3

This course will provide students with a solid foundation in becoming a manager by giving them a fundamental understanding of accounting theory and practice both internationally and in Turkey. Students will be provided the basic tools they require from the field of Financial Accounting.

BAS 151 Business Statistics (3-0)3

This is a course covering basic statistical concepts and methods useful in decision making in the business environment, emphasis on descriptive and inferential tools used in converting raw data into useful information, use of statistical computer packages and interpretation of statistical results. Topics include descriptive statistics, discrete and continuous probability distributions, sampling distributions, estimation, hypothesis testing, analysis of variance, simple linear regression, multiple-regression, multiple regression model building, and time series analysis.

BAS 182 Microeconomics for Business (3-0)3

This course is a comprehensive application of economic theory and methodology to business and managerial decision making; integrating the study of demand, production, cost, pricing, profit and firm size; market structure analysis; pricing theory and practices.

BAS 311 Business Communication (3-0)3

This course focuses on learning from experience. Students participate in exercises that illustrate the factors involved in a number of areas important to Management such as team work, motivation, problem solving, inter-group conflict, giving and receiving feedback and decision making styles. In addition it aims to provide better understanding of purposes and processes of communication in business. Cases and projects improving students' skills in a collaborative communication are provided. With the help of exercises, including videotaping, students have opportunities to improve and evaluate their communication skills, especially oral.

Prerequisite: CQS 311 Advanced Comp. Tools

BAS 314 Business Law (3-0)3

This is an introductory course on the legal environment of business. The course covers such subjects as: merchants, their rights and obligations; contract agency; legal forms of business; negotiable instruments; insurance law; maritime law.

Prerequisite: BLS 111 Legal Environment of Business

BAS 321 Organizational Behavior (3-0)3

This course reviews organizational influences on individual behavior. It reviews topics such as ability, personality, ethics, perception, decision making, values, attitudes, motivation, group behavior, leadership, power, politics, inter-group behavior, the fundamentals of organizational structure, and culture and change.

BAS 322 Organization Theory (3-0)3

The concepts of organization; dormal organizations; organizational dynamics and effectiveness; organizational development and change are analyzed.

BAS 324 Human Resources Management (3-0)3
Management of human resources in complex organizations, personnel recruitment and selection; increasing employee effectiveness, employee and management development, performance evaluation, motivation communication, employee morale, labor management relations, grievance and disciplinary actions, incentives and security are major areas covered in the course.
Prerequisite: MIS 311 Management Information Systems

BAS 352 Management Science (3-0)3
This is an introductory course covering the most commonly used models/methods of Operations Research/Management Science. Topics include: linear, integer and dynamic programming, inventory and queuing models, Markov processes and simulation.
Prerequisite: OPM 311 Operations Management

BAS 371 Principles of Marketing (3-0)3
This is the first exposure to the marketing discipline for students. Introduction to the nature of marketing; development of marketing thought over time; marketing research; consumer behavior; segmentation, targeting, positioning; product development and policies; pricing methods and practices; distribution decisions; integrated marketing communications; marketing management are topics covered in the course.
Prerequisite: MIS 311 Management Information Systems

BAS 381 Principles of Finance (3-0)3
This course addresses the theory and practice of financial management -the generation and allocation of financial resources. It provides students with grounding in the basic concepts of finance, including the time value of money, the role of financial markets, asset valuation, capital budgeting decisions, portfolio theory, asset pricing, and the risk-return tradeoff.
Prerequisite: ACCT 212 Managerial Accounting

OPM 311 Operations Management (4-0)4
An introduction to the design, planning and control of systems that produce goods and services. Topics include quality management, forecasting, product design, capacity planning, facility layout, MRP, just-in time manufacturing, scheduling, project planning and inventory management. Prerequisite: sophomore standing.
Corequisites: MIS 311 and CQS 311.

MIS 311 Management Information Systems (4-0)4
The effective deployment of information technologies and computer-based information systems has strategically enabled enterprises to achieve and maintain competitive advantage. In the context of management imperatives and the rapidly changing business environment, this course examines the role of various types of information technologies and systems in organizations, technical foundations of information systems and the development of information systems. Discussion labs provide the opportunity to become proficient in the use of productivity software, such as relational database management systems.
Prerequisites: CQS 111 and sophomore standing. Corequisites: OPM 311 and CQS 311.

CQS 311Advanced Computer Tools (2-0)2
Integrated lab component for the S-Core (OPM, MIS and CQS 311Æs). Provides laboratory exercises to support learning in the Operations Management and Management Information Systems.

ACCT 212 Managerial Accounting (4-0)4
Introduction to managerial accounting. Accounting as an informational system to provide managers with the basis for decision making. Includes basic CVP analysis, job and process costing, standard costing and variance analysis, as well as specific situational decision-making matrices. Not open to accounting students.
Prerequisite: ACCT 211.

BLS 111 Legal Environment for Business (4-0)4
Nature and role of law and its relation to business. Substantive law of contracts, procedural aspects governing.

MGMT 411 Global Strategic Management (4-0)4
Capstone course providing conceptual tools for integrating functional skills acquired in previous courses. Emphasis is on strategic and socially responsible operation of the total enterprise in a global environment. Combines lectures with in-depth case analyses and simulations or research studies of actual industries in real time. Students research industries and companies, make oral presentations and write research papers. *Prerequisites: completion of all required core courses and senior standing.*

IBUS 311 World of Business (4-0)4
Introduction to management within an international context. Covers the development of trade, trade patterns and theories, impact of trade and foreign direct investment on home and host countries, basic principles of exchange rates and global financial markets. Discusses managerial challenges arising from different cultural, socio-economic and political settings; modes of entering foreign markets and the rise of the global corporation; introduces sub-disciplines of management: marketing, human resource management, production and finance, and how these are managed globally. Prerequisite: junior standing.
Corequisites: FIN 311, MGMT 311 and MKTG 311.

Courses Offered in the MBA Program

Courses Offered in the Business, Management and Strategy Area

BA 5102 Strategic Management (3-0)3
It is a capstone course to show the student the need for and methods of integrating a firm's various functional area activities in a dynamically changing environment. Furthermore, strategic management will be emphasized, that is the process dealing with the fundamental organizational renewal and growth, with the development of the strategies, structures and systems necessary to achieve such renewal and growth and with the organizational systems needed to effectively manage the strategy formulation and implementation processes.

BA 5106 Business Law (3-0)3
This is an introductory course on the legal environment of business. The course covers such subjects as merchants, their rights and obligations, contract agency, legal forms of business, negotiable instruments, insurance law, and maritime law.

BA 5111 Managing Technology and Innovation (3-0)3
The objective of this course is to provide prospective managers with the practical and theoretical backgrounds with which to design and evaluate strategies for innovating, acquiring and integrating new technologies into the workplace, and enhancing employee creativity. The material to be covered in the course comes from a variety of sources, including books, articles and, if possible, guest speakers.

BA 5115 Business Ethics (3-0)3
This course provides an in-depth analysis of the moral responsibilities of a corporation and its employees. It analyzes the relationship between individual rights and the free market. The nature of a corporation, its structure, governance, ownership and social responsibilities are emphasized considering the living ethic of our own culture.

BA 5116 Organization, Work and Society (3-0)3
This course is concerned with the social-cultural-ethnic context of work in business organizations, focusing on the business environment as affecting social behavior and applying OB concepts in divers cultural settings. It overviews relevant topics in Human Relations area, focusing on selective human issues and topics that have must been covered in the previous courses, introduces OB in a global context in parallel with the developments in the larger world context, and tries to help students to integrate social-cultural-ethnic concepts in the light of changing world-order. Topics include the individual, the group (within and between) and the organization system, with a specific emphasis on thought-provoking ideas to stimulate interest and discussions.

BA 5120 Analysis of Turkish-EU Relations (3-0)3
The European Union; institutions, micro-economic policies, tariff/non-tariff barriers, the common market, foreign trade relations, and Customs Union with Turkey and its effect on the Turkish economy and businesses, the future of the economic and political union in Europe; projections and discussions are covered in the course.

BA 5121 International Business (3-0)3
The objective of the course is to introduce the Business Administration students to the main aspects of the international economy that one typically faces when conducting business at the international level. Specifically, the course aims at introducing the students to a manager's perspective in the field of international investment and international trade.

BA 5122 Topics in Self-Assessment for Quality Management (3-0)3
Concepts of quality improvement as developed by Deming, Juran, Imai and others are covered in depth. Concept of achieving company-wide quality control, total quality management, continuous quality improvement are among the topics stressed in this course. Recent developments in quality management theories are studied. Similarities and

differences between philosophies, approaches and tools of quality management are pointed out.

BA 5125 Turkish Business Environment (3-0)3

This course analyzes the main parameters of the environment within which business takes place in Turkey. To this end, it aims at understanding the historical background as well as the current context that Turkish firms have been operating in, as well as assessing the environment-related factors that cause firms to create, sustain, or lose competitive advantage.

BA 5129 Strategic Games for Managers (3-0)3

Game theory is an analytical tool used in modeling strategic interactions where an action by an agent influences the payoffs to other agents. Hence, game theory studies cooperative and competitive behavior in conflict situations. The applicability of game theory extends from economics, management science, bargaining, and conflict resolution to political science and theoretical biology. This course provides the students with the standard taxonomy and solution concepts necessary in formulating games, identifying optimum strategies, and predicting the outcomes of such games. Tools of game theory will be developed through lectures, readings, exercises, class discussions, and applications (business and economic). The course is mathematical in the sense that it requires logical thinking.

BA 5130 Managerial Judgment and Decision Making (3-0)3

The goal of this course is to introduce essential facts and skills from behavioral and rational analyses to make students into more competent and confident decision makers. By providing necessary insights and tools, this course will enable students to support and improve their own decision making as well as to understand the decision making of others.

BA 5132 Cases in Quality Management (3-0)3

The potential of quality management for significant performance improvement cannot be ignored. Confronted with growing intensity of global competition, business managers are trying to figure out how to do it, while academicians are working on definitions of the construct. Excellence of quality management targets and improvements based on continuous review and development should become a regular activity in any firm. The objective of this course is to go beyond total quality management through learning about themes and concepts while analyzing best practices. The practices of best-in-class companies will be reviewed towards learning how companies achieve excellence. Invited guest speakers from award winning companies will share their unique experience with students throughout the semester.

BA 5133 Corporate Governance and Social Responsibility (3-0)3

This course aims to address corporate social responsibility and governance which are major concerns in business today. The major components of social responsibility and governance will be discussed to build the foundation of these issues. The manifestations of problems in terms of complaints as to the responsibilities of a firm and managerial accountability, ineffective and complacent boards, and excessive managerial compensation will be major issues to be highlighted. How we have gotten to the point where we are today will be arguments to be brought within the content of the course. Lastly, what actions are being taken and may be taken to address these issues will be discussed.

BA 5135 Leadership Theory and Application (3-0)3

This course is designed to equip students with the knowledge and skills necessary to work more effectively with individuals and groups in contemporary organizations. Some examples of topics covered include using power to influence followers and others, delegating effectively, dyadic role making theories, contingency theories of leadership, leading change, strategic leadership and managing diversity.

BA 5136 Current Issues in Business (3-0)3

This course requires that students examine current business issues from the business press in the light of theories and models that they have learned throughout their university education. As a result, by using what they learned so far, students will be able to identify the major parties involved in the issues, their driving forces and possible directions that this may take. This analysis will help students sharpen important analytical skills that they will need to be successful in the business world.

BA 5137 Entrepreneurship (3-0)3

This course is designed to provide students with broad perspective of the topics of entrepreneurship, and the structure, development and management of family firms and their specific characteristics. The complex relationship between family, business and ownership are examined. Leadership, corporate culture and ethics of family firms and the reasons behind their short survivals are also analyzed. Other topics to be covered include responding to change, institutionalization of family business and

corporate strategy and policy in transition to professional management.

BA 5138 European Economic Integration (3-0)3

This course covers economic and monetary integration within the European Union (EU). Topics include regional economic integration types, economic integration of EU, trade policy instrument, EU Budget, common policies of EU, exchange rate regimes, theory of optimum currency areas and relevant institutions in EU.

BA 5140 Strategic Behavior and Experiments (3-0)3

The course aims to present some theoretical and empirical rules (although no single rule can be employed at all times) that managers, actually all decision makers, can and do use to help make decisions. For that purpose, the theoretical framework of managerial economic decision making will be presented through conducting samples of experiments/games in the classroom (e.g., winner's curse, bias in assessing risks) in decision making (particularly decisions in marketing and finance). The students will experience situations that they have to make many decisions of their own that will also give them the opportunity to evaluate their own decision making process through a series of classroom experiments.

BA 5141 Competition Law and Practice in Turkey (3-0)3

The course is aimed to cover Turkish Competition Law and the practices of the law, mainly executed by Turkish Competition Authority.

BA 5142 Family Business (3-0)3

The purpose of this course is to understand the compelling power of organizations that combines families and work. Being a family firm affects all participants. The course focuses on the 'specialness' of these businesses and the family dynamics intruding the business relationship. It provides the students with a theoretical as well as practical background in this specific type of business organization.

Courses Offered in the Organization and Human Resource Management Area

BA 5201 Organization and Management (3-0)3

A systematic and analytic study of the structure and functioning of organizations and the behavior of groups and individuals within them. The emphasis will be on the pragmatics of organization and management.

BA 5202 Human Resource Management (3-0)3

The course is concerned with the policies, procedures and practices governing the recruitment, selection, training, promotion, remuneration and working conditions of the people employed by an enterprise.

BA 5213 Selected Topics in Organizational Behavior (3-0)3

This course is about organizational and human dynamics and the management of these dynamics. It is designed to overview the relevant issues in human aspects of organization, focusing on selection of topics that have been included in the previous Organizational Behavior related courses.

BA 5215 Organizational Culture (3-0)3

The course aims to strengthen understanding of various concepts of organizational culture, enhance skills at discovering the central factors at play in a given environment that determine an organization's culture, and investigate how management practice is shaped by different organizational cultures.

BA 5216 Cross-Cultural Studies in Organizations (3-0)3

This course aims to broaden the approach to organizational behavior that has been primarily taught with a U.S. based understanding. Variations across cultures and their impact on organizations are discussed.

BA 5217 Cases in Human Resources Appraisal and Management (3-0)3

The course is designed to provide students with experiences from real world problems related to people in different organizations. Cases and exercises related to manpower planning, selection, recruitment, career development, and training in different environments such as government, private firms, hospitals and universities will be analyzed.

BA 5218 Organizational Influence Processes (3-0)3

Influence processes that individuals go through within organizations in order to accomplish personal and/or organizational goals are analyzed in this course. Topics include formal versus informal organization; authority versus power; individual and organizational sources of power; organizational politics, methods of influence, strategies and tactics for acquiring, increasing and using power, and ethics of political behavior.

BA 5219 Organizational Development (3-0)3
The course introduces the student to the field of organizational development and provides a basis in OD theory and application. It aims to: 1) introduce the student to the advances in theory and practice that have given rise to OD, 2) evaluate various models for organizational change, 3) review the basic elements of diagnosis and research in OD and, 4) help students to understand the benefits and limitations on current popular movements in OD. To illustrate the connection between OD theory and practice, concepts will be reviewed and applied to cases throughout the course.

BA 5222 Negotiation Process (3-0)3
The viewpoint that the manager is a negotiator is emphasized. Negotiation structure, planning for negotiation, aggressive,, consultative,, distributive and negative negotiations are analyzed, and various heuristics are developed. Cases and exercises in this area are used to build the necessary understanding and skills.

Courses Offered in the Information Systems Area

BA 5301 Information Systems (3-0)3
The course emphasizes the active and significant role managers must assume in the analysis, design, use, and management of information systems. It covers the planning and organization of an MIS project, strategies for the determination of requirements, the transition from analysis to design, the conceptual design of the new system, and phases in the implementation process and conversion methods.

BA 5312 Topics in MIS (3-0)3
The course provides a practical understanding of the concepts and theories involved in the development and implementation of Management information systems. The identification of various information subsystems, the initiation of and responsibility for the MIS project, the strategies for the determination of the system requirements, methods and tools for the analysis and design of the new system, software and hardware selection criteria are among the topics discussed through various case studies.

BA 5314 Computer Applications in Business (3-0)3
This is a practical hands-on course on how to use the computer, especially the microcomputer as a business problem solving tool. Topics include computer hardware and software, operating systems (such as DOS, UNIX), and applications in word processing, electronic spreadsheets, database management and business graphics and networking.

BA 5316 E-Technologies and Managerial Applications (3-0)3
The objectives of the course are to (i) introduce fundamentals of the internet and internet programming, (ii) discuss e-business concept/models and their contribution to a business environment, (iii) facilitate "hands-on" experience with the software tools required to develop web-based applications.

BA 5317IT Strategy and Governance (3-0)3
The objectives of this course are to describe how information technologies are matched with business strategy; to explore the ways that the IT can contribute to the overall success of the organization; to explain the role of IT governance in organizations, the best practices of IT governance implementation; to describe the uses of COBIT, Val IT and Risk IT frameworks.

Courses Offered in the Accounting Area

BA 5401 Accounting (3-0)3
Financial accounting and financial analysis; basic concepts of managerial accounting; organization of financial data for decision making; development of sound measurements and uses of accounting data; control and evaluation of economic activity are topics covered in this course.

BA 5411 Auditing (3-0)3
This course covers auditing theory and practice applicable to manufacturing business organizations in general; auditing standards, procedures, rules of professional conduct, and related material of professional importance.

BA 5412 Cost Accounting (3-0)3
Cost concepts, CVP relationships; budgeting; job, process and operation systems; flexible budgets and standards; service department cost allocation; allocation of joint and byproduct cost; spoilage, waste, defective units and scrap; relevant-cost analysis; capital budgeting; decentralization and transfer pricing.

BA 5413 Advanced Management Accounting (3-0)3
This is a study of those accounting topics that lend themselves to the use of mathematical and statistical techniques of cost analysis, with emphasis on the internal needs of management.

BA 5414 Special Topics in Accounting (3-0)3
This course is designed to equip the students with knowledge on contemporary issues in accounting such as funds flow and cash flow analysis, leases, pension plans, tax problems, consolidations, intangibles, approbation of retained earnings, responsibility accounting for home office and branches, accounting problems created by price-level changes.

BA 5415 Accounting Theory (3-0)3
The basic intention of this course is to provide a general frame of reference for evaluating and developing accounting principles. The methodology, concepts and structure of accounting theory; income concepts for financial reporting; problems of asset measurement under conditions of changing prices; reporting problems of specific asset and liability groups will be discussed. Special emphasis will be given to the problems of accounting and depreciation, intangibles, lease commitment and pension cost.

BA 5416 Managerial Accounting (3-0)3
This course provides an analysis of management's use of cost and other quantitative data in managerial planning and control.

BA 5417 Intermediate Accounting (3-0)3
This course covers international accounting standards within the scope of intermediate accounting topics. Topics covered include financing and operating activities of companies, application of generally accepted accounting principles to those activities, and evaluation of financial statements.

Courses Offered in the Quantitative Methods Area

BA 5501 Business Statistics (3-0)3
Statistical ideas and their relevance in business and social sciences; presentation and analysis of data, summary statistics and elements of exploratory data analysis; elementary probability; random variables and their distributions; the normal distribution; sampling and sampling distributions, the central limit theorem; student's distribution; large and small sample estimation procedure are areas covered in this course.

BA 5503 Management Science (3-0)3
Covers the most commonly used models/methods of Operations Research/ Management Science; emphasizes business applications rather than a mastery of the solution algorithms. Linear and dynamic programming, inventory and queuing models, simulation modeling and applications are studied.

BA 5505 Research Methods in Finance and Accounting (3-0)3
This course emphasizes the role and significance of research within accounting and finance, and covers different types and functions of research, formulating research, research questions, hypotheses, concepts, operations and briefs, research philosophies, epistemologies and ontologies and their relevance to quantitative and qualitative methodology and methods, collecting, analyzing and interpreting data: survey methodology and methods, questionnaire design and administration, questionnaire analysis including basic statistical techniques and computer data using a relevant statistical software package – i.e. SPSS (or equivalent). Also qualitative research methods including structured, semi-structured and unstructured interviews, focus groups, participant and non participant observation will be selectively discussed. Research ethics, social and economic objectives of research, writing and presentation research results and analysis will be addressed.

BA 5506 Quantitative Methods in Finance and Accounting (3-0)3
This course will cover the application of select mathematical tools in business and economics. Among these topics are equilibrium analysis, sets, functions, matrices and determinants, sequences, limits, cobweb model, rate of change, exponential function, continuous compounding, introduction to optimization, derivatives, partial derivatives, chain rule, integration, martingales, Brownian motion, Markov processes. The aim is to introduce how mathematical tools are applied in economics and business, especially in finance.

BA 5511 Business Forecasting (3-0)3
Introduction to quantitative and subjective forecasting methods. Evaluating forecast accuracy. Smoothing methods: Simple, Holt's and Winters' exponential smoothing techniques. Forecasting with Regression Methods: Forecasting with simple linear trend, using casual regression models, and forecasting with Multiple regression models. Time-series Decomposition models. Finding seasonal indexes, the long-term trend, and measuring cyclical component. Box-Jenkins (ARIMA) forecasting models. Introduction to simulation usage in forecasting. Combining Forecast results and Forecast Implementation are areas covered in the course

BA 5514 Risk Management (3-0)3
The aim of the Risk Management and Insurance course is to provide an introduction to the actuarial philosophy and the actuarial scientific method. All major areas in risk and insurance are treated in some depth, including basic concepts, fundamental legal principles, property and liability insurance, life and health insurance, social insurance, the functional and financial operations of insurance companies, and the main features of the Turkish insurance market.

BA 5515 Knowledge Management (3-0)3
Data Mining is a method of searching data with mathematical algorithms to identify trends and hidden patterns, profile customers, and then predict how these trends or customers will behave in the future. The objective of this course is to provide an insight into data mining techniques, build predictive models and apply them in real business problems.

BA 5516 Knowledge Management and Organizational Learning (3-0)3
As an emerging discipline, Knowledge Management bridges social-organizational and technological-technical aspects of management and business administration in the Knowledge Economy and Society. Underlying interrelated issues of organizational and managerial learning, this K nowledge Management course will have a specific

BA 5517 Decision Analysis: Tools and Methods (3-0)3
Decision analysis aims to provide a structured and systematic approach to guide the decision making activities in complex problems. This course attempts to convey the basic concepts and principles on the analytical methods, tools and techniques of decision analysis. Topics to be covered include Multi-Objective Decision Making (MODM), SMART, AHP, Multi-Attribute Utility Theory (MAUT), influence diagrams, decision trees and scenario planning.

BA 5518Decision Analysis: Behavioral and Psychological Perspective (3-0)3
Decision analysis is an interdisciplinary field that aims to provide a structured and systematic approach to guide the decision making activities in complex problems. At the same time, it attempts to understand the preliminary mechanisms underlying human judgment as well as the cognitive and psychological factors that affect the mental processes behind managerial decision making. The primary objective of this course is to provide an understanding on this perspective. Topics to be covered include rationality and managerial decision making, analysis of judgment, heuristics and biases, prospect theory, preference and choice, optimism, the perception of risk and group decision making.

Courses Offered in the Operations Management Area

BA 5602 Operations Management (3-0)3
The operations management functions in manufacturing and service industries; demand forecasting, capacity planning, facility location and layout, product design, process selection, job design and work measurement, production planning and control, Japanese manufacturing systems (JIT), theory of constraints, quality control.

BA 5616 Services Management (3-0)3
This course presents a study of the inherent characteristics of service organizations in the public and private sectors; the service package and service delivery system; service design and process selection; forecasting in services; location and layout of service firms; human resources management; capacity management and the quality challenge in services.

BA 5618 Project Management (3-0)3
The course provides a review of CPM and PERT models to cover cases with certain and uncertain activity times; project crashing and PERT/Cost analysis; GANTT charts and resource leveling decisions; use of simulation in connection with project scheduling; project control, revision and verification techniques; computer applications using commercial software.

BA 5621 Supply Chain Management (3-0)3
This course introduces the concepts, models, and solution tools that are needed in the design, control, and operation of supply chains. The discussion ranges from basic topics of inventory management, logistics network design, distribution systems, strategic alliances, buyer-supplier relationships, the value of information in the supply chain, utilizing readings, cases, and technical exercises.

BA 5622 ERP Applications (3-0)3
ERP (Enterprise Resource Planning) is an important tool utilized by organizations to streamline their operations, improve productivity and boost profits. This class focuses on the features, functions and benefits of the Oracle ERP e-Business Suite. In this course ORACLE Inventory, ORACLE Purchasing and ORACLE Order Management modules will be covered. Students will get the opportunity to understand operations in an organization from ERP perspective, visualize improvements and efficiencies.

Courses Offered in the Marketing Area

BA 5702 Marketing Management (3-0)3
The course is designed exclusively for the MBA student. It focuses both on the introduction of marketing concepts and managerial decision making regarding the marketing function. Strategic planning and the marketing management process; consumer and organizational markets; segmentation, targeting, positioning; product, pricing, distribution, and integrated marketing communications decisions; marketing control are topics covered in the course.

BA 5713 Promotion Management (3-0)3
The course builds on the basic knowledge of marketing and focuses on the design and management of the promotion mix, assumes an integrated marketing communications perspective and covers advertising, sales promotion, personal selling, direct marketing, publicity, and public relations. Cases, practical application assignments, and term projects are employed to emphasize applications.

BA 5714 Consumer Behavior (3-0)3
This course centers on the role of the consumer in the marketing process, enables the student to understand why certain marketing strategies are more effective than others, how humans behave in the marketplace, and which social and cognitive mechanisms the consumer brings to the purchasing decisions. Strong managerial, psychological, and personal implications; individual, social, and marketing determinants of consumption behavior are covered in the course.

BA 5715 Advertising Practice (3-0)3
The course is designed to familiarize the student with various practice-oriented aspects of the advertising profession. Briefing, planning, budgeting, concept and copy creation, execution, and evaluation of advertising campaigns; advertising agency management are areas covered. It integrates theory with practice; cases, applications and campaign assignments are employed to enhance learning.

BA 5716 Advertising Campaign Practice (3-0)3
Continuation of BA 4715.

BA 5717 Marketing Research (3-0)3
This course provides a hands-on introduction to empirical methodology for market research applications. Problem formulation, research design, measure development, scaling techniques, attitude measurement, simple and applied multivariate analysis, report writing are topics covered. An extensive term project enables the student to put the course content into practice.

BA 5718 International Marketing (3-0)3
The course introduces the student to the global marketing environment including the global economy, cultural forces, and the political and regulatory climate, explores how managers analyze global opportunities, buyer behavior, competitors, and marketing research, describes global marketing strategies, foreign market entry options, and the global implications of managing the marketing mix.

BA 5719 Marketing Channels (3-0)3
Institutional and functional analysis of distribution channels; power in distribution channels; selecting and evaluating channel systems; distribution problems, tools, and decisions are topics presented in the course.

BA 5720 Professional Selling (3-0)3
The course is designed to be a hands-on introduction to selling and sales management. Speakers, films, role playing, group projects, and field trips are employed to enhance learning. The objective is to develop skills and abilities that allow the student to manage sales territories as their own business.

BA 5721 Retailing (3-0)3
The course aims to give the student an appreciation of the constant change and development in retailing. It introduces the student to basic qualitative and quantitative retail management concepts; provides the student with current examples of retailing concepts in action; improves the student's skills is analyzing competitive situations and marketing opportunities.

BA 5722 Marketing Strategy (3-0)3
The course is designed to integrate and extend fundamental marketing concepts and apply them to business problems. Focus is on studying strategic issues relating to selection of business and segments in which to compete and how to spread resources across products and elements of the marketing mix. Case and simulation methodologies are employed.

BA 5723 Principles of Advertising (3-0)3
The course aims to introduce the student to an overview of the world of advertising industry and provide the fundamentals for developing, creating and implementing advertising campaigns based on strategic marketing principles and planning. The idea of the course is to develop students' knowledge and understanding of the advertising process. By the end of the course students will grasp the role of

advertising and get familiar with the basic concepts and terminology used in the business.

BA 5724 Advanced Marketing Research (3-0)3
This course aims to provide the students with an in-depth understanding of the research process and its practical applications in the marketplace. The course highlights the technical and academic concepts underlying business research, while at the same time attempting to develop a keen understanding of when, why, and how to use marketing research for more effective managerial decision-making.

BA 5725 Brand Managemet (3-0)3
The course provides a thotough understanding of branding processes in the 21st century. In the first part of the course, consumers and their behavior with regard to brands will be examined. Also, social role of brands as cultural, ideological, and political objects are discussed in the class. In the second part of the course, managerial concepts such as brand equity, brand identity, brand types, corporate branding, brand extensions, and brands and innovations are covered.

BA 5726 Understanding Consumption in Context (3-0)3
This module seeks to develop an interdisciplinary, theoretically informed understanding through an active piece of primary research into consumer behavior, consumer identities, and consumer experience. It aims to understand how consumers utilize consumption as a social process in their everyday lives. Various qualitative research methods are thought and conducted by students.

Courses Offered in the Finance and Economics Area

BA 5801 Business Economics (3-0)3
This course provides an application of the concepts of micro economic analysis through the use of if its tools in the decision making process, using modeling to find solutions that advance the best interest of businesses and other types of organizations. Topics include demand and supply analysis, production analysis, analysis of market structures and pricing strategies.

BA 5802 Financial Management (3-0)3
This course covers examination of special issues in finance incorporating advanced theory and practice with emphasis on investment and financing decisions of the firm. Special references are made to applications in Turkey.

BA 5811 Corporate Finance (3-0)3
This course is an introduction to the financial operations in business corporations and the related concepts like risk, rate of return, valuation. Topics covered: Risk, Rates of Return, Time Value of Money, Bond and Stock Valuation, Cost of Capital, Basics of Capital Budgeting, Cash Flow Estimation, Capital Structure and Leverage, Investment Banking and Securities Market.

BA 5814 Investment Management (3-0)3
The purpose of this course is to introduce the student to the area of investment with emphasis upon why individuals and institutions invest and how they invest. Topics include measures of risk and return; capital and money markets; process and techniques of investment valuation; principles of fundamental analysis; technical analysis; analysis and management of bonds; analysis of alternative investments; portfolio theory and application.

BA 5815 Project Evaluation and Financing (3-0)3
This course mainly deals with the design and analysis of new investment projects. Project financing approaches; Leasing, Venture Capital and Build-Operate-and-Transfer are discussed in the context of Turkey.

BA 5817 International Finance (3-0)3
The first part of the course aims at introducing the student to foreign exchange markets, exchange rate determination theories, forecasting and international trade financing. A project on Turkey will be assigned. The second part of the course deals with aspects of financial management for multinational corporations.

BA 5818 Analysis of Financial Statements (3-0)3
The objective of the course is to provide the knowledge and the skills necessary to take full advantage of financial reports and analysis. Starting with an overview of financial accounting, the topics that will be covered include financial statements, ratio analysis, comparative analysis and the management of operating funds.

BA 5819 Financial Institutions and Markets (3-0)3
This course is about analysis of financial intermediation and the determination of interest rates. Businesses, consumers, and governments in money and capital markets are observed with emphasis on financial instruments. International financial markets are discussed. The purposes and

functions of central banking are studied with primary attention to monetary policy.

BA 5820 Portfolio Management (3-0)3
The emphasis of the course is directed towards capital markets and portfolio management, and investments in securities. The discussions are basically about corporate securities and their valuation, and the organizations of the financial markets.

BA 5821 Bank Management (3-0)3
This is a course on basic assets, liability, and capital management. Topics include primary lending functions, pricing techniques, risk management, and bank organization, and familiarization with international banking.

BA 5825 Financial Derivatives (3-0)3
This course is designed to provide a solid foundation in the principles of derivatives. It attempts to strike a balance between institutional details, theoretical foundations, and practical applications. Parallel to the already increasing attempts to integrate derivative securities and markets into the Turkish financial system, this course will fill a gap so that the students are exposed to a rather comprehensive coverage of theory and application in the derivatives area.

BA 5826 Industrial Organization (3-0)3
The course analyzes structure, conduct and performance in imperfectly competitive markets. It considers strategic interaction between firms, and provides understanding of competition within and for the market place. Topics include monopoly, price discrimination, product selection, oligopoly, price competition, collusion, entry deterrence, reputation, limit pricing, and predation.

BA 5827 Fixed Income Analysis (3-0)3
Fixed income securities are an important part of portfolios held by individual and institutional investors around the world. In countries like Turkey, where the stock market is fairly new and highly risky, and treasury securities offer very high real returns, investment in fixed income securities become even more important. Fixed income securities have characteristics that are quite different from equity investments. Therefore, investments in these securities are governed by completely different principles. Furthermore, there are wide varieties of fixed income securities with quite complex cash flow structures in developed markets. Therefore, the objectives of this course are to:

- provide a review of different types of fixed income securities available in Turkish and international markets and their characteristics
- introduce interest rate models and their usage in valuation of complex cash flow streams of fixed income securities, and
- present professional fixed income portfolio management and evaluation of portfolio performance.

BA 5828 Trade and Project Financing (3-0)3
The course is designed to give detailed knowledge about trading with emphasis on export. It also includes project financing techniques and their applications. The course will help those seeking entrance into this most interesting field of finance by exploring problems that they may face in dealing in international trade and finance transactions on a daily basis. The course will deal with these subjects in the context of emerging markets rather than in the context of developed markets.

BA 5829 Valuation Models and Applications (3-0)3
This course focuses on valuation of real and financial assets. The valuation methods covered are discounted cash flow approaches, multiples and real options. Students will learn how to calculate the value for various asset types and how to choose the appropriate method of valuation.

BA 5830 Special Topics in Finance (3-0)3
This course is designed to deal with some special topics in finance. The purpose of the course is to extend knowledge of students beyond basic finance topics and increase awareness of students on some key issues of finance. The topics covered include short term financial planning, leasing, mergers and acquisitions, international finance and derivative securities.

BA 5832 Current Issues in Turkish Capital Markets (3-0)3
In this course we will provide an overview and analysis of the current issues in capital markets. We will examine the evolving structure and role of capital markets and institutions in the development of the economy. Attention will be given to Turkish capital markets in the context of intense global competition, increased capital mobility and global harmonization. The various evolving concepts in capital markets will be analyzed.

BA 5833 Central Banking (3-0)3
The aim of this course is to give the students a broad overvievw of both the basic principles and the practical implementation of central banking as well as functioning of the financial markets in an attempt to better understand how central bank operations

affect financial institutions and the monetary policy transmisision mechanism.

BA 5834 Financial Issues in Corporate Governance (3-0)3
In the 20th century, modern corporations became one of the world's dominant institutions. Consequently, the way they do business is now under close scrutiny. The relationship between ownership structure, performance and the demands of society requires that companies exercise a high degree of diligence in their governance.

BA 5836 Real Estate Finance (3-0)3
Introduction to real estate markets and financing alternatives for real estate investments. Topics on residential and commercial real estate and alternative ways of investing in real estate. Performance of real estate investments and their affect on the portfolios of investors.

BA 5097 Term Project NC

BA 5098 Prosthesis Seminar NC

BA 5099 Master's Thesis NC

GRADUATE PROGRAMS

MASTER OF BUSINESS ADMINISTRATION: The program offers participants from various disciplines a comprehensive foundation in management skills. The sound formation provided in the program equips the students with an enhanced awareness of the organization and its problems, and is aimed at developing the student's ability to apply managerial concepts and techniques in practical business situations.

The program incorporates a comprehensive and well-balanced range of MBA foundation courses and provides the opportunity to develop a particular area of expertise through the elective courses offered. The student has an option of doing a Master's thesis or picking the non-thesis Master's option. The Master's thesis entails supervised research where the student, with the guidance of a faculty member, can explore in detail a topic of interest to himself or herself. In the non-thesis option, the student is allowed to take further courses and conducts a term project research under the supervision of a faculty member.

EXECUTIVE MASTER OF BUSINESS ADMINISTRATION: The purpose of the program is to improve and update the managerial skills of people employed at the mid and upper level management positions in various sectors. The program combines the fundamental tools and core concepts with new developments in the business administration area.

The courses are designed to incorporate problem solving approaches, ethical considerations, international developments, teamwork and leadership abilities in interactive settings; and to provide a working knowledge of the tools and software technologies used in managerial decision making. The non-credit term project is a supervised project where actual problems from the field are addressed. The optional international seminars aim to broaden the visions of the participants and to provide a more international perspective in developing managerial skills.

Ph.D. IN ACCOUNTING AND FINANCE: Spanning a period of more than four decades, the Department draws upon its exceptional success and experience in teaching, research and consultancy. The program is uniquely positioned to produce effective instructors and researchers for the academic community, and specialist positions in the private and public sector that require doctoral-level education.

GRADUATE CURRICULUM
MASTER OF BUSINESS ADMINISTRATION
(NON-THESIS)

First Semester				Second Semester			
BA	5201	Organization and Management	(3-0)3	BA	5106	Business Law	(3-0)3
				BA	5202	Human Resource Management	(3-0)3
BA	5401	Accounting	(3-0)3				
BA	5501	Business Statistics	(3-0)3	BA	5602	Operations Management	(3-0)3
BA	5503	Management Science	(3-0)3	BA	5702	Marketing Management	(3-0)3
BA	5801	Business Economics	(3-0)3	BA	5802	Financial Management	(3-0)3
Third Semester				**Fourth Semester**			
BA	5301	Information Systems	(3-0)3	BA	5102	Strategic Management	(3-0)3
ECON	514	Macro Economics	(3-0)3	BA	xxxx	Elective	(3-0)3
BA	xxxx	Elective	(3-0)3	BA	xxxx	Elective	(3-0)3
BA	xxxx	Elective	(3-0)3	BA	xxxx	Elective	(3-0)3
				BA	5097	Term Project	NC
				BA	80xx	Special Studies	NC
BA	xxxx	Elective	(3-0)3	BA	90xx	Special Topics	NC

MASTER OF BUSINESS ADMINISTRATION
(WITH THESIS)

First Semester

BA	5201	Organization and Management	(3-0)3
BA	5401	Accounting	(3-0)3
BA	5501	Business Statistics	(3-0)3
BA	5503	Management Science	(3-0)3
BA	5801	Business Economics	(3-0)3

Second Semester

BA	5106	Business Law	(3-0)3
BA	5202	Human Resource Management	(3-0)3
BA	5602	Operations Management	(3-0)3
BA	5702	Marketing Management	(3-0)3
BA	5802	Financial Management	(3-0)3

Third Semester

BA	5301	Information Systems	(3-0)3
BA	xxxx	Elective	(3-0)3
BA	xxxx	Elective	(3-0)3
BA	5098	Prothesis Seminar	NC
BA	80xx	Special Studies	NC
BA	90xx	Special Topics	NC

Fourth Semester

BA	5102	Strategic Management	(3-0)3
BA	5099	Master's Thesis	NC
BA	80xx	Special Studies	NC
BA	90xx	Special Topics	NC

GRADUATE ELECTIVES

Courses Offered in the Business, Management and Strategy Area

BA	5111	Managing Technology and Innovation	(3-0)3
BA	5115	Business Ethics	(3-0)3
BA	5116	Organization, Work and Society	(3-0)3
BA	5120	Analysis of Turkish-EU Relations	(3-0)3
BA	5121	International Business	(3-0)3
BA	5122	Self-Assessment for Quality Management	(3-0)3
BA	5125	Turkish Business Environment	(3-0)3
BA	5129	Strategic Games for Managers	(3-0)3
BA	5130	Managerial Judgment and Decision Making	(3-0)3
BA	5132	Cases in Quality Management	(3-0)3
BA	5133	Corporate Governance and Social Responsibility	(3-0)3
BA	5135	Leadership Theory and Application	(3-0)3
BA	5136	Current Issues in Business	(3-0)3
BA	5137	Entrepreneurship	(3-0)3
BA	5138	European Economic Integration	(3-0)3
BA	5140	Strategic Behavior and Experiments	(3-0)3
BA	5141	Competition Law and Practice in Turkey	(3-0)3
BA	5142	Family Business	(3-0)3

Courses Offered in the Organization and Human Resource Management Area

BA	5213	Selected Topics in Organizational Behavior	(3-0)3
BA	5215	Organizational Culture	(3-0)3
BA	5216	Cross-Cultural Studies in Organizations	(3-0)3
BA	5217	Cases in Human Resources Appraisal and Management	(3-0)3
BA	5218	Organizational Influence Processes	(3-0)3
BA	5219	Organizational Development	(3-0)3
BA	5222	Negotiation	(3-0)3

Courses Offered in the Information Systems Area

BA	5312	Topics in MIS	(3-0)3
BA	5314	Computer Applications in Business	(3-0)3
BA	5316	E-Technologies and Managerial Applications	(3-0)3
BA	5317	IT Strategy and Governance	(3-0)3

Courses Offered in the Accounting Area

BA 5411 Auditing (3-0)3
BA 5412 Cost Accounting (3-0)3
BA 5413 Advanced Management Accounting (3-0)3
BA 5414 Special Topics in Accounting (3-0)3
BA 5415 Accounting Theory (3-0)3
BA 5416 Managerial Accounting (3-0)3
BA 5417 Intermediate Accounting (3-0)3

Courses Offered in the Quantitative Methods Area

BA 5511 Business Forecasting (3-0)3
BA 5514 Risk Management (3-0)3
BA 5515 Knowledge Management (3-0)3
BA 5516 Knowledge Management and Organizational Learning (3-0)3
BA 5517 Decision Analysis: Tools and Methods (3-0)3
BA 5518 Decision Analysis: Behavioral and Psychological Perspective (3-0)3

Courses Offered in the Operations Management Area

BA 5616 Services Management (3-0)3
BA 5618 Project Management (3-0)3
BA 5621 Supply Chain Management (3-0)3
BA 5622 ERP Applications (3-0)3

Courses Offered in the Marketing Area

BA 5713 Promotion Management (3-0)3
BA 5714 Consumer Behavior (3-0)3
BA 5715 Advertising Practice (3-0)3
BA 5716 Advertising Campaign Practice (3-0)3
BA 5717 Marketing Research (3-0)3
BA 5718 International Marketing (3-0)3
BA 5719 Marketing Channels (3-0)3
BA 5720 Professional Selling (3-0)3
BA 5721 Retailing (3-0)3
BA 5722 Marketing Strategy (3-0)3
BA 5723 Principles of Advertising (3-0)3
BA 5724 Advanced Marketing Research (3-0)3
BA 5725 Brand Management (3-0)3
BA 5726 Understanding Consumption in Context (3-0)3
BA 5727 Global and Intercultural Marketing (3-0)3
BA 5728 Marketing and Culture (3-0)3

Courses Offered in the Finance and Economics Area

BA 5811 Corporate Finance (3-0)3
BA 5814 Investment Management (3-0)3
BA 5815 Project Evaluation and Financing (3-0)3
BA 5817 International Finance (3-0)3
BA 5818 Analysis of Financial Statements (3-0)3
BA 5819 Financial Institutions and Markets (3-0)3
BA 5820 Portfolio Management (3-0)3
BA 5821 Bank Management (3-0)3
BA 5825 Financial Derivatives (3-0)3
BA 5826 Industrial Organization (3-0)3
BA 5827 Fixed Income Analysis (3-0)3
BA 5828 Trade and Project Financing (3-0)3
BA 5829 Valuation, Models and Applications (3-0)3
BA 5830 Special Topics in Finance (3-0)3
BA 5832 Current Issues in Turkish Capital Markets (3-0)3
BA 5833 Central Banking (3-0)3
BA 5834 Financial Issues in Corporate Governance (3-0)3
BA 5836 Real Estate Finance (3-0)3
BA 5097 Term Project NC
BA 5098 Prosthesis Seminar NC
BA 5099 Master's Thesis NC

EXECUTIVE MASTER OF BUSINESS ADMINISTRATION
(NON-THESIS)

First Semester

EMBA	5401	Accounting for Business Decisions– Financial	(2-0)2
EMBA	5403	Accounting for Business Decisions – Managerial	(1-0)1
EMBA	5501	Quantitative Decision Tools	(3-0)3
EMBA	5801	Microeconomic Environment of Business	(2-0)2
EMBA	5803	Macroeconomic Environment of Business	(1-0)1

Second Semester

EMBA	5202	Essentials of Organizations	(2-0)2
EMBA	5204	Managing Human Resources	(2-0)2
EMBA	5602	Managing Operations	(2-0)2
EMBA	5702	Marketing Management	(2-0)2
EMBA	5802	Financial Management for Executives	(2-0)2

Third Semester

EMBA	5101	Strategic Management	(2-0)2
EMBA	5103	Executive Skill Development	(3-0)3
EMBA	5301	Information Systems for Executives	(2-0)2
EMBA	xxxx	Elective	(1-0)1
EMBA	xxxx	Elective	(1-0)1
EMBA	xxxx	Elective	(1-0)1

Fourth Semester

EMBA	5097	Term Project	NC
EMBA	80xx	Special Studies	NC
EMBA	90xx	Special Topics	NC

EXECUTIVE MASTER OF BUSINESS ADMINISTRATION
ELECTIVES

EMBA	5111	Managing Technology and Innovation	(1-0)1
EMBA	5129	Strategic Games for Managers	(1-0)1
EMBA	5133	Business Ethics and Social Responsibility	(1-0)1
EMBA	5222	Negotiation for Business	(1-0)1
EMBA	5711	Marketing Strategy	(1-0)1
EMBA	5712	Marketing Research Practice	(1-0)1
EMBA	5812	Financial Derivatives	(1-0)1
EMBA	5813	Financial Planning & Control System	(1-0)1
EMBA	5817	International Financial Management	(1-0)1
EMBA	5818	Analysis of Financial Statements	(1-0)1
EMBA	5714	Consumer Behavior	(1-0)1

DOCTOR OF PHILOSOPHY IN ACCOUNTING AND FINANCE

Students without a master's degree are admitted to the integrated doctorate program and students that already hold a master's degree are admitted directly to the Ph.D. program. Students choose either a finance track or an accounting track for the degree.

CURRICULUM (Integrated Program First Year)

First Semester

BA	5505	Research Methods in Accounting and Finance	(3-0)3
BA	5811	Corporate Finance	(3-0)3
BA	5814	Investment Management (Finance track)	(3-0)3
		or	
BA	5818	Analysis of Financial Statements (Accounting track)	(3-0)3

Second Semester

BA	5506	Quantitative Methods in Accounting and Finance	(3-0)3

XX	xxxx	Elective (Restricted)	(3-0)3			And Market	(3-0)3
XX	xxxx	Elective (Restricted)	(3-0)3				
BA	5819	Financial Institutions					

CURRICULUM (Ph.D. Program)

First Semester

BA	6401	Accounting Theory (Accounting track)	(3-0)3
or			
BA	6801	Theory of Finance (Finance track)	(3-0)3
BA	6505	Applied Regression Analysis	(3-0)3
BA	6811	Microeconomic Theory for Business	(3-0)3

Second Semester

BA	6402	Topics in Accounting Research I (Accounting track)	(3-0)3
or			
BA	6802	Topics in Finance Research I (Finance track)	(3-0)3
BA	6506	Applied Multivariate Analysis	(3-0)3
XX	xxxx	Elective (Restricted)	(3-0)3

Summer Semester

BA	6021	Research Paper I (Seminar)	NC

Third Semester

BA	6403	Topics in Accounting Research II (Accounting track)	(3-0)3
or			
BA	6803	Topics in Finance Research II (Finance track)	(3-0)3
BA	6507	Applied Time Series and Panel Data Analysis	(3-0)3
XX	xxxx	Elective (Restricted)	(3-0)3

Fourth Semester

BA	6404	Topics in Accounting and Finance Research (Accounting track)	(3-0)3
or			
BA	6804	Topics in Accounting and Finance Research (Finance track)	(3-0)3

Fifth Semester

BA	6099	Ph.D. Dissertation	NC
BA	80xx	Special Studies	NC
BA	90xx	Special Topics	NC

Sixth Semester

BA	6099	Ph.D. Dissertation	NC
BA	80xx	Special Studies	NC
BA	90xx	Special Topics	NC

DESCRIPTION OF COURSES

Courses Offered in the Executive MBA Program

EMBA 5101 Strategic Management (2-0)2
This a capstone course to show the student the need for and methods of integrating a firm's various functional area activities in a dynamically changing environment. Furthermore, strategic management is emphasized, that is, the process dealing with the fundamental organizational renewal and growth, with the development of the strategies, structures and systems necessary to achieve such renewal and growth and with the organizational systems needed to effectively manage the strategy formulation and implementation processes.

EMBA 5103 Executive Skill Development (3-0)3
Especially designed for executives, this course provides students with the opportunity to develop cognitive, skill, and experiential-practicum learning applied to ongoing leadership and organizational problems. It aims to develop self-awareness of personal attributes and goals, enhance personal development, and help learn skills needed to function as future executives. Topics to be covered will include teamwork skills, negotiation skills, conflict management, managing time and stress, effective problem solving, understanding and working through corporate culture, written and oral communication skills, and other leadership skills.

EMBA 5105 Business Ethics and Social Responsibility (1-0)1
The course is on how ethics and social responsibility can be integrated in business decision making.

EMBA 5111 Managing Technology and Innovation (1-0)1
Types and sources of innovation, disruptive technologies; standards and dominant designs; technology strategy; collaboration strategies; protecting innovations; process of product development; organization for product.

EMBA 5129 Strategic Games for Managers (1-0)1
This is an introductory course to game theory. Focus will be on making decisions in multi person settings that involve strategic interactions. Game theory is a mathematical tool that can be used in modeling strategic interactions. It is used in many disciplines including business, economics, biology, political science etc. We will concentrate on establishing a taxonomy that enables us to think in a systematic pattern in the face of interactive decision making situations. Although the math will be kept at the minimum level possible, some knowledge of probability and derivatives will be necessary. Also some knowledge of economics (especially micro) will be helpful.

EMBA 5133 Business Ethics and Social Responsibility (1-0)1
The course aims to help future managers to learn what to think in making an ethical and responsible decision and develop good corporate citizens out of their firms.

EMBA 5202 Essentials of Organization (3-0)3
This course provides a systematic and analytic study of the structure and functioning of organizations and the behavior of groups and individuals within them. The emphasis will be on the pragmatics of organization and management. Further emphasis is on the analysis of the fit among the organization, its people and their work, its environment and internal systems; analysis of the interaction of organizational design and various performance measures; awareness of contemporary views of best practice in the structuring of organizations and the management of the people that comprise them.

EMBA 5204 Managing Human Resources (2-0)2
The course is designed to cover the policies, procedures and practices governing the recruitment, selection, training, promotion, remuneration and working conditions of the people employed by an enterprise. Special emphasis is assigned to the concept of globalization and its impact on work force diversification and organization of the work force.

EMBA 5222 Negotiation For Business (1-0)1
The viewpoint that the manager is a negotiator is emphasized. Negotiation structure, planning for negotiation; aggressive, consultative, distributive and negative negotiations are analyzed, and various heuristics are developed. Cases and exercises in this area are used to build the necessary understanding and skills.

EMBA 5301 Information Systems for Executives (2-0)2
The course focuses on the strategic role of information systems in organization. It has a managerial, rather than technical perspective on how to generate business value from information systems investments. Various types of information systems and their applications in different decision making environments, their impact on firm performance, strategic issues in the planning, development and implementation of systems, the opportunities and threats of e-Business are among the topics covered.

EMBA 5401 Accounting for Business Decision Financial (2-0)2

Designed for executives, basic concepts of financial and managerial accounting are covered in this course. Special emphasis is given to reading financial statements.

EMBA 5403 Accounting for Business Decisions-Managerial (1-0)1
This Course is designed to provide a foundation of macro economic. Special emphasis is given to the recent developments in the Turkish economic environment.

EMBA 5501 Quantitative Decision Tools for Managers (3-0)3
This is a course covering basic statistical concepts and methods useful in decision making in the business environment. Emphasis is placed on descriptive and inferential tools used in converting raw data into useful information; and on the use of statistical computer packages and interpretation of statistical results. The course also covers the most commonly used models/methods of Operations Research/Management Science. This course aims at introducing the students to some of the quantitative decision making tools that are highly applicable in solving practical problems faced every day by managers.

EMBA 5602 Managing Operations (2-0)2
The operations management functions in manufacturing and service industries; demand forecasting, capacity planning, facility location and layout, product design, process selection, job design and work measurement, production planning and control, Japanese manufacturing systems (JIT), theory of constraints, quality control are topics covered in this course.

EMBA 5702 Marketing Management (2-0)2
This course focuses both on the introduction of marketing concepts and managerial decision making regarding the marketing function. The course is designed for people who have little or no formal training in marketing. It is especially designed for business professionals who work with marketing professionals on a day-to-day basis, managers who want to know more about marketing, or small business owners who need to understand the basic marketing concepts. It is covered through a case-based and highly applied perspective.

EMBA 5711 Marketing Strategy (1-0)1
Competition, competitive processes, and marketing; strategy making and implementation issues in marketing; managing business relationships; managing customer relationships; data-based marketing decision making; pricing practices; promotions practices; product design and related issues; behavioral and structural issues in channels management; performance metrics and measurement issues in marketing; digital age and marketing applications**.**

EMBA 5712 Marketing Research Practice (1-0)1
This course designed to introduce you to research methodology and application of research techniques and procedures in marketing. The primary goal in this course is to develop a sound understanding of research methods in marketing applications. The course will have a practical orientation and focus on the current practice of marketing research in the Turkish marketing environment.

EMBA 5714 Consumer Behavior (1-0)1
Centers on the role of the consumer in the marketing process. Enables the student to understand why certain marketing strategies are more effective than others, how humans behave in the marketplace, and which social and cognitive mechanisms the consumer brings to the purchasing decisions.

EMBA 5725 Brand Management (1-0)1
The course provides a thorough understanding of branding processes in the 21st century. In the first part of the course, consumers and their behaviour with regard to brands will be examined. Also, social role of brands as cultural, ideological, and political objects are discussed in the class. In the second part of the course, managerial concepts such as brand equity, brand identity, brand types, corporate branding, brand extensions, and brands and innovations are covered.

EMBA 5801 Micro Economic Environment of Business (2-0)2
This Course is designed to provide a solid foundation of economic understanding for use executive decisions. Thereby, the course offers a comprehensive treatment of micro and principles and analysis to help the business firm in its specific decision problems.

EMBA 5802 Financial Management for Executives (2-0)2
This course examines the main issues in finance incorporating theory and practice with emphasis on investment and financing decisions of the firm. Special references are given to applications in Turkey. It provides students with grounding in the basic concepts of finance, including the time value of money, the role of financial markets, asset valuation, capital budgeting decisions, portfolio theory, asset pricing, and the risk-return tradeoff.

EMBA 5803 Macro Economic Environment of Business (1-0)1
This course is designed to provided a foundation of macro economic. Special emphasis is given to the recent developments in the Turkish economic environment.

EMBA 5812 Financial Derivatives (1-0)1
The course is designed to provide a foundation in the principles of financial derivatives and risk management. It provides an introduction to a myriad of available financial derivative instruments and emphasizes practical issues in setting up investment strategies in order to manage risk in financial markets.

EMBA 5813 Financial Planning & Control System (1-0)1
The objective of this course is to allow the students to gain knowledge, and analytical skills related to how a corporation's executives go about designing and implementing those ongoing formal systems used to plan and control the firm's performance. The key ideas underlying this course are (i) different organizations typically have different strategies, and (ii) different control systems are needed to effectively implement different strategies.

EMBA 5817 International Financial Management (1-0)1
This course recognizes the importance of global integration of financial markets, a tread that is creating a host of threats and opportunities for individual investors and for firms that consider undertaking become familiar with the issues that shape today's global markets and to acquire the skills necessary to tackle managerial problems related to international investing, financing, and exchange rate risk management.

EMBA 5818 Analysis of Financial Statements (1-0)1
The objective of the course is to provide the knowledge and the skills necessary to take full advantage of financial reports and analysis. Starting with an overview of financial accounting, the topics that will be covered include financial statements, ratio analysis, comparative analysis and the management of operating funds.

EMBA 5097 Term Project NC

EMBA 80xx Special Studies NC

EMBA 90xx Special Topics NC

Courses Offered in the Ph.D. Program

BA 6021 Research Paper I NC
During the summer of the first year, the students are required to replicate a recent research study in their field of interest under the supervision of their advisor. While replicating a research, the students are required to critically analyze the motivation, methodology and the results of the study.

BA 6401 Accounting Theory (3-0)3
The aim of the course is to introduce the students to prevailing schools of thought in accounting theory. Specifically, the historical development of accounting theory will be covered with special emphasis on current development. The course is organized around three main topics: normative and positive accounting theories; financial reporting disclosures and ethical considerations; and income determination.

BA 6402 Topics in Accounting Research I (3-0)3
The course covers main research areas in accounting utilizing an extensive list of readings starting with earlier research and ending with very recent research in accounting. The areas covered include, but are not limited to, capital market research, behavioral research in accounting, analytical research in accounting, and other empirical research in accounting and related areas. The students are expected develop skills pertaining to how research work should be evaluated critically.

BA 6403 Topics in Accounting Research II (3-0)3
This course is a continuation of BA 6402 Topics in Accounting Research I. It is aimed to bring the students up-to-date by covering the latest research agenda in the area of accounting.

BA 6404 Topics in Accounting and Finance Research (3-0)3
The course covers the research that addresses the common problems in accounting and finance. Articles that investigate issues such as stock market reaction to announcements, capital structure of firms and financial analysis are some of the topics that are discussed. The aim of the course is to broaden the research prospective of the students.

BA 6505 Applied Regression Analysis (3-0)3
This course will cover the following topics: Simple Linear Regression, Introduction to Multiple Regression, Multiple Regression Model Building, Heteroscedasticity and Autocorrelation, Dummy Variables and Truncated Variables, Nonlinear Regressions, Simultaneous Equation Models, MLE, GMM. The instruction will be based on applied work in business with extensive use of a statistical software package- i.e. SPSS, MINITAB

BA 6506 Applied Multivariate Analysis (3-0)3
This course will cover Multivariate data, Multivariate normal distribution, Multivariate ANOVA, MANCOVA, Repeated measures MANOVA, Multivariate regression, Principal Components, Factor Analysis, Canonical Correlation Analysis, Discriminant Analysis, Cluster Analysis, and Multidimensional Scaling. Students will be required to understand the use of and apply the techniques in finance and accounting using a relevant statistical software- i.e. SPSS, MINITAB

BA 6507 Applied Time Series and Panel Data Analysis (3-0)3

This course will cover the following materials in two parts, with an applied emphasis in finance and accounting. TIME SERIES: Data handling, Univariate time series, VARs and VECMs, Structural VAR modeling and Impulse Response Analysis, forecast error variance decomposition, Conditional Heteroscedasticity; PANEL DATA: One-way error component: fixed effects, random effects, Two-way error component: fixed effects, random effects, SUR, Nonstationary Panels: panel unit root, panel co-integration, estimation and inference in integrated panels. A statistical software package will be extensively used- i.e. Eviews, Microfit, RATS & CATS

BA 6801 Theory of Finance (3-0)3

The aim of the course is to introduce the students to the literature on financial theory. Utility theory, state-preference theory, mean-variance portfolio theory, the capital asset pricing model and arbitrage pricing model, option pricing theory, and MM theorems are analyzed both conceptually and empirically.

BA 6802 Topics in Finance Research I (3-0)3

This course is a doctoral seminar that covers the major theories and empirical studies that have been developed in the areas of financial markets, investments and asset pricing.

BA 6803 Topics in Finance Research II (3-0)3

This course is a doctoral seminar that covers the major theories and empirical studies that have been developed in the area of financial institutions.

BA 6804 Topics in Accounting and Finance Research (3-0)3

The course covers the research that addresses the common problems in accounting and finance. Articles that investigate issues such as stock market reaction to announcements, capital structure of firms and financial analysis are some of the topics that are discussed. The aim of the course is to broaden the research prospective of the students.

BA 6811 Microeconomic Theory (3-0)3

he course will cover topics relevant to the program such as consumer choice, demand, expected utility, production, models of the firm, partial equilibrium, general equilibrium, perfect competition, imperfect competition, and strategy.

BA 6099 Ph.D. Dissertation NC

BA 80xx Special Studies NC

BA 90xx Special NC

DEPARTMENT OF ECONOMICS

PROFESSORS

ERDİL, Erkan: B.S., M.S., METU; Ph.D., Maastricht University.
ÖCAL, Nadir (***Department Chair***): B.S., M.S., METU; Ph.D., University of Manchester.
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ÖZVEREN, Eyüp (***Dean of the Faculty of Economic and Administrative Sciences***): B.S., METU; M.A., Ph.D., State University of New York at Binghamton.
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YILDIRIM, Onur: B.S., METU; M.A. State University of New York at Binghamton and Princeton University; Ph.D., Princeton University.

ASSOCIATE PROFESSORS

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EGE, Aylin: B.S., METU; M.A., Ankara University; M.A., Ph.D., University of Kent at Canterbury.
ERCAN, Hakan: B.S., M.S., METU; Ph.D., University of Iowa.
KIRDAR, Murat Güray: B.S., M.S., University of Michigan; Ph.D., University of Pennsylvania.
SARAÇOĞLU, Şirin: BA METU; MA, PhD University of Minnesota
TUNÇ, Gül İpek: B.S., M.S., Ph.D., METU.
TÜRÜT AŞIK, Serap B.S., M.S., METU; Ph.D., Texas Tech University.
VOYVODA, Ebru : B.S., M.S., Ph.D., Bilkent University.

ASSISTANT PROFESSORS

AĞIR, Seven: B.S., M.S., Middle East Technical University, Ph.D., Princeton University.
CÖMERT, Hasan : B.A, METU; M.A., METU; Ph.D, Universtiy of Massachuseets at Amherst.
DERİN GÜRE, Pınar: B.S., M.S., METU; Ph.D., Boston University.
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YILDIRIM, Dilem (***Vice Chair***): B.S., M.S., METU; Ph.D., University of Manchester.

INSTRUCTORS

AKDERE, Cınla: B.S., Ankara University, M.S., PhD. Paris I Panthéon-Sorbonne University
GÜLSEVEN, Osman: B.S., Bilkent University; M.S., Ph.D., North Carolina State University

GENERAL INFORMATION: Economics is the study of individual and social activities related to the choice, production, distribution and consumption of goods and services. It is the science that attempts to capture and perceive the essence of the material aspect of human life. Today's modern dynamic economic environment calls for a challenging learning process even for the simplest decision-maker of everyday life. The prominent position that economic behavior occupies in social activities has imparted a kind of priority to economic inquiry in understanding human development through ages. The principal aim of the program offered by the Department of Economics is to establish and improve the understanding of economic problems from the elementary to the most complex, and to provide its students with necessary tools to undertake critical and systematic analyses of the economic environment we live in and to develop policy options.

AIMS AND OBJECTIVES OF UNDERGRADUATE PROGRAM: The Undergraduate Program is composed of two parts. During the first two years, students are provided with a firm background in

economic theory within a general social science context, as well as mathematics and statistics that enable them to proceed on analytical grounds for the most advanced and specialized courses to be taken in the third and fourth years. Due to the choice of methodology and field of study, the program offers a remarkably wide range of options including certain applied issues as economic development, economic history, monetary policy, public finance, international trade, political economy, labor economics, industrial relations, energy and environmental economics.

CAREER OPPORTUNITIES: The specialized advanced courses in the fourth year of the program are designed to prepare students for careers in government, private sector, banking and higher education for academic career. Graduates take up academic posts, or positions in research departments of major state and commercial banks and posts in the public sector that require independent research and analytical capability.

LABORATORIES AND EQUIPMENT: Located at Building A of Faculty of Economics and Administrative Sciences, the Department has access to two computer laboratories reserved for the use of undergraduate students. The two laboratories include 65 computers with high speed internet access and print services. The preferred operating system is Windows 7 and Microsoft Office applications are installed on all computers. The computer applications are supported with the necessary statistical and computational software package tools such as M-Fit., QSP, Lindo, Minitab, Eviews etc., which are extensively used in courses on econometrics, programming and statistical analysis. The students also have access to online academic resources and journals through the computer laboratories. Installed in classrooms are projection devices used to aid in education. The Department also has portable projection devices to be used as the need arises. A third computer laboratory is reserved for the use graduate students only. The graduate students' laboratory has 10 computers and is also equipped with printers and scanners. The Faculty buildings are also equipped with the necessary infrastructure for wireless internet access.

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: The main objective of the program is to give students high-level training in basic theoretical and applied branches of economics to enable them to conduct independent research.

MAJOR GRADUATE LEVEL RESEARCH ACTIVITIES: Seminars and workshops on a variety of theoretical and applied fields with student and staff participation are organized by the Department. The Department staff conducts research financed by various sources like The Scientific and Technological Research Council of Turkey, Research Framework Programs of the European Union and Scientific Research Projects of the University. The graduate students are encouraged to take part in these projects as well as conduct individual research.

UNDERGRADUATE CURRICULUM

FIRST YEAR

		First Semester	
ECON	101	Introduction to Economics I	(4-2)5
ECON	105	Introduction to Research Methods I	(2-2)3
MATH	119	Calculus w Analytic Geometry	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4
TURK	101	Turkish I	NC
IS	100	Introduction to Information Technologies and Applications	NC
ECON	107	Economy, Society and Civilization I	(3-0)3

		Second Semester	
ECON	102	Introduction to Economics II	(4-2)5
ECON	106	Introduction to Research Methods II	(2-2)3
MATH	120	Calculus for Functions of Several Variables	(4-2)5
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	NC

And **one** of the following courses

ECON	108	Economy, Society and Civilization II	(3-0)3
ADM	1122	Modern State and Politics	(3-0)3
SOC	104	Introduction to Sociology	(3-0)3
ADM	1121	Enlightenment and Development of Social Science	(3-0)3

PSY	150	Understanding Social Behavior	(3-0)3

SECOND YEAR

Third Semester

ECON	201	Microeconomic Theory I	(4-0)4
ECON	202	Macroeconomic Theory I	(4-0)4
ECON	205	Statistics for Economist I	(3-0)3
MATH	260	Basic Linear Algebra	(4-0)4
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

ECON	203	Microeconomic Theory II	(4-0)4
ECON	204	Macroeconomic Theory II	(4-0)4
ECON	206	Statistics for Economist II	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
ECON	208	Social and Economic History II	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

And **one** of the following courses

ECON	207	Social and Economic History I	(3-0)3
BA	1401	Financial Accounting	(3-0)3
BA	2405	Principles of Financial Accounting	(3-0)3
ADM	2121	History of Pol. Thought I	(3-0)3
ADM	2242	Turkish Administrative System	(3-0)3
MATH	219	Introduction to Differential Equations	(4-0)4
ADM	2122	History of Political Thought	(3-0)3
ADM	2436	Introduction to Law for Economists	(3-0)3
MATH	219	Introduction to Differential Equations	(4-0)4
MATH	251	Advanced Calculus I	(4-0)4
MATH	252	Advanced Calculus II	(4-0)4
ENG	212	Report Writing	(3-0)

THIRD YEAR

Fifth Semester

ECON	301	Introduction to Econometrics I	(3-2)4
ECON	361	History of Economic Analysis I	(3-0)3
Elective			
Elective			
Elective			

Sixth Semester

ECON	302	Introduction to Econometrics II	(3-2)4
Elective			
Elective			
Elective			
Elective			

FOURTH YEAR

Seventh Semester

ECON	460	Structure of Turkish Economy	(3-0)3
Elective			
Elective			
Elective			
Elective			

Eighth Semester

Elective			
Elective			
Elective			
Elective			
Elective			

N.B.: Every student must take 16 electives in the third and fourth years to graduate. At least ten of the electives must be chosen from the Elective courses offered by the Department. The maximum number of non-faculty electives (outside FEAS) which are not listed in the curriculum is 3. Out-of- department electives should have credit values and should be at least on second year level.

ELECTIVE COURSES

ECON	311	Monetary Theory and Policy	(3-0)3
ECON	312	Fiscal Policy and Public Finance	(3-0)3
ECON	353	Introduction to International Economics I	(3-0)3
ECON	354	Introduction to International Economics II	(3-0)3
ECON	362	History of Economic Analysis II	(3-0)3
ECON	400	Seminar in Economics	(0-6)3
ECON	401	Practical Training in Economics I	(3-0)3
ECON	402	Practical Training in Economics II	(3-0)3
ECON	406	Real Estate Economics and Finance	(3-0)3
ECON	407	Input–Output Analysis and Economic Modeling	(3-0)3
ECON	410	Economics of Entrepreneurship	(3-0)3
ECON	411	Economics of Networks and the Internet	(3-0)3
ECON	418	Women and the World Economy	(3-0)3
ECON	421	Advanced Macroeconomics	(3-0)3
ECON	422	The Chinese Economy	(3-0)3
ECON	423	Public Sector Economics	(3-0)3
ECON	425	Environmental Economics	(3-0)3
ECON	426	Economics of Natural Resources	(3-0)3
ECON	432	Economics of Inequality and Discrimination	(3-0)3
ECON	433	Financial Markets	(3-0)3
ECON	434	Economics of the Firm I	(3-0)3
ECON	435	Economics of the Firm II	(3-0)3
ECON	439	Topics in Macroeconomics	(3-0)3
ECON	440	Macroeconomic Theory and Stabilization Policies	(3-0)3
ECON	442	Topics in Monetary Macroeconomics	(3-0)3
ECON	443	Game Theory	(3-0)3
ECON	444	Economics of Innovation	(3-0)3
ECON	445	Introduction to Linear and Nonlinear Programming	(3-0)3
ECON	447	Monitoring the Economy	(3-0)3
ECON	448	Technology and Industrial Dynamics	(3-0)3
ECON	449	Macroeconomics of Technological Change	(3-0)3
ECON	451	Industrial Economics	(3-0)3
ECON	452	Agricultural Trade Policies	(3-0)3
ECON	453	Business Forecasting	(3-0)3
ECON	454	Economics of Regulation and Antitrust	(3-0)3
ECON	455	Turkish Economic History	(3-0)3
ECON	457	Turkish Fiscal System	(3-0)3
ECON	458	Project Evaluation	(3-0)3
ECON	459	Turkish Banking System	(3-0)3
ECON	462	Topics in Economic History	(3-0)3
ECON	464	Development Planning	(3-0)3
ECON	465	Development Economics	(3-0)3
ECON	466	Economics of Growth	(3-0)3
ECON	469	Economics of Labor	(3-0)3
ECON	471	Statistical Database in Turkey	(3-0)3
ECON	472	Problems in Ottoman Economic History	(3-0)3
ECON	475	Introduction to Mathematical Economics I	(3-0)3
ECON	476	Introduction to Mathematical Economics	(3-0)3
ECON	477	Welfare Economics and the Theory of Social Choice	(3-0)3
ECON	478	Topics in Linear and Non-linear Programming	(3-0)3
ECON	480	World Economy	(3-0)3
ECON	481	Agricultural Economics	(3-0)3
ECON	482	Review Topics in Economics	(3-0)3
ECON	483	Applied Econometrics I	(3-0)3
ECON	484	Applied Econometrics II	(3-0)3
ECON	489	European Union and Turkey	(3-0)3
ECON	490	International Economic Institutions	(3-0)3
ECON	493	Urban Economics	(3-0)3
ECON	495	Labor Market in Turkey	(3-0)3
ECON	496	Political Economy of the Middle East and North Africa	(3-0)3
ECON	497	Comparative European Labor Markets	(3-0)3
ECON	498	Labor Market Economics	(3-0)3
ECON	499	International Money	(3-0)3

MINOR PROGRAM IN ECONOMICS

Economics Minor program aims to furnish students of other departments with a certain insight into issues in economic theory, policy applications in monetary and fiscal issues and international trade and economic relations. The program gives a solid basis in these areas which can increase the problem solving capacity of students in their professional life in the public as well as private sectors.

Compulsory courses

ECON	201	Microeconomic Theory I	(4-0)4
ECON	202	Macroeconomic Theory I	(4-0)4

Two courses from the list below:

ECON	203	Microeconomic Theory II	(4-0)4
ECON	204	Macroeconomic Theory II	(4-0)4
ECON	301	Introduction to Econometrics I	(3-2)4
ECON	302	Introduction to Econometrics II	(3-2)4
ECON	311	Monetary Theory and Policy	(3-0)3
ECON	312	Fiscal Policy and Public Finance	(3-0)3
ECON	353	Introduction to International Economics I	(3-0)3
ECON	354	Introduction to International Economics II	(3-0)3

Two electives approved by the Department

DESCRIPTION OF UNDERGRADUATE COURSES

N.B.: The conditions for the "consent of the Department" in the following prerequisites will be announced at the beginning of each academic year.

ECON 101 Introduction to Economics I (4-2)5

The economic problem; theories of supply and demand; various market structures; theory of distribution.

ECON 102 Introduction to Economics II (4-2)5

Firms and fiscal policy; interdependence of the economy; national income; theory of income determination; money and banking; monetary policy; international trade and finance.
Prerequisite: ECON 101 or consent of the Department.

ECON 105 Introduction to Research Methods I (2-2)3

The aim of the course is to introduce students to the principles and practicalities of doing research. Basic grounding in social science concepts, analytical approaches, research tools, selecting problems, reviewing the literature and presenting research are the major topics of the course.

ECON 106 Introduction to Research Methods II (2-2)3

This course covers, at introductory level, Descriptive Measures and Probability, Discrete Probability Distributions, Continuous Probability Densities, Distributions of Sample Statistics, Confidence Interval Estimation: One Population, Confidence Interval Estimation: Further Topics, Hypothesis Tests of a Single Population, Two Population Hypothesis tests. Application of those concepts, through computer usage, is encouraged.

ECON 107 Economy, Society, and Civilization I (3-0)3

This course is designed to provide Economics students with a strong humanities background. An interdisciplinary social science emphasizes on the origins and evolution of economic activities and institutions against the background of a history of civilization.

ECON 108 Economy, Society, and Civilization II (3-0)3

Continuation of ECON 107.

ECON 122 Principles of Macroeconomics (4-2)5

Introductory macroeconomics course designed for non-departmental students. The nature of economics. The elements of supply and demand. Theory of income determination. Money and banking. Fundamentals of macroeconomic policy, monetary and fiscal policy. Basics of international trade.

ECON 201 Microeconomic Theory I (3-2)4

Scope and method, demand, supply and market prices; theory of consumer behavior; applications; demand elasticity; theory of production and cost;

pricing in competitive markets; general equilibrium and welfare economics.
Prerequisite: ECON 101.

ECON 202 Macroeconomic Theory I (3-2)4
The course examines the short-run and long-run determination of key macroeconomic variables in both closed and open economies, primarily in the context of an IS/LM -AD/AS model. The course aims to develop a framework to analyze policy questions and provide a sound understanding of macroeconomic aggregates and macroeconomic and financial linkages. More specifically, the course aims to provide students with a solid economic understanding of the mechanisms underpinning the macroeconomics.
Prerequisite: ECON 102.

ECON 203 Microeconomic Theory II

This course continues the development of microeconomic analysis from Econ 201. The main aim is to provide an introduction to general equilibrium analysis and strategic decision making processes of agents in different economic environments. i) The course is intended to fit into the Economics B.Sc. program as a second year must course. ii) The basic purpose of this course is to introduce advanced topics in microeconomics. Upon successful completion of this course, the student is expected to gain knowledge on major microeconomic topics.
Prerequisite: ECON201

ECON 204 Macroeconomic theory II
Intertemporal consumption-saving decisions; Ricardian equivalence theorem; credit market imperfections; intertemporal investment decision of the firm; optimal investment rule; cash-in-advance model; Fisher relation; Liquidity trap; monetary policy rules; neutrality of money; New Keynesian Economics; Keynesian transmission mechanism for monetary policy; menu cost models; Friedman rule; Financial intermediation and Banking; The Diamond-Dybvig Banking model; The Phillips curve; Rational expectations hypothesis; Time consistency problem; Beginning of Modern Macroeconomics; The Neoclassical Synthesis; The Rational Expectations Critique.
Prerequisite: ECON202

ECON 205 Statistics for Economist I (3-0)3
This course continues the development of research methods and data analysis from Econ 106 and deals, at intermediate level, with basic probability theory, probability distributions and densities, mathematical expectations, special probability distributions and densities, functions of random variables and sampling distributions and their applications.
Prerequisite: MATH 120, ECON106

ECON 206 Statistics for Economist II (3-0)3
This course continues the development of statistical methods from Econ 205 and deals, at intermediate level, with theory of estimation, estimation and applications, principles of point and interval estimations, properties of point and interval estimators, optimality criteria in estimation, hypothesis testing, comparison tests for independent and paired samples, multiple comparisons and estimation methods: method of moments, maximum likelihood and ordinary least squares.
Prerequisite: ECON 205

ECON 207 Social and Economic History I (3-0)3
Based on some of the work of Karl Polanyi this course explores certain socio-economic aspects of non-capitalist societies of past times. It provides points of comparison as a way of better understanding the economy of the present-day.

ECON 208 Social and Economic History II (3-0)3
This course deals with transformation of the politically fragmented, non-market European feudal societies into societies characterized by market-orientation and centralized political structures. It focuses on differential patterns of agrarian and commercial development in individual regions as well as in the formation of a global economy centered around Western Europe.

ECON 210 Principles of Economics (3-0)3
A non-departmental course designed for students outside the Faculty of Economic and Administrative Sciences. The nature of economics. A general view of price system. Markets and pricing. The determination and the control of national income. Fiscal policy. Money, banking and monetary policy. International trade and finance. Economic growth and development.

ECON 211 Principles of Economics I (3-0)3
Introductory microeconomics course, especially designed for non-departmental students.

ECON 212 Principles of Economics II (3-0)3
Continuation of ECON 211, introductory macroeconomics.

ECON 301 Introduction to Econometrics I (3-2)4
The Classical Linear Regression Model: Estimation and Inference, Functional Forms, Specification

Analysis and Model Evaluation, Multicollinearity, Dummy Independent Variables, Testing for a Structural Change, Seasonality.
Prerequisites: ECON 206;

ECON 302 Introduction to Econometrics II (3-2)4
Autocorrelation: causes, consequences, tests and estimation. Univariate Time Series Modeling and Testing for Non-Stationarity, Dynamic Models, Cointegration and Estimation of Equilibrium Correction Models, Simultaneous Equations Models: identification and single-equation estimation. Heteroscedasticity: Causes, consequences tests and estimation.
Prerequisite: ECON 301.

ECON 311 Monetary Theory and Policy (3-0)3
Monetary theory and policy tools. An overview of the financial mechanism. Interest rate determination and the working of the capital market. Analysis of the demand and supply of money. Monetary transmission mechanism and monetary approach to balance of payments. Selected macro models in which money appears as an endogenous variable. Special applications to Turkey.
Prerequisite: ECON 202 or consent of the Department.

ECON 312 Fiscal Policy and Public Finance (3-0)3
Introduction to fiscal theory and policy. Government expenditures. Budgeting. Taxation and subsidies. Government finance.
Prerequisite: ECON 201 or consent of the Department.

ECON 314 Econ. Of Growth and Development (3-0)3
This course is designed as an introduction to the field of economic development, and examining the intersection of this literature with the newly emerging field of political economy of institutions and development.

ECON 353 Introduction to International Economics I (3-0)3
The classical theory of foreign trade, comparative costs; factor proportions and comparative advantages; factor-price equalization, income distribution and gains from trade: extensions on trade theories and empirical verifications; economic growth and trade, theory of tariffs and trade policy, tools and policy implications, theory of economic integration
Prerequisite: ECON 201 or consent of the Department.

ECON 354 Introduction to International Economics II (3-0)3
Balance of payments; foreign exchange market, disequilibrium and adjustment: the monetary and portfolio balance approaches, price adjustment approach, national income and the current account. Economic policy in the open economy under flexible and fixed exchange rate regimes, comparison of effectiveness of different policies in attaining internal and external balance with different capital mobility assumptions; international monetary systems: past, present and future
Prerequisite: ECON 202 or consent of the Department.

ECON 361 History of Economic Analysis I (3-0)3
The evaluation and improvement of the tools of analysis of economic phenomena within a historical perspective; Mercantilism, Physiocrats Classicals School (A. Smith, T. Malthus, D. Ricardo, J. S. Mill), Marxian economics, Marginal School (Stanley Jevons, Alfred Marshall, Léon Walras), Keynesians (John Maynard Keynes and Neo-Keynesians), Austrian School (Friedrich Hayek, Carl Menger).
Prerequisites: ECON 101; ECON 102

ECON 362 History of Economic Analysis II (3-0)3
Reading and analyzing the original works of the economists from different schools with a historical perspective. Creating discussion on the evolution of the key notions of the history of economic thought e.g. value, price, money, accumulation, and entrepreneur. Developing a critical approaches to neoclassical theory and to its arguments.
Prerequisites: ECON 101, ECON 102.

ECON 400 Seminar in Economics (0-6)3
The seminar is devoted to a detailed study of an individual research theme on an assigned theoretical or applied economic problem. Each student prepares a paper during the semester. The student is advised by an instructor in his/her research and is expected to write regular progress reports so that specific problems and aspects of his/her work can be discussed
Prerequisites: ECON 201; ECON 202.
N.B.: For all the following courses, ECON 101 and ECON 102 or the consent of the Department is a prerequisite. Additional prerequisites are noted wherever necessary.

ECON 401 Practical Training in Economics I (3-0)3
The course is designed for 3rd and 4th year students to equip them with practical tools of their future

careers. For those students planning to enter academic career, the course will involve teaching techniques, practical teaching in tutorials, discussion and problem hours. For those students planning to enter the applied research career, the course will involve research techniques, statistical databases and practical training in research institutions.

ECON 402 Practical Training in Economics II (3-0)3

The course is designed for 3rd and 4th year students to equip them with practical tools of their future careers. For those students planning to enter academic career, the course will involve teaching techniques, practical teaching in tutorials, discussion and problem hours. For those students planning to enter the applied research career, the course will involve research techniques, statistical databases and practical training in research institutions.

ECON 404 Health Economics (3-0)3

The main objective of this course is to introduce the students to the active field of health economics, which is a vibrant and growing part of microeconomics. After introducing the key concepts that are developed by the microeconomists in the fields of information and market failure, the students will be encouraged to use these concepts to some selected current issues of health policy. The students who take this class will learn about the worldwide distribution of health, the connection of this with the worldwide income distribution and the importance of considerations of equity in understanding this distribution. We expect them learn to identify important health care problems and to bring a new understanding of these problems through the prism of economic theory.

ECON 406 Real Estate Economics and Finance (3-0)3

This course applies the economic and finance theory to real estate investment analysis. Debt financing in real estate investment, portfolio theory with optimization problems, deterministic and continuous asset pricing models will be covered.

ECON 407 Input–Output Analysis and Economic Modeling (3-0)3

Input–output analysis and thus the resulting field of quantitative approach, which is referred to as inter-industry economics has been developed after the pioneering work of Leontief in the 1930's. The objective of this course is to discover the field of input-output economics as an integral component of economic theory. The interdependence of economic units in different empirical problems in varied fields of economics is analyzed within the context of input-output approach in this course.

ECON 410 Economics of Entrepreneurship (3-0)3

This course focuses on the role of innovation with a special emphasize on entrepreneurship in the growth and development of 21st century economies. During the course, the economic theories behind entrepreneurship is discussed. The methods used in successful enterprises are also analyzed as an entrepreneurial process.

ECON 411 Economics of Networks and The Internet (3-0)3

The course consists of three parts. The first part is devoted to the analysis of technological change in computing and telecommunication technologies. The second part focuses on the economics of networks and the Internet. The following topics are covered in this part: technological convergence and market convergence, structure of networks and the internet, network externalities and "lock in", pricing and regulation of networks, Internet cost structures and pricing and versioning information. The third part of the course is about the economics of information policy.

ECON 418 Women and the World Economy (3-0)3

One obvious feature of the present-day world-economy is its vast inequalities. This course considers one aspect of inequality—that one organized and legitimated via gender roles. Clearly there are differences: women in "Third world" areas face more disadvantages than women in core states, non-white women more than white women, immigrants more than natives and so on. This course explores the historically constructed economic and social processes that originate and perpetuate these inequalities, and how gendering contributes to the accumulation process.

ECON 421 Advanced Macroeconomics (3-0)3

This course is designed to introduce advanced level students to dynamic macroeconomic theory and familiarize them with current issues. The topics include inter-temporal consumption-saving choice, exogenous growth, introduction to neo-classical growth model, business cycles, theories of unemployment, markets with frictions and quantity rationing, dynamic inconsistency and commitment, dynamic fiscal policy, macroeconomic analysis with demographic details.

ECON 422 The Chinese Economy: Transitions and Change (3-0)3
Evolution of the Chinese economy during pre- and post-1949 periods; analysis of China's post-1978 reform period using basic economic tools; identification of characteristics of China's economic transition/transformation and development; structural change; urban-rural gap; labor markets; foreign trade and investment; foreign exchange and financial markets; China's post-WTO economic reforms and multinational enterprises; industrial policy; role of government and the market as allocators of resources; global imbalances.

ECON 423 Public Sector Economics (3-0)3
This course provides an overview of public sector economics: important topics of public finance. We start with dynamic fiscal policy and examine the effects of fiscal policy on the economy namely capital formation, economic growth, and intergenerational equity; the influence of long run expectations on short-run outcomes; and the restrictions imposed by current policies on the set of feasible future policies. Dynamic analysis gained favor over static analysis in public economics as fiscal variables are continually modified and current policy changes alter the course of the economy. A dynamic perspective is also crucial in weighting the short run benefits versus the long run costs of the fiscal policies.

ECON 425 Environmental Economics (3-0)3
The effects of economic activity on the natural environment with special reference to urban development forms the central subject matter of the course. Consideration is given to economic analysis of the causes of pollution and its control through taxes, the use of property rights and standards.

ECON 426 Economics of Natural Resources (3-0)3
This course is designed to introduce students to certain areas of natural resource economics. Topics include theories of replenishable and exhaustible resource exploitation and the environment. Specific natural resources (e.g. depletable energy resources, recyclable resources, replenishable but depletable resources, etc.) are studied in depth.

ECON 432 Economics of Inequality and Discrimination (3-0)3
The course explores a number of central debates evolving around the issue of economic inequality and discrimination within both conventional and alternative theories. The course particularly focuses on the different theoretical explanations of the causes and consequences of discrimination in the context of gender and society.

ECON 433 Financial Markets (3-0)3
The structure and functions of financial markets are analyzed. Operations and regulations in the money and capital markets introduced. Financial innovations and liberalization processes will be at the core of the course.

ECON 434 Economics of the Firm I (3-0)3
This course studies the organization and behavior of the firm. Emphasis is laid on the interdependence between financial and organizational structures of the firm, investment planning control of assets and liabilities and internal and external financing.

ECON 435 Economics of the Firm II (3-0)3
This course is the continuation of ECON 434 and focuses on the role of institutions and markets in monitoring and controlling the behavior of the firm.
Prerequisite: ECON 434.

ECON 439 Topics in Macroeconomics (3-0)3
The course aims to enhance students' understanding of macroeconomics and trade concepts through a study of North-South trade models.
Prerequisite: ECON 202.

ECON 440 Macroeconomic Theory and Stabilization Theory (3-0)3
The course primarily deals with economic stabilization policies with an emphasis on developing country experiences. The following topics are covered: different approaches to stabilization policies (heterodox, orthodox), conditions for a successful stabilization policy, structural reform programs, inflation, monetary and exchange rate targeting policies and monetary vs. exchange rate based stabilization programs. Special emphasis will be given to current macroeconomic issues in the Turkish economy.

ECON 442 Topics in Monetary Macroeconomics (3-0)3
The main objective of the course is to introduce students to a number of approaches to monetary theory and policy. The following topics are covered: Theoretical Fundaments of Monetary Policy, Vulnerabilities and Limits to Monetary Policy: Financial Dollarization, Fiscal Dominance, New Monetary Macroeconomics Beyond IS-LM, Monetary Policy Transmission Mechanisms, Inflation Dynamics, Monetary Policy and Nominal Anchors, Inflation Targeting.

ECON 443 Game Theory and Its Applications (3-0)3
This course consists of two separate parts. The first part of the course is devoted to the techniques of non-cooperative game theory. After introducing the basic solution concepts in game theory the second part of the course focuses on the macroeconomic

applications of game theory focusing upon the interrelationships among monetary and fiscal policy makers and wage setters in a national or an international context.

ECON 444 Economics of Innovation (3-0)3
Theories of innovation and technical change. Determinants of the rate and direction of technical change. The nature, sources and outcomes of product and process innovations. Industrial organization, inter-firm relations, networks and innovative activity. Management of product and process innovations. Dominant design, product life cycles, and technological trajectories. The effects of firm size, market structure and innovation opportunities on innovative activities. Measurement of innovative activity. Financial systems and innovation. Sectoral and industrial studies and policy issues.

ECON 445 Introduction to Linear and Nonlinear Programming (3-0)3
Optimization problem, graphical solutions, algebraic solutions, simplex method, revised simplex method, duality, sensitivity analysis, applications.
Prerequisite: MATH 260.

ECON 447 Monitoring the Economy (3-0)3
How to monitor developments in the world and Turkish economy? What are the main issues exposed by these developments? How economic policies shape the course of events? How these policies relate to elegant, but somewhat abstract, theories and models of economist? Is it possible for these abstractions to drive the observed practice? Are we all, paraphrasing Keynes, prisoners of defunct economists? Alternatively, do living economists shape policy and hence impact upon economic developments? This course is an introduction to these and related questions -ranging from practical to philosophical.

ECON 448 Technologies and Industrial Dynamics (3-0)3
The main objective of this course is to enable students to understand and to analyze the forces which determine industrial development. The material includes a wide range of issues from a variety of perspectives: Broad historical analyses, microeconomic theory, the economics of technological change and industrial policy from both a domestic and an international perspective.

ECON 449 Macroeconomics of Technological Change (3-0)3
The primary objective of this course is to analyze the political economy of technological change from the point of view of both the producers and users of technology. The material will include a short historical analysis of technological progress and technology policies that have been followed in Turkey and in some advanced countries or trade blocks. Recent theoretical approaches and trends in the international sphere to technology-related subjects such as R and D policies, human capital formation will be evaluated in the light of the Turkish development process.

ECON 451 Industrial Economics (3-0)3
The course is an extension of ECON 201. Organization and development, concentration, entry barriers and other aspects of oligopolistic market structures will be discussed in the first part of the course. The second part will involve the theoretical and empirical dimensions of firm behavior. The specific topics will center on the pricing, investment and growth processes of modern oligopolistic firms.
Prerequisite: ECON 201 or consent of the Department.

ECON 452 Agricultural Trade Policies (3-0)3
The goal of this course is to convey the basic economics of widely used agricultural trade policy schemes. The course is designed for students who have some grasp of microeconomic principles. Numerous trade policy mechanisms like; tariffs, quotas, mixing regulations, market discrimination, and export subsidies are analyzed. Effects of various trade policies on domestic and international prices, consumption, production, trade and government revenue are examined. Some ideas about the effects of individual trade policies on general economic welfare are also discussed.

ECON 453 Business Forecasting (3-0)3
Various forecasting methods are introduced with emphasis on their applications for social and economic planning. The core of the course is the use of models in forecasting future sales, capital, investment, new product development etc.

ECON 454 Economics of Regulation and Antitrust (3-0)3
Government regulation and antitrust (competition) policy is one of the most exciting (and problematic) areas of economic policy. This course deals with questions such as, what particular market failures provide a rationale for government intervention? How can economic theory illuminate the character of market operation, the role for government action, and the appropriate form of government action? What do formal empirical analyses of economic

behavior and the effects of government intervention indicate about the direction this intervention should take? Where does the antitrust policy stand within this framework? Economic theory and empirical analysis that have been devised to further understanding of regulations and antitrust policies will be used to provide the most up to date answers to these questions.
Prerequisite: ECON 201.

ECON 455 Turkish Economic History (3-0)3
Study of Ottoman and Turkish economic and social history, beginning with developments during the 16th and 17th centuries followed by the study of the 19th and early 20th centuries.

ECON 457 Turkish Fiscal System (3-0)3
Public expenditures and revenues; processes of budgeting and annual planning; formal and legal aspects of budgeting in Turkey; sources of public revenues; principles of taxation and public borrowing; introduction to Turkish tax system; variations of fiscal policy; fiscal policy and growth.

ECON 458 Project Evaluation (3-0)3
Alternative approaches to the evaluation of development projects at the micro and macro levels; private versus social costs and benefits; intertemporal choice problem; market imperfections and shadow prices; integration of project and sector studies.

ECON 459 Turkish Banking System (3-0)3
This course is an introduction to the Turkish financial system. Structure and functions of the Central Bank of Turkey, banking system in general, other public and private financial institutions and securities market are the basic issues that will be discussed. Comparisons with the Western practice and general evaluations of Turkish financial system are made.

ECON 460 Structure of the Turkish Economy (3-0)3
Overall structure of the economy; sources and use of income; economy of government; main sectors; agriculture, industry, services; income distribution; regional dispersion of economic activities.
Prerequisites: ECON 101, ECON 102.

ECON 462 Topics in Economic History (3-0)3
Methodological problems of economic history. Some current issues and debates. Problems of socio-economic systems and modes of transition

ECON 464 Development Planning (3-0)3
This course is an introduction course to development planning and programming. The course explores project cycle methodologies of international organizations. Comparative evaluation of project appraisal methods in the public and private sectors, economic and social cost-benefit analysis, identification of economic costs and benefits, shadow pricing, income distribution and social analysis, comparison of LMST and UNIDO methodologies and interdependence in investment decisions and sectoral planning are topics introduced in this course.

ECON 465 Development Economics (3-0)3
This course studies the current policy issues of underdeveloped countries with reference to the relevant theoretical debates and country experiences, with some emphasis on the East Asian experience. Economic relations between North and South; trade, technology and financial policy issues; the role of the state; the implications of endogenous growth theory and international institutional constraints on policy making are discussed.

ECON 466 Economics of Growth (3-0)3
The main objective of the course is to familiarize the students with the key theories of growth and the implications for economic development. The course is designed to combine the theoretical rigor of main growth theories, with the intuition of major development issues. Another equally important aim of this course is to channel the students into thinking about various development issues and sources of growth in Turkey, or around the world.

ECON 469 Economics of Labor (3-0)3
This course will involve the systematic economic study of human behavior regarding labor market operations. How labor markets operate in theory and in practice will be carefully examined. A wide range of topics and issues will be covered throughout the semester. The subjects to be discussed include; wage determination, worker productivity, labor supply and demand, employment and output, occupational choice, unemployment, unionization, discrimination, poverty, and some others. In short, since everyone sells their labor resources to earn a living, it is important to understand how the labor market operates. The ultimate goal in the course is to develop a critical understanding of how to evaluate labor market policy.

ECON 471 Statistical Database in Turkey (3-0)3
This course will introduce the student to the sources of economic statistics in Turkey. It will also emphasize the methodologies involved in such statistics, by examining their coverage, sampling framework, frequency, survey design and questionnaires.

ECON 472 Problems in Ottoman Economic History (3-0)3
This course deals with issues of agricultural and commercial transformation models in the Ottoman Empire. Emphasis is laid on the interaction of the Ottoman economy with European capitalism after the 16th century.

ECON 475 Introduction to Mathematical Economics I (3-0)3
Nature of equilibrium analysis. Comparative statics and dynamic analysis. Mathematical treatment of some topics in microeconomics.

ECON 476 Introduction to Mathematical Economics (3-0)3
This course is the continuation of ECON 475. It is based on mathematical treatment of some topics in macroeconomics

ECON 477 Welfare Economics and the Theory of Social Choice (3-0)3
This course systematically develops the foundations of modern welfare economics. In particular, the twin pillars of positive economics and ethical premises are stressed and both the weaker ethical premises underlying economic efficiency and the stronger ones underlying social welfare maximization are examined. The techniques that constitute the important ingredients in the constructive use of economics in policy making are developed.

ECON 478 Topics in Linear and Non-linear Programming (3-0)3
Problem formulation, post optimality analysis, special topics in linear and non-linear programming, computer applications, economic applications.

ECON 480 World Economy (3-0)3
The course investigates developments, trends, cycles and facts of the world economy during the 1980's and its future. A framework is developed within which to examine the subject matter. Outcomes of "structural adjustment" on a major country basis as well on a global basis are evaluated.

ECON 481 Agricultural Economics (3-0)3
Agricultural development; agricultural sector in Turkey; analytical topics in agricultural economics, analysis of government policies in agriculture; further topics in agriculture.

ECON 482 Review Topics in Economics (3-0)3
Scope and method, micro vs. macro, equilibrium and stability, markets and prices, expectations, technological equity vs. efficiency, time in economics, rationality.

ECON 483 Applied Econometrics I (3-0)3
This course concentrates on formulation and estimation of simultaneous equation systems and their applications. As an example, macro econometric models of Turkey are reviewed. Other areas of application may include estimation of consumption functions, systems of demand functions, production and cost functions, international trade relationship and others.

ECON 484 Applied Econometrics II (3-0)3
This course concentrates on limited dependent variable models and panel data estimation. Logit and probit models of binary and multivariate responses, Tobit models and models for panel data methods and their applications are included such as difference-in-differences, fixed effects random effects models and estimation of simultaneous equations models with panel data.

ECON 489 European Union and Turkey (3-0)3
The progress and problems of Turkey's association with the EU, the analysis of comparative economic indicators and policies of Turkey and the EU, Turkey's achievements and problems in adapting to common policies of the EU and other issues associated with Turkey's full membership.

ECON 490 International Economic Institutions (3-0)3
Major international institutions and organizations involved in financing either on a global or regional scale. Their policies, financing instruments and the role they play on the world economic order.

ECON 493 Urban Economics (3-0)3
Urban economics as a field of study; theories of urban spatial structure; urban economic structure; techniques of urban economic analysis, economic aspects of the study of the community; economics of major urban problems.

ECON 495 Labor Market in Turkey (3-0)3
This course evaluates historical development of the labor market in Turkey form a comparative

perspective. The demographic, economic, social, legal and institutional framework of the labor market in Turkey from the mid-19th century until the contemporary period from an internationally comparative perspective, with special emphasis on wages and living and working conditions and on the mechanisms and dynamics of their determination are introduced taking into consideration the situation in various other countries and the international conventions and other instruments.

ECON 496 Political Economy of the Middle East and North Africa (3-0)3
This course examines the issues of development in the region from Morocco to Iran using the tools of analysis of development economics and political economy. The topics to be covered include the concept of development, an introduction to the economic history of the region, agrarian change, rural to urban and international migration, informal sector, industrialization with and without oil, external debt and the impact of restructuring and stabilization programs.

ECON 497 Comparative European Labor Markets (3-0)3
This course examines labor market characteristics and institutions in developed countries in general and Western European countries in particular. Comparisons to the most flexible labor market, the US, will be a focus of the course. Underlying paradigms are the skill-biased technological change adversely affecting low-skill workers and labor market institutions –as these institutions relate to labor market flexibility or wage rigidity.

ECON 498 Labor Market Economics (3-0)3
An up-to-date review of modern labor market theories, related policy issues and applications, as well as methods and findings of empirical research, including national and regional level analysis of these markets both in developed and developing countries. Open to economic and administrative sciences majors as well as to students from computer science, regional planning and engineering.

ECON 499 International Money, Finance and Banking (3-0)3
The course aims to introduce students to alternative approaches to international money, finance and banking. Whilst the emphasis is on policy questions, theory postulations and empirical evidence will be referred to frequently. The course is planned to cover some topical issues including i) International monetary regimes and financial integration, ii) Exchange rate determination theories and evidence, iii) Alternative exchange rate regimes and policies, iv) Banking system: risks and regulation, v) The international experience with currency and banking crises, vi) Turkish financial system: Issues, risks and regulation, vii) Monetary policy in financially open economies with special reference to Turkey.

GRADUATE PROGRAMS AT THE DEPARTMENT OF ECONOMICS

GRADUATE CURRICULUM

MASTER OF ECONOMICS WITH THESIS

First Semester				Second Semester
ECON	500	Mathematics for Economists	(2-0)2	3 Electives*
ECON	501	Microeconomic Theory I	(4-0)4	
ECON	502	Macroeconomic Theory I	(4-0)4	
ECON	507	Econometric Methods I	(4-0)4	

Third Semester

ECON	595	Seminar	(0-0)0
ECON	599	Master's Thesis	(0-0)0
ECON	800-899	Special Studies	(0-0)0

* If Ph.D. degree is aimed, electives from the area of Economic Theory should be taken.

MASTER OF ECONOMICS NON-THESIS

First Semester				Second Semester
ECON	500	Mathematics for Economists	(2-0)2	3 Electives
ECON	501	Microeconomic Theory I	(4-0)4	
ECON	502	Macroeconomic Theory I	(4-0)4	
ECON	507	Econometric Methods I	(4-0)4	

Third Semester	Fourth Semester			
3 Electives	ECON	589	Term Project	(0-0)0
	ECON	800-899	Special Studies	(0-0)0

DEFICIENCY PROGRAM IN ECONOMICS

First Semester				Second Semester			
ECON	201	Microeconomic Theory	(4-0)4	ECON	202	Macroeconomic Theory	(4-0)4
ECON	301	Introduction to Econometrics	(3-2)4	ECON	302	Introduction to Econometrics II	(3-2)4
ECON	475	Introduction to Mathematical Economics*	(3-0)3	* If required by the advisor			

Ph.D. PROGRAM OF ECONOMICS

If admitted by M.S. degree:

First Semester	Second Semester			
4 Electives*	ECON	503	Microeconomic Theory II	(3-0)3
	ECON	504	Macroeconomic Theory II	(3-0)3
	ECON	508	Econometric Methods II	(3-0)3
	or			
	3 Electives **			

Third Semester			Forth Semester		
Ph.D Qualification Exam (November)			Ph.D. Qualification Exam (May)		
ECON	699	Ph.D. Dissertation	ECON	699	Ph.D. Dissertation

*A minimum of 3 electives out of 4 or 7 should be chosen from a single area of specialization.
**The students who have taken the three must courses through a MS degree are to take these 3 additional electives.

DEFICIENCY PROGRAM

First Semester

ECON	501	Microeconomic Theory I	(4-0)4
ECON	502	Macroeconomic Theory I	(4-0)4
ECON	507	Econometric Methods I	(4-0)4

If admitted by B.S. degree:

First Semester

ECON	500	Mathematics for Economists	(2-0)2
ECON	501	Microeconomic Theory I	(4-0)4
ECON	502	Macroeconomic Theory I	(4-0)4
ECON	507	Econometric Methods I	(4-0)4

Second Semester

ECON	503	Microeconomic Theory II	(3-0)3
ECON	504	Macroeconomic Theory II	(3-0)3
ECON	508	Econometric Methods II	(3-0)3

Third Semester

Ph.D. Qualification Exam (November)

ECON	699	Ph.D. Dissertation

4 Electives*

Forth Semester

Ph.D. Qualification Exam (May)

ECON	699	Ph.D. Dissertation

3 Electives*

Fifth Semester

Ph.D. Qualification Exam (November)

ECON	699	Ph.D. Dissertation

Sixth Semester

Ph.D. Qualification Examination (May)

Econ	699	Ph.D. Dissertation

*A minimum of 3 electives out of 4 or 7 should be chosen from a single area of specialization.

DEFICIENCY PROGRAM

First Semester

ECON	201	Microeconomic Theory	(4-0)4
ECON	301	Introduction to Econometrics	(3-2)4
ECON	475	Introduction to Mathematical Economics*	(3-0)3

Second Semester

ECON	202	Macroeconomic Theory	(4-0)4
ECON	302	Introduction to Econometrics II	(3-2)4

* If required by the advisor

GRADUATE COURSES

ECON	500	Mathematics for Economists
ECON	501	Microeconomic Theory I
ECON	502	Macroeconomic Theory I
ECON	503	Microeconomic Theory II
ECON	504	Macroeconomic Theory II
ECON	507	Econometric Methods I
ECON	508	Econometric Methods II
ECON	510	Turkish Economy
ECON	512	Introduction to Political Economy
ECON	514	Macroeconomic Theory and Policy
ECON	528	European Economic Integration and Turkey
ECON	535	Public Finance
ECON	589	Term Project
ECON	595	Seminar
ECON	599	Master's Thesis
ECON	605	Development Macroeconomics I
ECON	608	CGE Models
ECON	616	Multisector Models of Growth and Development
ECON	621	Computational Macroeconomics
ECON	623	Advanced Studies in Political Economy
ECON	624	Financial Economics I

ECON	625	International Economics I
ECON	626	International Economics II
ECON	630	Financial Theory and Corporate Policy
ECON	631	Monetary Theory
ECON	636	International Macroeconomics
ECON	637	Topics in International Macroeconomics
ECON	641	Agricultural Trade and Policy
ECON	642	Advanced Studies in Institutional Economics
ECON	643	Advanced Studies in Economic History
ECON	645	Applied Non-linear Time Series
ECON	647	Political Economy of the Middle East
ECON	651	Advanced Industrial Organization
ECON	658	Seminar in Growth and Development
ECON	659	Mathematical Economics
ECON	667	Development Economics
ECON	680	Time Series Econometrics
ECON	681	Macroeconometrics
ECON	682	Microeconometrics
ECON	683	Applied Econometrics I
ECON	684	Applied Econometrics II
ECON	685	Topics in Time Series Econometrics
ECON	691	Economics of Technology Policy
ECON	692	Evolutionary Economics
ECON	693	Economics of Education, Health and Human Capital I
ECON	694	Economics of Education, Health and Human Capital II
ECON	697	Behavioral Economics
ECON	698	Labor Market Economics
ECON	699	PhD Dissertation

DESCRIPTION OF GRADUATE COURSES

ECON 500 Mathematics for Economists (2-0)2
This course covers the elements of mathematical analysis, qualitative behaviors of dynamic systems and, static and dynamic optimization techniques.

ECON 501 Microeconomic Theory I (4-0)4
This course is designed to provide students an understanding of the principles of microeconomic theory. This is done through a rigorous mathematical treatment of the consumer theory, producer theory and general equilibrium. The course also aims to give the students the knowledge of nonlinear programming which they will use in analyzing consumer and producer behavior.

ECON 502 Macroeconomic Theory I (4-0)4
The course starts with an introduction to real dynamic macroeconomic models using the tool of dynamic programming, and continues with central issues in monetary theory, studying topics such as currency-in-the-utility function and cash-in-advance models. In the second part of the course, we examine long-run growth theories, using a host of models to explain economic growth, such as the Solow-Swan model, the Ramsey model, and the OLG model.

ECON 503 Microeconomic Theory II (3-0)3
The objective of the course is to provide the students an understanding of game theory. The approach of the course is oriented towards teaching the students the methods of solving different types of games. *Prerequisite: ECON 501*

ECON 504 Macroeconomic Theory II (3-0)3
The objective of this course is to build and strengthen the student's foundation in modern macroeconomics. In this course, we apply the tools earned in Econ 502-Macroeconomic Theory I to several important topics in macroeconomics. As in Econ 502, we continue on with the microeconomic foundations approach to macroeconomics. Throughout the course, the analysis essentially is on understanding the use of dynamic general equilibrium models in macroeconomics and its applications to macroeconomic policy in closed and open economies. *Prerequisite: ECON 502*

ECON 507 Econometric Methods I (4-0)4
The objective of this course is to familiarize graduate students with the basic tools of econometric research. As such, it does not seek to teach econometrics modeling but provide a sound grounding in the methods of econometrics. The topics include:
Probability Distribution Theory and Statistical Inference; the linear regression model; maximum likelihood; specification problems; data problems; non-linear regression.

ECON 508 Econometric Methods II (3-0)3
This is a continuation of ECON 507 and is required for Ph.D. students but is optional for M.S. students. It covers more advanced topics in Econometrics and has the same objectives as ECON 507. The topics include: Nonspherical disturbances; heteroscedasticity and autocorrelation; the use of panel data, seemingly unrelated regression; simultaneous equation multiple time series:

cointegration and error correction; discrete dependent variables.
Prerequisite: ECON 507

ECON 510 Turkish Economy (3-0)3
Microeconomic and macroeconomic problems of the Turkish economy will be discussed in a historical perspective. Emphasis will be placed on recent problems such as structural change, liberalization, privatization and public sector finance.

ECON 512 Introduction to Political Economy (3-0)3
This course analyses the political dynamics underlying the development of economic theories and institutions. The conflicting nature of capitalist accumulation process and its crises is also discussed.

ECON 528 European Economic Integration and Turkey (3-0)3
The objective of this course is to give a comprehensive understanding of the European economic integration process, with particular emphasis on the integration of product, service, capital, and labor markets, economic and monetary union and the common policies of the European Union, as well as their implications for Turkey.

ECON 535 Public Finance (3-0)3
This course will provide a graduate level overview of public economics. We will mainly cover taxation, social security, government spending and public goods. It is hard to cover all important public economies subjects in one semester, so this class will be more like a small summary of a graduate level public economics. Most of the papers will be based on US economy but we can have some arguments in class on the specific Turkish cases.

ECON 589 Term Project (0-0)0
This is a non-credit course for M.S. students who are to take a non-thesis degree. The objective is to have them carry out resaerch of a more limitted nature than a M.S. thesis

ECON 595 Seminar (0-0)0
The objective of this course is to enable the student to prepare the ground for his/her M.S. thesis. Students in their first year can take this course in the second semester.

ECON 599 Master's Thesis (0-0)0
This is the course assigned to MA students during the preparation of their theses.

ECON 605 Development Macroeconomics (3-0)3
Structuralist macro models; closure rules and distributional implications; financial programming and related controversies; money inflation and growth; empirical aspects of saving-investment behaviour; critical review of selected policy episodes.

ECON 608 Computable General Equilibrium Models (3-0)3
The objective of the course is to introduce the students with the principals and practicalities of applied general equilibrium modeling and aims to present the basic tools for constructing and implementing large-scale, applied general equilibrium modeling techniques.

ECON 616 Multisector Models of Growth and Development (3-0)3
The main objective of this course is to discuss issues related to economic growth and development. The central focus will be specifically on studying growth in multi-sector environments, motivated by some stylized facts on growth. The course is distinctively designed to provide the student with the basic tools of handling structural multi-sector dynamic macroeconomic systems. In doing so, first a sound background in theory will be presented, and then methods of empirically executing the models (i.e. handling the data and solution methods) will be introduced.

ECON 621 Computational Macroeconomics (3-0)3
This is an introductory course to computational methods in macroeconomics that are used to solve and calibrate and 'estimate' DSGE models that that does not admit analytical solutions. The objective of the course is to equip students that have completed their first year sequence with a particular set of tools that would allow them to start working on their own research agenda using dynamic stochastic general equilibrium models. The course is distinctively designed to provide the student with the basic computational tools of solving representative and heterogeneous agent models.

ECON 623 Advanced Studies in Political Economy (3-0)3

This course covers classical as well as contemporary ideas in political economy by recourse to original texts. It purports to give students a deeper theorecital understanding of the trends and prospects of capitalism as a world economic system with its characteristic institutions and dynamics. Students will have to develop their

own research agenda in conjunction with relevant directed readings.

ECON 624 Financial Economics I (3-0)3
The focus of this course is on asset pricing. The topics to be discussed are: choice under uncertainty, expected utility theory, mean-variance portfolio theory using both static and dynamic approach, the theory of capital market equilibrium and asset valuation, the capital asset pricing model, the Arbitrage Pricing Theory, mutual fund separation and aggregation theorems, risk neutral valuation in complete markets, incomplete asset markets, differential information, risk measure, general equilibrium under uncertainty and asymmetric information.

ECON 625 International Economics I (3-0)3
Exchange rate determination; exchange rate regimes; international monetary reform; policy conflict and cooperation; the LDC debt problem; pricing of international assets; balance of payments crises.

ECON 626 International Economics II (3-0)3
Theoretical treatment of international trade and international finance. Includes Ricardian and Heckscher-Ohlin theories of comparative advantage, analysis of tariffs and other trade barriers, international factor mobility, balance of payments adjustments, exchange rate determination, and fiscal and monetary policy in an open economy.

ECON 630 Financial Theory and Corporate Policy (3-0)3
This course is designed to provide the students a thorough knowledge of financial theory and corporate policy through the study of the interaction between individuals, corporations and the macro-economy. The course is mainly oriented towards graduate students with finance background. At the end of this course the students will be expected to establish the appropriate investment criteria in a world of certainty and in a multi-period framework, to understand investor behaviour under uncertainty (risk), to price traded and derivative securities, to derive the optimal capital structure of firms, and to establish the optimal dividend policy.

ECON 631 Monetary Theory (3-0)3
This course will take a fundamentally aggregate approach and relate "money" to different areas in economics such as "fiscal policy" international trade", "international monetary economics", "inflation", "economic growth", etc. Different types of macroeconomic model with a monetary sector will be studied and some of these models will be solved, using the Turkish data. Special emphasis will be given to current monetary issues in the Turkish economy.

ECON 636 International Macroeconomics (3-0)3
This course examines the determination of exchange rates, the current account and other important macroeconomic variables in an open economy. The course aims to develop a general framework to address important policy questions and provide a sound understanding of exchange rate determination, balance of payments problems and implications of macroeconomic and financial linkages between economies. The course will cover recent topics in the area of open economy macroeconomics and international monetary economics.

ECON 637 Topics in International Macroeconomics (3-0)3
The main objective of this course is to enable students to have a better understanding of the different applications of 'new open economy macroeconomics' models which are regarded as the new workhorse model of macroeconomics used to analyse the effects of macroeconomic policy in an open economy setting.

ECON 639 Economics of Consumption and Demand Analysis (3-0)3
Analysis of demand with emphasis on the theory of consumption decisions, the development and estimation of models, and the assessment and interpretation of empirical results. Topics will include the following: Demand system specification. Duality and flexible functional forms. Separability and aggregation. Dynamic demand models. Household consumption models, demographics, and equivalent scales. Cost-of-living indices and standard of living measurement. Quality of goods. Empirical applications with emphasis on food demand.

ECON 641 International Agricultural Trade and Policy (3-0)3
This course deals with agricultural policies in an independent world. The focus is intentionally analytical, using verbal and graphical analysis, to derive alternative policy choices. The course is designed to assist the student with understanding policy choice in the world of domestic agricultural policies linked through world commodity markets. Use of analytical techniques in intermediate microeconomics and a general understanding of comparative advantage are the basic requirements.

ECON 642 Advanced Studies in Institutional Economics (3-0)3
After a brief overview of institutional economics, a theme specific approach to some of the more important concerns of contemporary institutional economic analysis will be adopted. This course will dwell upon methodological questions, new developments in the conceptualization of the firm, debates surrounding the constitution of the market itself as an institution, the institutional evolutionary approaches to economic change and development, and the implications of institutional analysis for environmental studies.

ECON 643 Advanced Studies in Economic History (3-0)3
This course is designed to familiarize students with the classic works and most up-to-date controversies within the field of economic history. Major classical texts in economic history will be taken as a springboard for discussing contemporary issues not only in economic history but also in political economy and economic thought. The now-classic three-volume study of Fernand Braudel, the prominent French historian, will be the basic reading for the course. In addition, the works of Hicks, Lane, North, Polanyi, Schumpeter, Steensgaard, Veblen will be consulted.

ECON 645 Applied Nonlinear Time Series Analysis (3-0)3
This course presents definitions and evidence of business cycle non-linearity (Asymmetry); implications of non-linearity in economics and finance; empirical non-linear models; non-linearity tests against specified and unspecified alternatives.

ECON 651 Advanced Industrial Organization (3-0)3
Diverse mathematical topics within advanced micro theory like oligopoly, strategic behavior, firm structure and industrial economics related topics in macro and international dimensions. Students will test different hypotheses by econometric methods using real data.

ECON 658 Seminar in Growth and Development (3-0)3
This course presents models of growth, including Solow growth, models of human capital, endogenous technological change technology transfer, the course integrates the theories with data and evaluates the theoretical approaches for better perspectives on the fundamental causes of economic growth.

ECON 667 Development Economics (3-0)3
The concept of development; historical aspects of economic development; the extent of development gap among countries, measurement of development. Major theories of development; structuralist and neoclassical approaches; dependence theories. Main policy issues; income distribution and poverty, population growth, employment, migration, trade and industrialization, agriculture, stabilization policies, external debt.

ECON 680 Time Series Econometrics (3-0)3
Univariate time series models; ARIMA modeling, Bob-Jenkins methodology. Deterministic and stochastic trends. Non-stationary and unit roots; testing and model selection. VAR models; structural VARs, innovation accounting. Cointegration; the Johansen method.

ECON 681 Macroeconometrics (3-0)3
Advanced time series analysis as applied macroeconomic problems.

ECON 682 Microeconometrics (3-0)3
This is a one-semester course on the econometric issues related to the use of (individual, household or firm) microdata as opposed to aggregate data. The objective is to cover commonly employed models in microeconometric analysis: Qualitative and limited dependent variables, selection models, duration models, and (dynamic) panel data methods. Panel data models are also commonly used in the analysis of cross-section time-series data for countries or regions.

ECON 685 Topics in Time Series Econometrics (3-0)3
This course considers vector autoregression, structural vector autoregression, innovation accounting, cointegration in a VAR framework, testing and modeling using the Johansen approach, dynamic panel data models, estimation and testing for unit roots in panel data.

ECON 691 Economics of Technology Policy (3-0)3
Neo-classical and evolutionary theories of science and technology policy. National and international systems of innovation. Science and technology policies in developed and newly industrialized countries. Comparative analysis of science parks and technoparks. The aims and means of technology policy in Turkey. National system of innovation in Turkey: institutional structure, agents, and policies. Seminars by relevant policy institutions (TUBITAK, TTGV, DPT, KOSGEB, UNIDO, etc.) and R&D institutions on their structures and activities.

ECON 692 Evolutionary Economics (3-0)3
The main objective of this course is to enable students to understand concepts, methods and results of evolutionary analysis of technical change and economic dynamics. Students examine how evolutionary approaches can be used to further the understanding of complex processes and industrial dynamics (selection, competition, innovation, variety-creation, learning, etc.) that transform economic and social structures. The course includes micro simulation exercises on the computer to allow students to explore evolutionary theories and applications of these in an active way.

ECON 693 Economics of Education, Health and Human Capital I (3-0)3
Human capital refers to a set of abilities and acquired skills that an individual combines with their own effort and offer to employees. Education and health are the major components of the stock of human capital. This course provides an introduction to the economic theory of human capital and its application to the study of education. The theory and empirical approaches to the economics of education will be emphasized. Open to Economics students and students from Faculty of Administrative Sciences, Sociology, Education, Regional Planning, and other fields.

ECON 694 Economics of Education, Health and Human Capital II (3-0)3
The main aim of this course is to provide an introduction to the economic theory of human capital and its applications in the study of various topics in human behavior. Education will be covered only marginally since it is emphasized in Econ 693. The various other applicaıtions in this course include investment in children, fertility, fertility and development, discrimination, health, health and development, aging individuals and the society and various aspects of skilled and unskilled, national and international migration. The basic theory underlying these topics and empirical approaches to hypothesis testing will be emphasized.

ECON 695 Independent Study in Economic Theory (3-0)3
The aim of this course is to improve and to test the knowledge of the student in three main fields of economic theory. The student is expected to study independently, and to take a written exam in the fields of microeconomics, macroeconomics, and econometrics.

ECON 696 Graduate Seminar in Economics (3-0)3
ECON 695 should be taken before ECON 696. *Prerequisite: ECON 695.*

ECON 697 Behavioral Economics (3-0)3
This course focuses on psychology of decision making in various aspect of economics in both individual level and macro economic issues. Behavioral Economics is a new approach to understand the behavior of the economic agents via conducting labratuary experiments and testing the theories against the collected data. The theoretical framework is based on Game theory and game experiment.

ECON 698 Labor Market Economics (3-0)3
An up-to date review of modern labor market theories, related policy issues and applications, as well as methods of findings of empirical research, including national and regional level analysis of these markets both in developed and developing countries. Open to economic and administrative sciences majors as well as to students from computer science, regional planning and engineering.

ECON 699 PhD Dissertation NC
This is the course assigned to Ph.D. students during the preparation of their theses.

INTERNATIONAL JOINT PROGRAM ON GLOBAL AND INTERNATIONAL AFFAIRS

Program Coordinator: BEDİRHANOĞLU TOKER, Pınar**,** (METU, Department of International Relations): B.A., Ankara University; M.A., Reading University; D.Phil., Sussex University, European Institute.

GENERAL INFORMATION: The aftermath of the Cold War saw the rise of globalization as a dominant process across the world. The undergraduate program on Global and International Affairs (GIA) aims to familiarize students with the complex web of social relations generated by the globalization process as well as its national and international dimensions. The program is jointly developed by the International Relations and Political Science & Public Administration Departments of the Middle East Technical University, in close collaboration with their counterparts of the State University of New York (SUNY) at Binghamton in the United States.

GIA is an interdisciplinary program specifically designed to meet the requirements of students interested in contemporary political and social problems that cannot be grasped in abstraction from international developments. Deriving on the pool of resources, academic research and expertise provided by the Departments of International Relations and Political Science & Public Administration at the Middle East Technical University and their counterparts at the SUNY -Binghamton, the students are offered a range of compulsory and elective courses throughout the four years of their studies. Compulsory courses aim not only to familiarize students with the fundamentals of social, economic, political theory, and provide in-depth analyses of world history but also to equip students with the advanced approaches and scientific skills necessary to analyze the dynamics of the globalization process. A wide spectrum of elective courses, on the other hand, allow students to specialize on the politics and history of important regions in the world, compelling policy areas in global politics, as well as important themes in the international political economy.

This four-year program includes full-time enrollment. Students spend their first and third year in METU and second and fourth year in Binghamton University. Upon successful completion of the Program the students are offered separate degrees by both the Middle East Technical University and SUNY at Binghamton.

For more information on SUNY-Binghamton and the description of the courses offered by that University please visit www.binghamton.edu

UNDERGRADUATE CURRICULUM

FIRST YEAR (METU)

First Semester

GIA	103	World History	(3-0)3
GIA	105	Introduction to Politics I	(3-0)3
GIA	107	Understanding Global Politics	(3-0)3
GIA	109	Society and Culture	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
TURK	101	Turkish I	NC
IS	100	Introduction to Information Technologies and Applications	NC
HIST	2201	Principles of Kemal Atatürk I	NC
ENG	105	TOEFL IBT Preparation I	NC

Second Semester

GIA	104	Contemporary World History	(3-0)3
GIA	106	Introduction to Politics II	(3-0)3
GIA	108	Issues in Global Politics	(3-0)3
GIA	110	Comparative Government	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	NC
HIST	2202	Principles of Kemal Atatürk II	NC
ENG	106	TOEFL IBT Preparation II	NC

SECOND YEAR (Binghamton University)

Third Semester

GIA	201	Microeconomics	(4-0)4
GIA	203	Research Methods I (Qualitative Research Methods)	(4-0)4
GIA	205	US History I (One elective course from SUNY's list of US History courses)	(4-0)4
GIA	207	Global History I	(4-0)4

(One elective course from SUNY's list of Global History courses. Except '130 Modern World History')

Fourth Semester

GIA	202	Macroeconomics	(4-0)4
GIA	204	Research Methods II (Statistics)	(4-0)4
GIA	206	US History II (One elective course from SUNY's list of US History courses)	(4-0)4
GIA	208	Global Politics II	(4-0)4

(One elective course from SUNY's list of Global History courses. Except '130 Modern World History')

Course Lists:

GIA 205 and GIA 206:

HIST	103	Foundations of American Civilization, to 1877
HIST	104	Foundations of American Civilization, since 1877
HIST	256	Recent and Contemporary United States, 1945-present
HIST	353	Society and Thought in Modern America
HIST	356	American Legal History
HIST	361	Society and Culture in Contemporary United States

GIA 207 and GIA 208:

HIST	232	Africa, Europe and the America, 1400-1888
HIST	233	Africa, Europe and the Americas
HIST	286A	World Environmental History
HIST	286D	Science and Technology in the Modern World
HIST	386R	Human Rights in the Modern Era

THIRD YEAR (METU)

Fifth Semester

GIA	301	Modern Governance	(3-0)3
GIA	303	Turkish Politics and Political Structure	(3-0)3
GIA	305	(One from METU's List of Regional Politics Courses)	(3-0)3
GIA	307	(One from METU's List of World Politics Courses)	(3-0)3

One course on Aesthetics

Sixth Semester

GIA	302	International Public Law	(3-0)3
GIA	304	Turkish Foreign Policy	(3-0)3
GIA	306	(One elective course from METU's list of Political Science courses)	(3-0)3
GIA	308	(One elective course from METU's list of Political Science courses)	(3-0)3

One Course on Humanities

Course Lists:

GIA 305:

IR	317	Politics in the Balkans
IR	407	Middle East in World Affairs
IR	417	Process of European Integration
IR	419	German Foreign Policy
IR	421	Asia in International Politics
IR	423	Central Asia in World Politics
IR	463	Russian Foreign Policy
IR	218	Transitions from the Ottoman Empire to the Turkish Republic
IR	336	Europe in World Affairs
IR	342	Southern Europe in World Politics
IR	362	Russian Politics and Foreign Policy
IR	421	Asia in International Politics
IR	423	Central Asia in World Politics
IR	454	Ottoman Diplomacy and European State System
IR	470	Turkey and the EC/EU
ADM	482	Current Issues in Central Asian Politics

GIA 306:

ADM	301	Comparative Politics I
ADM	447	Media and Opinion
ADM	451	Theories of Democracy

ADM	459	Political Parties
ADM	405	Political Geography

GIA 307:

IR	321	International Political Economy
IR	327	Decision-Making and Implementation in Foreign Policy
IR	459	International Environmental Law
IR	316	Political Economy of Globalization
IR	320	The Modern International System
IR	326	International Organization
IR	328	International Security
IR	340	Politics of International Migration
IR	422	Theories of International Relations
IR	432	Human Rights in World Politics

GIA 308:

ADM	302	Comparative Politics II
ADM	414	Contemporary Political Theory
ADM	490	Gender and Politics
ADM	394	Theories of Fascism
ADM	458	Social Movements

FOURTH YEAR (Binghamton University)

Seventh Semester

GIA	401	Global History III (One elective course from SUNY's list of Global History Courses)	(4-0)4
GIA	403	International Relations I (One elective course from SUNY's following list of International Relations Courses: 402,403,405,406, 432,486,327,350, 380)	(4-0)4
GIA	405	International Relations II (One elective course from SUNY's following list of International Relations Courses:402,403,405,406, 432,486,327,350, 380)	(4-0)4
GIA	407	Regional Politics (One elective course from SUNY's list of Regional Politics courses)	(4-0)4

Course Lists:

GIA 401:

HIST	232	Africa, Europe and the America, 1400-1888
HIST	233	Africa, Europe and the Americas
HIST	286A	World Environmental History
HIST	286D	Science and Technology in the Modern World
HIST	386R	Human Rights in the Modern Era

GIA 402, GIA 403, GIA 404, GIA 405, GIA 406:

GIA 407 and GIA 408:

PLSC	264	Politics in Latin America
PLSC	267	Politics of Sub-Saharan Africa
PLSC	311	Politics of Western Europe
PLSC	312	Politics of FSU and Eastern Europe
PLSC	316	Politics of Middle East and North Africa

Eighth Semester

GIA	402	Global History IV (One elective course from SUNY's following list of International Relations Courses :402,403,405,406, 432,486,327,350, 380)	(4-0)4
GIA	404	International Relations (One elective course from SUNY's following list of International Relations Courses :402,403,405,406, 432,486,327,350, 380)	(4-0)4
GIA	406	International Relations V (One elective course from SUNY's following list of International Relations Courses :402,403,405,406, 432,486,327,350, 380)	(4-0)4
GIA	408	Regional Politics VII (One elective course from SUNY's list of Regional Politics courses)	(4-0)4

PLSC	402	Dynamics of International Conflict
PLSC	403	Islam in World Politics
PLSC	405	International Politics of Third World
PLSC	406	Models of World Politics
PLSC	432	Political Transformation of Today's Europe
PLSC	486	Islam and the West
PLSC	327	American Foreign Policy
PLSC	350	Comparative Political Parties
PLSC	380C	Diplomacy in a Changing World

GIA 103 World History (3-0)3
The course examines the rise and fall of great powers as political, military, and economic entities, with reference to political and economic relations of large states like the Ottoman Empire, France, Great Britain, Austrian-Hungarian Empire, Prussia, as well as two great powers, the United States and Russia, within the framework of 'European Balance of Power' and the traditional 'isolationist foreign policy' of the US in the last century. The course includes the analysis of World War I.

GIA 104 Contemporary World History (3-0)3
This course intends to examine the developments in Europe and the US since 1919 until today, dealing with World War I and the new political structure after 1918, World War II and the involvement of the US in European affairs, Cold War, Sovietization of Eastern Europe and the emancipation of the Third World countries, and relations between industrial and non-industrial countries in political, economic and military fields with respect to global developments.

GIA 105 Introduction to Politics I (3-0)3
This course provides the introductory conceptual framework for the study of politics. Definition of the basic concepts of authority, power, sovereignty, legitimacy, and ideology will be followed by the examination of major political ideologies; classical liberalism, conservatism, Marxism and fascism. This course also studies political regimes and systems, pressure groups, political parties, elections and voting behavior.

GIA 106 Introduction to Politics II (3-0)3
Continuation of ADM 121 Introduction to Politics I

GIA 107 Understanding Global Politics (3-0)3
This course analyzes the behavior of states within the framework of the international system. The main purpose of this course is to equip students with the analytical tools which contribute to their understanding of the changing context of international politics.

GIA 108 Issues in Global Politics (3-0)3
Continuation of GIA 107.

GIA 109 Society and Culture (3-0)3
This is an introductory course exploring issues of culture, social institutions and social relations from a sociological viewpoint. It aims to familiarize non-sociology majors (particularly students specializing in political science, economics and international relations) with the fundamental concepts and terminology of sociological analysis. In this context, topics such as culture, socialization, family, marriage and divorce, gender, ethnicity, stratification and mobility, mass-media, education, religion and urbanization are covered with the aim of comprehending the "world in change" through a comparative and historical perspective. The course also tries to relate the personal to the social and is particularly sensitive to such pressing concerns of contemporary life as gender issues.

GIA 110 Comparative Government (3-0)3
This course provides a conceptual introduction to the field of Comparative Government. After briefly analyzing the legislative, executive and judiciary branches of government, it studies the governments of the United States, the United Kingdom, France and the Russian Federation.

GIA 301 Modern Governance (3-0)3
The course aims to acquaint the students with the prominent theoretical perspectives on modern governance followed by those alternative ways and modes of administration/organization in practice. The final phase will include the analysis of some concrete cases of modern governance, selected from throughout the world, in the form of case studies with the expectation to offer the students wider outlook and insight on the topic.

GIA 302 International Public Law (3-0)3
An introductory course, dealing with Sources of international law, states, individuals, recognition, international agreements, international responsibilities of states, peaceful settlement of disputes, theory and reality in modern law of war, coercive measures, laws of land and serial warfare, laws of maritime warfare, enemy persons and property within belligerent states, neutral states, termination of war.

GIA 303 Turkish Politics and Political Structure (3-0)3
This course is designed for providing the students with a general scheme of Turkish politics between 1923-1960 by looking at both continuities and discontinuities with the Ottoman past. It also analyses several other basic themes such as modernization nationalism the construction of nation state secularism, military and politics and democracy.

GIA 304 Turkish Foreign Policy (3-0)3 The course aims to identify and analyze various factors contributing to Turkey's foreign policy orientation. While the main focus of this course is the political dynamics and issues of Turkish foreign policy after World War II, the problems and determinants of Turkish foreign policy between 1919-1945, with reference to past experiences and geopolitical imperatives placing certain constraints on the state's decision makers, will also be briefly discussed.

DEPARTMENT OF INTERNATIONAL RELATIONS

PROFESSORS

ALTUNIŞIK, Meliha ***(Director of the Graduate School of Social Sciences)***: B.A. Ankara University; M.A. METU; Ph.D. Boston University.
BAĞCI, Hüseyin ***(Department Chair)***: B.A., M.A., Ph.D. University of Bonn.
BÖLÜKBAŞIOĞLU, Süha: B.A. Ankara University; M.A., Ph.D. University of Virginia.
DAĞI, İhsan D.: B.A. Gazi University; M.A., Ph.D. University of Lancaster.
ERALP, Atila ***(Director of the Center for European Studies):*** B.A. METU; M.A., Ph.D. University of Southern California.
POLAT, Necati: B.A. İstanbul University; Ph.D. University of Nottingham.
TANRISEVER, Oktay F.: B.S., M.S. METU; Ph.D. University of London.
TÜRKEŞ, Mustafa: B.A. Hacettepe University; M.A., Ph.D. University of Manchester.
YURDUSEV, A. Nuri: B.S., M.S., METU; Ph.D. University of Leicester.

ASSOCIATE PROFESSORS

BEDİRHANOĞLU, Pınar: B.A. Ankara University, M.A. University of Reading; Ph.D. University of Sussex.
BOYAR, Ebru: B.S. METU, M.S. METU; Ph.D. Cambridge University.
ÇİTAK, Zana: B.A. METU, M.S. London School of Economics; Ph.D. Boston University.
GÜNEŞ, Şule: B.A. Ankara University, Dip. Institute of Social Studies, The Hague; M.A., Ph. D. Ankara University. ***(YÖK)***
KAHRAMAN, Sevilay: B.A., M.A., Ph.D. METU. ***(YÖK)***
ŞENYUVA, Özgehan: B.A. METU, M.S. METU and Universita Degli Studi di Siena; PhD.Universita Degli Studi di Siena.
TAYFUR, Fatih: B.S., M.S., METU; Ph.D. London School of Economics and Political Science.
TÜR, Özlem: B.S., M.S. METU; Ph.D. University of Durham.
YALVAÇ, Faruk: B.Sc.,Ankara University; M.Sc., London School of Economics and Pol. Science; M.Sc., Fletcher School of Law and Diplomacy; Ph.D., London School of Economics. ***(YÖK)***

ASSISTANT PROFESSORS

KALE, Başak: B.A, M.S., Ph.D. METU, Ph.D. University of Oxford.
KUŞÇU, Işık ***(Vice Chair)***: B.A. Hacettepe University, M.S. METU, Ph.D. Indiana University.
TORUN, Zerrin: B.A, M.S. METU; Ph.D. University of Sussex.
ÜNLÜ BİLGİÇ, Tuba ***(Vice Chair)***: B.A., M.A. Bilkent University; Ph.D. Georgetown University.

INSTRUCTORS

AKKAŞ SONAT, Meltem: B.A. METU, M.A. METU.
ANIL, Işıl: BSc. METU; MSc. METU, MPhil. Department of Political Science, City University of New York (CUNY), New York; Ph.D. Department of Political Science, City University of New York (CUNY), New York.
BAHÇECİK, Şerif Onur: B.A. Bogazici University; M.S. METU; Ph.D. Carleton University.
ERGENÇ, Ceren: B.S. METU; M.S. METU; Ph.D. Boston University.

GENERAL INFORMATION

UNDERGRADUATE PROGRAM

The department offers a comprehensive undergraduate program designed to combine a thorough understanding of the discipline of International Relations, with an increasing emphasis on specialized and in-depth knowledge demanded by the practical developments in the field.

Designed to provide an adequate framework for the study of International Relations as a branch of social science drawing on a wide range of other disciplines, as well as for a better understanding of the discipline as a whole, the program includes core courses in International Relations Theory, International Law, Foreign Policy Analysis, International Political Economy, International Organizations, and Regional Studies. Students are encouraged to further develop a more in-depth understanding of their areas of interest through elective courses.

An important part of the department is the Center for Area Studies which was established in 1988 and designed to assist and provide the necessary resources for researchers and academic personnel who wish to conduct research in area studies.

GRADUATE PROGRAM

The department also offers Master of Science and Ph.D. degrees in International Relations, designed for students holding a first degree in International Relations or a related discipline, with an interest in further study in the field. The department's emphasis on providing adequate analytical skills for academic work and its concern with the development of in-depth knowledge of the topics of International Relations are addressed at the graduate level with a series of advanced courses in the relevant areas of study.

The M.S. program aims at giving students a firm grounding and enhanced awareness in theoretical and methodological issues concerning International Relations. By doing this, the program intends to provide specialized knowledge in the field to professionals and experts in public and private sectors, as well as new graduates.

The Ph.D. program is designed to prepare students for a lifetime of teaching and scholarship. The program is built around two core areas; international relations theory and regional studies. The graduate curriculum offers students excellent preparation in these two core areas as well as the flexibility to branch out beyond the basics.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
IR	101	World History I	(3-0)3	IR	102	World History II	(3-0)3
IR	104	Comparative History of Civilizations	(3-0)3	ADM	122	Introduction to Politics II	(3-0)3
or				ECON	102	Introduction to Economics II	(4-2)5
MATH	157	Calculus with Analytic Geometry	(4-2)5	IR	110	History of International Political Theory	(3-0)3
ADM	121	Introduction to Politics I	(3-0)3	ENG	102	English for Academic Purposes II	(4-0)4
ECON	101	Introduction to Economics I	(4-2)5	TURK	102	Turkish II	NC
ENG	101	English for Academic Purposes I	(4-0)4				
TURK	101	Turkish I	NC				
IS	100	Introduction to Information Technologies and Applications	NC				

SECOND YEAR

Third Semester

ADM	237	Introduction to Law	(3-0)3
IR	231	Introduction to International Politics I	(3-0)3
IR	221	Communication in International Relations I	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

ELECTIVE COURSES OFFERED
(1 Approved course from the below list)

IR	223	Introduction to Peace and Conflict Studies	(3-0)3
IR	234	Introduction to Foreign Policy Analysis	(3-0)3
IR	235	Introduction to International Political Economy	(3-0)3
IR	247	The Social History of the Modern Middle East	(3-0)3

Fourth Semester

IR	232	Introduction to International Politics II	(3-0)3
IR	222	Communication in International Relations II	(3-0)3
IR	224	Research Methods in International Relations	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

ELECTIVE COURSES OFFERED
(One Approved course from the below list)

IR	218	Transition from the Ottoman Empire to the Turkish Republic	(3-0)3
IR	230	Politics of International Migration	(3-0)3
IR	254	Pacific Challenge	(3-0)3
IR	206	Introduction to International Relations (this course is for non-IR students)	(3-0)3
IR	252	Introduction to International Development	(3-0)3

1 Approved elective from other departments **Non-IR**
IR 206 Introduction to International Relations (3-0)3

THIRD YEAR

Fifth Semester

IR	305	Public International Law I	(3-0)3
IR	345	Turkish Foreign Policy I	(3-0)3

ELECTIVE COURSES OFFERED
(One Approved course from the below list)

IR	317	Politics in the Balkans	(3-0)3
IR	328	International Security	(3-0)3
IR	329	Turkish Politics and Foreign Policy	(3-0)3
IR	335	Applied Research Methods in International Relations	(3-0)3
IR	341	Non-State Actors in World Politics	(3-0)3
IR	355	Contemporary China	(3-0)3

Non-IR/ Non-FEAS (only for exchange students)
IR 370 Contemporary Turkey: Politics and Policies (3-0)3
2 Approved electives from other departments

Sixth Semester

IR	306	Public International Law II	(3-0)3
IR	326	International Organizations	(3-0)3
IR	346	Turkish Foreign Policy II	(3-0)3

ELECTIVE COURSES OFFERED
(Two Approved elective from the below list)

IR	316	Political Economy of Globalization	(3-0)3
IR	342	Southern Europe in World Politics	(3-0)3
IR	352	International Private Law	(3-0)3
IR	356	Critical Security Studies	(3-0)3
IR	366	Process of European Integration	(3-0)3

2 Approved electives from other departments
Non-IR (only for exchange students)
IR 370 Contemporary Turkey: Politics and Policies (3-0)3

FOURTH YEAR

Seventh Semester

ELECTIVE COURSES OFFERED
(3 Approved courses from the below list)

IR	407	Middle East in World Affairs	(3-0)3
IR	421	Directed Readings	(3-0)3
IR	422	Theories of International Relations	(3-0)3
IR	435	British Foreign Policy	(3-0)3
IR	459	Int. Environmental Law	(3-0)3
IR	473	European Union in World Affairs	(3-0)3
IR	483	Politics of International Aid: Issues, Actors and Dilemmas	(3-0)3

2 Approved electives from other departments

Eighth Semester

ELECTIVE COURSES OFFERED
(3 Approved courses from the below list)

IR	411	American Foreign Policy	(3-0)3
IR	434	Directed Readings	(3-0)3
IR	444	Issues and Politics in Central Asia and Transcaucasia	(3-0)3
IR	454	Ottoman Diplomacy and the European States System	(3-0)3
IR	464	Historical Sociology of International Relations	(3-0)3
IR	470	Turkey and the EC/EU	(3-0)3
IR	488	Turkey and International Politics of Energy	(3-0)3

2 Approved electives from other departments

MINOR PROGRAM IN EUROPEAN STUDIES

The purpose of the European Studies Minor Program is to provide students majoring in other disciplines with insight into issues in contemporary European economic and political agenda. The program addresses students' interest in International Relations and European affairs with two core courses and a selection of electives as may be relevant to related disciplines.

Compulsory courses

IR	231	Introduction to International Politics I	(3-0)3
IR	326	International Organizations	(3-0)3

Four electives approved by the Department

Elective courses

IR	316	Political Economy of Globalization	(3-0)3
IR	317	Politics in the Balkans	(3-0)3
IR	342	Southern Europe in World Politics	(3-0)3
IR	345	Turkish Foreign Policy I	(3-0)3
IR	346	Turkish Foreign Policy II	(3-0)3
IR	366	Process of European Integration	(3-0)3
IR	432	Human Rights and World Politics	(3-0)3
IR	435	British Foreign Policy	(3-0)3
IR	454	Ottoman Diplomacy and the European State System	(3-0)3
IR	463	Russian Foreign Policy	(3-0)3
IR	470	Turkey and the EC/EU	(3-0)3
IR	473	Europe in World Affairs	(3-0)3
IR	488	Turkey and International Politics of Energy	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

IR 101 World History I (3-0)3
The course examines the rise and fall of great powers as political, military and economic entities, with reference to economic and political relations of large states like the Ottoman Empire, France, Great Britain, Austrian-Hungarian Empire, Prussia as well as the two great powers, the United States and Russia, within the framework of "European Balance of Power" and the traditional "isolationist foreign policy" of the U.S. in the last century. The course includes an analysis of the World War I.

IR 102 World History II (3-0)3
This course intends to examine the developments in Europe and U.S. since 1919 until today, dealing with World War I and the new political structure after 1918, World War II and the involvement of the U.S. in European affairs, Cold War, Sovietization of Eastern Europe and the emancipation of the Third World countries, and relations between industrial and non-industrial countries in political, economic and military fields with respect to global developments.

IR 104 Comparative History of Civilizations (3-0)3

The basic purpose of this course is to introduce the students to the history of civilizations through a comparative perspective. The course starts with a conceptual analysis of the term "civilization" and deals with the basic questions in definition and civilizing process. Its departing point is that there is a common human civilizing process and also a plurality of human civilizations.

IR 110 History of International Political Theory (3-0)3

The aim of this course is to acquaint students with classical political thought extending from Plato to Nietzsche through an analysis of the political thought of selected scholars along with their contributions to international relations. To contribute to a deeper understanding of political thought and its significance for International Relations, the course undertakes both textual and contextual analysis, addressing not only the texts but the social context in which they have been situated.

IR 206 Introduction to International Relations (3-0)3

This course introduces the basic concepts, theories and issues in international politics. By the end of the semester, the students will have an understanding of the mainstream theories of international relations, fundamental concepts and the contemporary issues of importance in international affairs.

IR 218 Transition from the Ottoman Empire to the Turkish Republic (3-0)3

The course intends to outline administrative structure of the Ottoman Empire and concentrates on the Tanzimat Reforms, the intellectual discussions of the time; the Ottomanism, Islamism and Turkism. The collapse of the Ottoman Empire and the establishment of the nation states in the place of the Ottoman Empire are discussed. The double revolution; the National Liberation Movement of 1919-1923 and the establishment of republican regime, the İzmir Economic Congress and the following economic policies of the republican regime are looked through. Intellectuals of the time, such as Ziya Gökalp, Yusuf Akçura, Ahmet Ağaoğlu, Ahmet Hamdi Başar and the Kadro Movement, and their arguments regarding economic development policies as well as nationalism, are included among the topics. As to the foreign policy of the republican regime, the territorial settlements of the period from 1919 to 1923, the Mosul Question, the straits Question, the foreign policy approach of the republican regime, with particular references to the Balkan Pact of 1934 and the Sadabad Pact of 1937, are examined.

IR 221 Communication in International Relations I (3-0)3

This course aims to improve the reading, writing, speaking, and listening abilities of the students through the use of various contemporary international affairs texts, videos and lectures. Students will be expected to make short oral presentations and to participate in discussions. They will also write short essays based on information gained both from their reading materials as well as from the facts learned in their other classes.

IR 222 Communication in International Relations II (3-0)3

This course further develops the skills gained in the Communication in International Relations I course.

IR 223 Introduction to Peace and Conflict Studies (3-0)3

The course outline is prepared in order to achieve the objective of the course. For the purpose of realizing this goal, the course will provide a theoretical background to the issues in concern and along with enabling students to delve more closely into the major concepts, approaches, actors and issues in peace and conflict studies.

IR 224 Research Methods in International Relations (3-0)3

The aim of the course is to provide students with a basic knowledge of research methods in the social sciences, with special emphasis on research methods in International Relations. The course has the twofold aim of acquainting students with epistemological issues in the conduct of research in the social sciences, while also providing students with practical research skills ,including research design, data collection and analysis, and use of library resources.

IR 231 Introduction to International Politics I (3-0)3

This course analyses the behavior of states within the framework of the international system. The main purpose of the course is to equip students with the analytical tools which contribute to their understanding of the changing context of international politics. In addition, the course is basic for the more specialized courses offered in the third and fourth years.

IR 232 Introduction to International Politics II (3-0)3

Continuation of IR 231.

IR 234 Introduction to Foreign Policy Analysis (3-0)3

This course is intended to provide an introductory examination of the subject of foreign policy analysis. In this general context, the nature, scope and definition of foreign policy; the impact of main theories and methods of international relations on foreign policy studies; and various approaches and methods to the study of foreign policy will be covered in the lectures.

IR 235 Introduction to International Political Economy (3-0)3

This course is intended to provide an introductory examination of the subject of International Political Economy (IPE). In this context, first, the basic concepts and issues of international economics; and second, the development of thought about the relationship between international politics and international economics is covered in the lectures and discussion. Syllabus: Issues of Political Economy; Mercantilism; Liberalism; Marxism; the dynamics of IPE; World Economy vs. International Economy; Power in the World Economy; Structures of Power in the World Economy: the security structure, the production structure, financial structure, knowledge structure.

IR 247 The Social History of the Modern Middle Eat (3-0)3

The aim of this course is to examine the international and inter-regional relations of the Middle East through the prism of social history and, focusing on global themes such as urbanization, poverty and consumption, to consider the internal dynamics of Middle Eastern societies and the impact on them of extra-regional factors. The course will cover the period from the late eighteenth century to the early 1980s. The themes will be examined using specific case studies from selected countries and comparisons will be made between the experiences of different countries in the region. The students will be provided with primary material in translation and films made by Middle Eastern film makers will be shown.

IR 305 Public International Law I (3-0)3

An introductory course, dealing with sources of international law, states, individuals, recognition, international agreements, international responsibilities of states, peaceful settlement of international disputes, theory and reality in modern law of war, coercive measures, laws of land and serial warfare, laws of maritime warfare, enemy persons and property within belligerent states, neutral states, termination of war.

IR 306 Public International Law II(3-0)3

Continuation of IR 305.
Prerequisite: IR 305

IR 316 Political Economy of Globalization (3-0)3

This course aims to develop a critical understanding on the changes in global political economy since the 1970s. After a brief introductory discussion on state-market relationship and pre-1970 developments, the course will examine the reasons of the rise of neoliberalism, its dominance in economic policy-making since the 1980s, its implementation through different processes as well as its limits and contradictions.

IR 317 Politics in the Balkans (3-0)3

The topics covered in the course are: History of the Balkans, the territorial settlement of 1919-1923, revisionism in the Balkans, characteristics features of the regimes during the period between the two World Wars, the establishment of communist regimes in the 1940s and their subsequent collapse in 1989-1990 period. International and domestic problems faced by the Balkan states during the transitional period are examined, with emphasis on current 'hot' issues in the Balkans.

IR 326 International Organizations (3-0)3

This course examines the evolution of international organizations in relation to the developments in the international system, undertaking a comparative study between the various pacts and systems prior to the foundation of the League of Nations, the League of Nations and the United Nations system. The course addresses the relevant international organizations of the post-World War II period and the post-Cold War international system.

IR 328 International Security (3-0)3

This course examines the range of security threats that the international community faces at the beginning of the new millennium and discusses, both at the level of discourse and the level of practice, how the international community is responding to the persistence of such threats as nuclear proliferation and terrorism and the emergence of new ones such as chemical and biological warfare, pandemics and mass migration. Special emphasis will be placed on comparing and contrasting traditional security paradigm with newly emerging ones, as well as their complex interaction.

IR 329 Turkish Politics and Foreign Policy (3-0)3

Foreign policy has conventionally been understood as detached from the domestic policy environment. This is derived from the realist assumption that there exists a clear demarcation line between the domestic and the international. Yet this assumption has been questioned by theoretical analysis as well as practical developments in recent years. This course aims at elaborating domestic sources of foreign policy making in the context of Turkish politics. It is based on the hypothesis that an "interactional" approach better serves to the understanding of both Turkish domestic politics and Turkish foreign policy. Thus the course will explain domestic sources of foreign policy issues, like democratization, human rights, the Kurdish question, the role of the military in Turkish politics etc.

IR 335 Applied Research Methods in International Relations (3-0)3

The course aims to introduce the students to empirical political research methods and to basic statistical techniques, resources and concepts. It aims to develop skills in the analysis, interpretation and presentation of research findings, including standards for written research reports. The course will encourage the students to gain an awareness of the real nature of research and the means of collecting information, and to report findings. The course will cover a wide range of subjects and authors, but particular attention will be devoted to the nature of research methodology in social sciences, and mainly in the study of international relations. The course will mainly stress quantitative research design. The course aims at providing the students with necessary knowledge and skills for planning, designing, carrying out, interpreting and presenting their own research at any level – a term paper, a dissertation or more advanced levels such as articles or theses.

IR 342 Southern Europe in World Politics (3-0)3

This course intends to provide the student with an understanding of Southern Europe and the Mediterranean (including theoretical and conceptual approaches). Case studies: Greece and Spain. Economic Environment: economic development patterns; characteristics of the economic elites; state as an actor in the economy; the role of foreign economic aid and foreign investment. Political Environment: the nature of the political establishment; authoritarianism; democratization; the role of individual leaders. External Environment: supportive and reactionary responses in the international system (intervention, solidarity, etc); foreign policy behavior; the role of the USA, EEC/EC/EU and USSR/Russia.

IR 345 Turkish Foreign Policy I (3-0)3

The course aims to identify and analyze various factors contributing to Turkey's foreign policy orientation. While the main focus of this course is the political dynamics and issues of Turkish foreign policy after World War II, the problems and determinants of Turkish foreign policy between 1919-1945, with reference to past experiences and geopolitical imperatives placing certain constraints on the state's decision makers, will also be briefly discussed.

IR 346 Turkish Foreign Policy II (3-0)3

Continuation of IR 345.

IR 352 International Private Law (3-0)3

Private International Law is a third year Course which requires three hours attendance per week. Turkish Private International Law is considered as a branch of private law in Turkey although two of its fields namely “Law of Nationality” and “Status of Aliens” submit a public law character. In this course together with the above mentioned fields of law the Conflict of Laws and the Law of International Civil Procedure are examined as well as a part of Turkish Private International Law. “Law of Nationality”, deals with the acquisition, loss and proof of Turkish nationality; “Status of Aliens”, covers the fundamental rights of aliens in Turkey mainly as right of entry, right to residence, right of employment, title to property, succession; “Conflict of Laws”, deals with the relationships and legal acts involving foreign element. Its main aim is to determine the applicable law in legal disputes involving foreign element such as contracts, torts, restitution, marriage, divorce, maintenance claims, prescription etc. It also covers the general problems such as renvoi, public policy, application of foreign law, preliminary question. “Law of International Civil Procedure”, covers the particular rules and procedure to be followed in cases involving foreign element. International jurisdiction of Turkish courts, recognition and enforcement of foreign judgments, sovereign immunity, caution and prorogation are the major topics examined under this subject.

IR 366 Process of European Integration (3-0)3

This course is designed as a general introduction to the process of European integration and the politics of the European Union (EU). The course consists of three parts: Part One traces the history of European integration from the end of the WWII through 2002. To facilitate different interpretations of the EU in the making, part one also reviews the main

academic debates about European integration and about the Union. Part Two looks at the institutional politics of the EU including a detailed analysis of the formal and informal aspects of EU governance. Part Three discusses the main policy areas ranging from agriculture to EMU. On the basis of the findings drawn from the theory and practice of European integration, the course address the relationship of the post-1995 enlargement with the challenge of deepening of the EU and seeks an answer to the question of what the future European integration may hold.

IR 370 Contemporary Turkey: Politics and Policies (3-0)3
This course aims to introduce exchange students at METU to the main characteristics of contemporary Turkish politics, policies and society by offering the chance to explore actors and institutions involved. In this light, the objective is to help students contextualize and deepen their knowledge on Turkey. By the end of the course, students are expected to be able to demonstrate knowledge of Turkish politics, policies and society and to identify international and domestic factors behind change and continuity in Turkey.

IR 407 Middle East in World Affairs (3-0)3
The course aims to introduce students to the domestic political and socioeconomic processes of the Middle East countries, including the Arab States, Iran and Israel. Emphasis is placed on decolonization, state formation, evolution of the political systems, socioeconomic developments, impact of the military, crisis of legitimacy, social movements, ideology and recent attempts at economic and political reform.

IR 411 American Foreign Policy (3-0)3
The aim of this course is to introduce students to the basic theme, principles, and the implementation of the American postwar security policies. An assessment of the containment policies of the US policy-makers towards the Soviet Union will be given a special emphasis. The course is designed to enable students to understand properly the post cold-war period in US foreign policy and its implications for the world peace and order.

IR 421 Directed Readings (3-0)3
This course is offered to those students having a higher academic average with the aim of helping them to further specialize in the certain issues and topics of international relations and to conduct research under the guidance of an instructor.
(Offered as IR 434 in the Spring term).

IR 434 Directed Readings (3-0)3
This course, unlike the structured courses, has no fixed lectures and is based solely upon the reading and analysis abilities of the students. Its basic requirements are detailed examination of research material and a paper based on this material under the guidance of the lecturer.

IR 435 British Foreign Policy (3-0)3
This course provides an insight to British Foreign Policy. Spanning the period from the spread of the British Empire to the present day, this module seeks to offer an overview of British foreign policy by concentrating on: a) the major actors involved b) the institutional and historical context of decision-making and c) the relationship between domestic political factors and foreign policy initiatives/decisions. Particular emphasis will be placed on the period after 1945. The module covers six thematic issues: 1) The Rise and Decline of the British Empire 2) Decolonization and Its Aftermath 3) Anglo-American Relations 4) Britain in Europe 5) Defense and Security Policy 6) Foreign Policy and Domestic Factors. Two weeks´ lectures will be devoted to each thematic issue. Efforts will be made to allocate time for debate at the end of each lecture-student participation is strongly encouraged.

IR 444 Issues and Politics in Central Asia and Transcaucasia (3-0)3
This course is designed for students interested in the contemporary problems of Central Asia and Azerbaijan. Although there is no prerequisite, it is expected that the students have had some familiarity with the 20th century developments in the region.

IR 454 Ottoman Diplomacy and the European System (3-0)3
The basic purpose of this course is to give the students a general understanding of Ottoman diplomacy through the relations between Ottoman Empire and the European states. It takes the concepts of “diplomacy” and “states-systems” as basic tools and first dwells on the beginnings of Ottoman diplomacy and the European states-systems. Secondly, it deals with the ad loc diplomacy period and the establishment of permanent diplomacy. Thirdly, the practice of Ottoman diplomacy in foreign capitals is studies. The course will conclude with a discussion of the legacy of Ottoman diplomacy.

IR 459 International Environmental Law (3-0)3
The main purpose of this course is to familiarize students with the environmental issues and the legal dynamics of the response given by the humanity to

this problem either at regional or global levels. Concerning the question of efficiency and adequacy of the international regulatory processes in prevention and restitution of environmental problems, the underlying concepts, principles and techniques, the role of international, inter-governmental and non-governmental organizations, the methods of enforcement, the application of the reformulated doctrine of state responsibility and liability will be discussed within the context of existing international structures.

IR 464 Historical Sociology of International Relations (3-0)3

The course will consist of lectures concerning the sociological aspects of international relations. It will attempt to provide a sociological perspective and interpretation to the main controversies prevalent in international relations (theory). The main theme of the course is the necessity to develop a sociological perspective to international relations. This implies the analysis of the relation between social relations and other social forms such as the state, the state system, power and law. Therefore, an analysis of the relation between social relations, social forms and its implications for the theory of international relations will be discussed. It will also be demonstrated through out the course that a sociological perspective to the prevalent disputes of realism/neorealism, idealism and some interpretations of theories of globalization.

IR 470 Turkey and the EC/EU (3-0)3

This course is designed to enable students to understand properly the political, economic, foreign policy and security issues that influence the relations between Turkey and the EC/EU. The course content includes an analysis of the normative structure of the EU-Turkey relations; major breakthroughs in Turkey-EC/EU relations; the impact of EC/EU's developments on its relations with Turkey; the role of EC/EU bodies such as the Commission; the Council of Ministers and the European Court of Justice on Turkey's relations with the EC/EU; the influence of the Mediterranean policy of the EC/EU on Turkey. Furthermore, the recent developments will be examined to project the future of relations between Turkey and the EU.

IR 473 Europe in World Affairs (3-0)3

The purpose of this course is to provide students with a general understanding of the role of the EU in wider European and international arenas. The course is divided into three sections. First, various attempts to develop a European foreign policy are traced, beginning with the creation of EPC in 1970, culminating in the EU's CFSP as laid down in the Treaty on the EU. Secondly, alternative approaches for understanding the EU's foreign policy behavior are presented. Against this theoretical background, the Union's relations with the rest of Europe, with the developing countries and with the US are examined.

IR 483 Politics of International Aid: Issues, Actors and Dilemmas (3-0)3

The purpose of this course is to introduce and analyze a wide range of issues that are central to the politics of international aid. Drawing on the historical record and more recent case studies, students will develop an in-depth understanding of the main actors, mechanisms, and dilemmas in the contemporary aid system; how foreign aid and development policy theories are constructed and used. We will examine the role of international and local politics on the provision of international aid not only from the perspective of donor countries, but also from the standpoint of recipient countries.
This course is intended to facilitate students to acquire knowledge and think critically about origins, evolution and forms of foreign assistance; the types of donors involved and their various motivations; the determinants, allocation, impact, and effectiveness of aid; aid delivery in humanitarian crises, conflict and post-conflict situations; the debates and criticisms surrounding specific policy initiatives; and the changing role of aid in international relations since 9/11.

IR 488 Turkey and International Politics of Energy (3-0)3

This course is designed for the undergraduate students who are interested in learning Turkey’s role in international politics of energy. The course deals with the approaches to and characteristics of international politics of energy as well as Turkey’s energy strategy in a wider international context. The course also covers Turkey’s production and consumption of coal, oil, natural gas, nuclear and renewable forms of energy. Besides, the course explores Turkey’s energy cooperation with the United States, the European Union and Russia as well as international politics of energy in the following neighbouring regions of Turkey: The Caspian, the Black Sea, the Middle East and the Mediterranean.

GRADUATE PROGRAM AT THE DEPARTMENT OF INTERNATIONAL RELATIONS

M.S. PROGRAM IN INTERNATIONAL RELATIONS

Required Courses

IR	503	Theories of International Relations	(3-0)3
IR	599	Master's Thesis	NC
IR	800-899	Special Studies	NC
IR	550	Seminar in International Relations	NC

Elective Courses

IR	505	Problems in International Security	(3-0)3
IR	508	Issues in Turkish Foreign Policy	(3-0)3
IR	525	International Propaganda	(3-0)3
IR	529	International Political Sociology	(3-0)3
IR	536	Radical Politics in the Middle East	(3-0)3
IR	538	Central Asia and Transcaucasia in World Affairs	(3-0)3
IR	542	British School of International Relations	(3-0)3
IR	544	Politics in East-Central Europe	(3-0)3
IR	552	International Political Economy	(3-0)3
IR	555	European Regime of Human Rights	(3-0)3
IR	556	Politics, Economics and Foreign Policy in Greece	(3-0)3
IR	558	The Making of European Security	(3-0)3
IR	561	Enlargement and Integration in the European Union	(3-0)3
IR	564	Russia and the European State-System	(3-0)3
IR	565	Global Politics of Money and Finance	(3-0)3
IR	566	Theory and Event	(3-0)3
IR	570	Global Environmental Issues	(3-0)3
IR	575	Research Methods in the International Relations	(3-0)3
IR	576	State in Global Capitalism	(3-0)3
IR	579	Human Rights Issues in Europe	(3-0)3
IR	581	Energy, Water and Environmental Policies in and around the European Union	(3-0)3
IR	584	The Politics of Arab- Israeli Relations	(3-0)3
IR	586	Religion and Nationalism in World Politics	(3-0)3
IR	590	International Relations of the European Union	(3-0)3
IR	591	Controversies in European Integration	(3-0)3
IR	592	Human Rights Politics in the European Union	(3-0)3
IR	594	Immigration, Integration and Transnationalism in North America	(3-0)3
IR	598	Foreign Policy Analysis	(3-0)3

Ph.D. PROGRAM IN INTERNATIONAL RELATIONS

Required Courses

IR	601	Advanced Topics in Theory and Methodology in International Relations	(3-0)3
IR	602	History, Politics and International Relations	(3-0)3
IR	603	Middle East in World Affairs	(3-0)3
or			
IR	604	Europe in World Affairs	(3-0)3
or			
IR	605	Eurasia in World Affairs	(3-0)3
IR	699	Ph.D. Dissertation	NC

Elective Courses

IR	650-690	Independent Studies in International Relations	(3-0)3
IR	900-999	Special Studies	NC

IR 503 Theories of International Relations (3-0)3

This course provides an analysis of the three important theoretical debates of international relations: Idealism vs Realism, Traditionalism vs Behaviouralism, and Realism vs Neo-realism. The course also addresses the level of analysis problem, as well as the central assumptions and key concepts of various theories of international relations, with special emphasis on the basic concepts, propositions, and current critique of realism and neo-realism.

IR 505 Problems in International Security (3-0)3

The course addresses concepts of power, influence and coercion, the nature of diplomatic and strategic behavior, and is organized around the following areas: The state system after World War II; problems of contemporary strategy: The impact of nuclear weapons; the theory of nuclear deterrence; Crisis Management; Limited War; arms control and the stability of Mutual Deterrence; arms limitations and control; Detente: SALT, Mutual Forces Reduction Talks, the CSCE and the INF Treaty.

IR 508 Issues in Turkish Foreign Policy (3-0)3

The aim of this graduate seminar is to give the student an awareness of the various foreign policy issues that confront Turkey. An attempt will be made to discuss the causes and consequences of the various crises and regional problems between Turkey and its neighbors. The Turco-Greek problems, the Cyprus dispute, Turkey's relations with the Middle Eastern states and with the Turkish republics of the former Soviet Union, as well as the Turco-American and Turco-European ties will be examined.

IR 525 International Propaganda (3-0)3

This course seeks to analyse the use and effects of propaganda, mass persuasion and psychological warfare in modern world politics. It will focus on the historical development of propaganda and the use of different propaganda means such as press, film, posters, and social media using specific case studies. This course aims to develop students' understanding of the significance of cultural manipulation and the power of propaganda in the policy-making environment. Students will be expected to develop their ability to analyse historical data and to show evidence of a sophisticated approach to historical interpretation.

IR 529 International Political Sociology (3-0)3

International political sociology (IPS) has recently emerged as a sub-field of international studies. The main tenets of this new literature are the emphasis on social practices, a sociological approach to the international and international political problems as the main analytical focus. This course surveys the contributions of scholars inspired by Michel Foucault's thought to the study of International Relations. It introduces students to Foucault's later work known as governmentality and the genealogical method. The course then focuses upon current transformations in world politics from a governmentality perspective. In particular, it highlights the international political sociology literature on questions such as international order, war, political power, governance, reason of state, risk, territoriality and borders. The objectives of this course are assessing the contributions of governmentality perspective to the IR discipline and developing the skills to use theoretical concepts to analyze empirical political phenomena.

IR 536 Radical Politics in the Middle East (3-0)3

The aim of the course is to analyze the roots and forms of radicalism in Middle Eastern Politics. Beginning with discussions of Arab nationalism and Arab Baath Socialism the course focuses on the historical roots and the ideological outlook of radical Islam, with particular emphasis on the following issues: Radical Islam and the West, Iran as a revolutionary state, Islamic movements in Lebanon, Egypt, and the Gulf, radical Islam and North Africa.

IR 538 Central Asia and Transcaucasia in World Affairs (3-0)3

The aim of this graduate course is to give the student an awareness of the various domestic and international factors that influence government, politics and foreign policymaking in the five Central Asian states and in Azerbaijan. In addition to the history of the region, we will examine the contemporary developments and we will try to project the future shape of the region's socio-political and geopolitical landscape.

IR 542 British School of International Relations (3-0)3

This graduate seminar entails a general survey and a critical appraisal of the British School of

International Relations. First, it places the British School in the "British tradition" and attempts to uncover its historical origins. Secondly, it distinguishes the British School from other schools of International Relations such as the Realist School, Behavioralist School and World System School. Then, it proceeds to critically examine the work of the representative scholars identified with the School.

IR 544 Politics in East-Central Europe (3-0)3

The objective of this course is to provide students with an analytical understanding of current political and security developments in East-Central Europe. The focus will be on the issues of post-Cold War political integration tendencies and security problems in East-Central Europe. Evolution of the attitudes and roles of major political and security organizations concerning East-Central Europe are to be examined.

IR 550 Seminar in International Relations NC

IR 552 International Political Economy (3-0)3

The purpose of this course is to examine the evolution of the international economic relations since the emergence of the modern state system in the mercantilist period. The course is intended to give students background on the interaction between economics, economic history, politics, international history, and international relations. In this context, the theories and history of international economic relations will be discussed with an emphasis on the significant issues in the twentieth century. During the lectures and seminars, the emergence and evolution of the international economy since the mercantilist era will be analyzed in the context of inter-state relations. The emphasis will be on the impact of inter-state system and military and security issues on the international and national and the interaction between them. Accordingly, the political impact on the operation of the international and national markets and the opportunities provided and limitations imposed on the political, military security, and autonomy issues by the market will be analyzed. In this context, the analysis will also focus on the interaction and the relationship between state and market, power and production, growth, development, distribution of wealth, intergovernmental organizations (IGOs) and the multinational corporations (MNCs)

IR 555 Turkey and the European Court of Human Rights (3-0)3

This course aims to introduce and evaluate the recent Turkish experience as a participant of the Council of Europe human rights regime, with emphasis on the European Court of Human Rights (ECHR), the sole control organ of the system presently. The course discusses, to begin with, human rights under international law and, in particular, the issue of the international protection of human rights, in turn moving on to the European human rights regime through establishment and the subsequent development. The main thrust of the course then becomes the case law of the ECHR, offering open-ended discussion of several cases, which involve, or of relevance to, Turkey.

IR 556 Politics, Economics and Foreign Policy in Greece (3-0)3

During the lectures and seminars, the political, economic and foreign policy establishments in Greece in different international environments will be discussed. The institutional structures and the power positions and orientations of main individual actors and groups and their respective roles in the economic and political developments are analyzed with a special emphasis on the democratization and Europeanization processes. The relations with major European powers, Turkey, the US, and the EU are analyzed with reference to the domestic political and economic structures and actors.

IR 558 The Making of European Security (3-0)3

The objective of this course is to provide students with an analytical understanding of current security developments in Europe. The modern history of Europe from the World War I to to-day is to be taught to prepare a better ground to focus on the issues of the post-Cold War security considerations in Europe. Tutelage of European security under the US and the USSR, the European responses and continuity and departure in the making of European security are to be discussed. The Evolution attitudes and roles of major powers and restructuring of security organizations (NATO, WEU, OSCE and ESDI and EDSP) concerning European security are to be examined. The unilateral and multilateral military interventions in the post-Cold War era in Europe are to be specifically discussed with particular references to different schools of thoughts. Students are expected to look into first hand documents and are encouraged to follow up the latest developments in Europe.

IR 561 Enlargement and Integration in the European Union (3-0)3

This course is intended primarily for MSc International Relations and MSc in European Studies. It may also be taken by certain students provided that they already have a sufficient knowledge of the process of European integration and of the EU, its political system and its policy-making as a whole. The aim of the course is to develop a detailed critical/analytical approach to the study of the one of the most important political and economic issues facing EC/EU since its foundation, namely the enlargement of the Union to include new members. The course hence aims to complement more general courses on European integration and EU. By drawing on the experience and lessons of previous enlargements, the course will provide a detailed knowledge on the current enlargement process to include the 10 Central and Eastern European countries as well as 3 Mediterranean states; Cyprus, Malta and Turkey. The course also aims to develop a comprehensive and comparative approach to the analysis of EU-Turkey relations by placing it in the broader context of an enlarging and deepening Europe. Indeed, the overall impact of enlargement-both in terms of challenges and possibilities- for the EU can be studied not only by focusing on the internal (policy) implications and external implications of enlargement but also by placing emphasis on the uneasy relationship between enlargement and deepening of the EU. What emerges are the current recurrent contending visions of European unity (federalist versus confederalist; Atlanticist versus Europeanist) ant the pros and cons of a more differentiated Europe that appears to be breaking forth in the Union.

IR 564 Russia and the European State-System (3-0)3

This post-graduate course seeks to explore and analyze the evolution of Russia's place in the European state-system, especially in the post-Cold war era. The first part of this course discusses various conceptual frameworks that are used to analyze the dilemmas in Russia's process of Westernization and the existing conceptions of Europe among the Russian intelligentsia. The next part deals mainly with the historical evolution of Russia's orientation towards the European state-system during both the Tsarist and Soviet periods. Afterwards, the course will discuss Russia's place in the emerging institutional architecture of Europe in the post-Cold war era. In this part, the emphasis will be on Russia's relations with CSCE/ OSCE, NATO and the European Union. In the penultimate section, the course will examine Russia's relations with the Western countries, the Central and East European countries, the Balkans and the Baltics. The concluding part will discuss the change and continuity in Russia's place in the European state-system.

IR 565 Global Politics of Money and Finance (3-0)3

This graduate course aims to provide students with a critical historical understanding of state-money/finance relations since the 16th century with a particular focus on the post-1980 developments. After a methodological and theoretical analysis on money and finance and the constitutive role played by social relations and states on monetary and financial developments, the course will problematize the issue in relation to changing global hegemonic powers, international monetary orders, international organization of credit, and global financial crises.

IR 566 Theory and Event (3-0)3

This course introduces the student to the "theory in the event" and the "event in the theory," in the reference frame of world politics, with a view to enhancing the uses of theory in postgraduate work. The theory in the event designates the thematic patterns that emerge out of cases, situations and acts in international affairs, enabling abstract thinking on the event, roughly in response to the question: What is the pattern? And the event in the theory is about the functioning of theories as simplifying devices, rehearsing answers to the question: How do theories make sense of events that are inherently chaotic? The course, which does not assume a prior knowledge of theories of IR, aims to provide instruction on these themes through attention grabbing examples provided by the world of movies.

IR 570 Global Environmental Issues (3-0)3

Our planet is threatened by a wide variety of environmental problems ranging from climate change, ozone depletion, deforestation, marine pollution, desertification to extinction of species, which require international cooperation. Though the commitment of the states to protect the quality of the environment is impressive, the implementation of these policies is problematic. In this course, the nature and extent of the global environmental issues and the response given by humanity to these problems, at national, regional and international level will be analysed.

IR 575 Research Methods in the International Relations (3-0)3

This course will look at a wide variety of methods for researching politics in the contemporary world.

To do this, we will first look at some general and theoretical issues of research methodology. Subsequent sessions will tend to be more practical and concentrate on issues directly related to carrying out research projects using the different methodologies. The final sessions will look at ideas on how to write up a piece of research and present it to an audience.

IR 576 State in Global Capitalism

This course aims to provide the graduate students with a critical historical understanding on the changes in the form of political authority in relation to the so-called globalisation process. After a methodological and historical analysis on the development of the modern state in its bourgeois democratic as well as national forms until the 1980s, the course will scrutinize the social, economic and ideological bases of the ongoing transformations in the political field since then from a political economy perspective. In this regard, possible implications of global processes on the state will be discussed by focusing on the restructurings that have been taking place in state-society relationship, economic management and legal framework with a particular emphasis on their impact on democracy and nationhood.

IR 579 Human Rights Issues in Europe (3-0)3

This is a legal course in international human rights law that centres on a close scrutiny of actual cases in mapping and discussing issues of human rights in western Europe. As a theme, "human rights" is usually associated with somewhat peripheral political cultures in which the civil society is typically weak and grievances abound due to partisan, patriarchal or discriminating uses of public authority. The present course focuses instead on democracies in western Europe that seem rarely suspect in this regard, stretching from the UK, France and Germany to Iceland and Norway, from Spain and Italy, to Sweden, Switzerland, the Netherlands, Belgium and Ireland.

IR 581 Energy, Water and Environmental Policies in and around the European Union (3-0)3

This postgraduate course seeks to examine the key aspects of energy, water and environmental policies in and around the European Union. The first part of the course develops the conceptual framework for analysing the relationships among energy, water and environment by exploring the political realist, liberal and critical approaches. In the following part, the course will deal with the development and characteristics of energy, water and environment policies in the European Union. The concluding final part of the course discusses in interactions between the energy, water and environment policies inside the European Union and its neighbourhood, covering the Americas, Africa, Asia, Eurasia and Turkey.

IR 584 The Politics of Arab-Israeli Relations (3-0)3

The course aims to provide the students with an understanding of the historical development of the Arab-Israeli conflict, the major debates and discourses that have emerged regarding the historiography, the sociology, the politics and the international relations of the conflict as well as an understanding of the essential political ideas and ideologies that have motivated and guided the principal actors in the conflict.

IR 586 Religion and Nationalism in World Politics (3-0)3

The aim of this course is to study the influence of religion and nationalism in the modern world. The course will first explore the role of religion in the pre-modern world. It will then provide a historical analysis of secularization and introduce students to the literature of secularization. It will then examine the literature on nationalism and look closely to the relationship between religion and nationalism. Finally, it will discuss the contemporary debates on secularization and nationalism.

IR 590 International Relations of the European Union (3-0)3

Since the 1990s, there has been a steady expansion of the practical and scholarly interest in the international role of the EC/EU both as a partner to other major actors in world affairs and as an actor in its own right. The objective of this course is to give a broad introduction to ideas and issues related to the EU's international role and identity in a globalizing world. The course commences with a conceptual and theoretical analysis of the international presence and actorness of the EU. Next, it overviews the legal bases and the institutional framework of EC/EU's external relations and outlines various attempts to further develop EU's foreign and security policy, beginning with European Political Cooperation, culminating in the Common Foreign and Security Policy and the recent move into Common European Security and Defence Policy. Against this theoretical and historical background, the course assesses the Union's relations with its peripheries to the east, south, and with the rest of the world. Finally, by way of conclusion, the challenges facing the EU foreign and security policy and the the Union's international role and identity are examined in the context of a wider Europe.

IR 591 Controversies in European Integration (3-0)3

Since its inception the European Union (EU) has been a fiercely contested and politically divisive project. In recent years, controversial issues such as the EU enlargement, the constitutional crisis, declining public support for European integration and the latest Eurozone crisis have tested the EU to its limits and increasingly divided both political elites and mass publics. Starting with a solid overview of the European integration process in successive stages, this course will analyse the key issues and debates related to the political system of the EU and to the politics of European integration. While most mainstream courses on the EU describe the history, the institutions, policy areas and theorizing about European integration, this course aims at familiarising the students with many of the most important issues in EU politics and enable them to reflect on the current and future state of the EU.

IR 592 Human Rights Politics in the European Union (3-0)3

This course explains why the EU has developed a human rights policy with implications on its internal evolution and external relations. To understand this, the course explores policies and mechanisms adopted by the EU including the founding treaties, the council's declarations, the parliament's resolutions and the ECJ's rulings. The course also analyses the role the Union has played in the promotion and protection of human rights in the process of enlargement. Furthermore the human rights conditionality attached to trade and development aid with the third countries is examined in the context of the EU's global reach in influencing human rights policies.

IR 594 Immigration, Integration and Transnationalism in North America (3-0)3

This seminar will examine the challenges and dilemmas posed by global migration and the political responses of various national communities. Geographically, the course will focus on the North American region with emphasis on the US and Canada as host countries.

In the first part of the course, we will consider the nature of migration, and address such topics as the reasons why people choose to migrate, various immigration and citizenship policies, as well as changes and continuities with respect to migration flows and policies.

In the second part, the focus will be on examining incorporation of immigrant communities in their recipient countries. We will consider contemporary approaches to settlement and integration, once migrants have become citizens. We look at different regimes of integration and political incorporation in Canada and the US from a comparative perspective.

The final part will be devoted to the study of transnationalism. In this section, we will analyze the host society and home country relationships, the role of immigrant organizations in immigrant integration and in influencing policies within both contexts. We will pay particular attention to the dynamics of gender and religion and how they shape transnational relations of migrant communities.

In short, this seminar aims to provide students with the analytical tools with which to critically compare and contrast the relevant issues, actors, political institutions, and political processes that form the basis of immigration-related policy debates in North America.

IR 598 Foreign Policy Analysis (3-0)3

This course aims to provide a profound examination of foreign policy phenomenon. The nature scope, actors and determinants of foreign policy; main theories and methods of Foreign Policy Analysis and their relationship with international relations and 'change' in foreign policy are the main topics to be analyzed. In this framework, the actors and the structures of foreign policy; domestic and external sources of foreign policy; foreign policy decision and policy making, decisional bodies and processes (individuals/leadership, groups, organizational and bureaucratic politics) and the issue of rationality in foreign policy are discussed through case stories in the seminars. Furthermore the complex interactions between ideas, culture, media, public opinion, interst groups, etc, and foreign policy are analysed. Special emphasis is given on "change and foreign policy" and the "state and transnational actors," "theory and practice in foreign policy", and "foreign policy implementation".

IR 599 Master's Thesis NC

IR 800-899 Special Studies NC

IR 601 Advanced Topics in Theory and Methodology in International Relations (3-0)3

This course focuses on two important issues of methodology and theory of international relations: the "level of analysis" problem and the question of "order and change". These two issues are analyzed within major theories of international relations. The aim of this analysis is not only to examine the main

propositions of major theories of international relations with regard to these issues, but also to understand the limitations of the theories of international relations on these issues.

IR 602 History, Politics and International Relations (3-0)3

The basic purpose of this graduate seminar is to give students a general understanding of philosophy of history and to explore its possible implications for political theory and the study of international relations. The idea of history and its relations with human knowledge i.e. the problem of theory and history is the first issue to be dealt with. Then, the relations between history, political theory and the study of international relations are to be analyzed and the basic problems and issues are to be considered.

IR 603 Middle East in World Affairs (3-0)3

This is an advanced seminar designed to encourage a synthesis of national and international issues facing the countries of the region ranging from Morocco to the Persian Gulf. Within this context issues of state formation, democratization, economic development, and regional conflicts will be discussed.

IR 604 Europe in World Affairs (3-0)3

The aim of this course is to examine the emergence and the evolution of the idea of Europe in world politics. After examining the historical origins of this idea, the course focuses on the developments in this century, primarily on the post-second world war period. The process of European integration and its impact on the European nation-state system will be one of the central concerns of the course.

IR 605 Eurasia in World Affairs (3-0)3

This course is designed for Ph. D students who are interested in the contemporary issues in Eurasia and their relevance to world politics. The course will cover the developments in Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, the Russian Federation, Tajikistan Turkmenistan Ukraine and Uzbekistan. The course will explore the process of post-Soviet transition in the Eurasian countries from a critical perspective. Regional developments in Eurasia will be evaluated in comparison to the trends in other post-Communist countries in order to identify which aspects of the post-Communist transition are specific to the Eurasian region. This course will first examine the historical legacy in Eurasia, focusing on the Tsarist and Soviet periods. Subsequently, it will examine the key security, political, economic, social, and cultural issues in Eurasia from 1991 to the present.

IR 650-690 Independent Studies in International Relations (3-0)3

IR 699 Ph.D. Dissertation NC

IR 900-999 Special Studies NC

DEPARTMENT OF POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

PROFESSORS

ACAR, Feride: B.S., METU; M.A., Ph.D., Byrn Mawr College.
AYATA, Ayşe: B.S., METU; Ph.D., University of Kent at Canterbury.
KAYA, Raşit ***(Department Chair)***: B.S., Ankara University; Institut Français de Presse en Science de l'Infomation;
Docteur és Science de l'Information, Université de Paris (Paris II).

ASSOCIATE PROFESSORS

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ASLAN-AKMAN, Canan: B.S., METU; M.S., Trinity College, Dublin University; Ph.D., McGill University.
OKYAYUZ, Mehmet: B.A., M.A., Universität Heidelberg; Ph.D. Universität Marburg.
ŞENGÜL, H. Tarık: B.CP, M.A., METU; Ph.D., University of Kent at Canterbury.
ÜSTÜNER, Yılmaz: B.S., M.S., Ph.D., METU.
DEVECİ, Cem: B.S., M.S., METU; Ph.D., Carleton University.
ERDOĞAN, Necmi: B.S., M.S., METU; Ph.D., University of Lancaster.
ÜSTÜNER, Fahriye B.S., M.S., Ph.D., METU.
DEVECİ ÇIRAKMAN, Aslı: B.S., M.S. METU; Ph.D., Queen's University.
YALMAN, Galip: B.S., METU, M.A., University of Southampton; Ph.D., University of Manchester.
ERTUĞRUL, Kürşad: B.S., METU; M.A., University of Leeds; Ph.D., METU.
AYTEKIN, Atilla: B.S., METU; M.S., Bilkent University; Ph.D., Binghamton University, SUNY.

ASSISTANT PROFESSORS

AŞÇIOĞLU-ÖZ, Gamze: B.A., Ankara University; L.L.M., University of Nottingham;
Ph.D., Ankara University.
VURAL EREN, İpek ***(Vice Chair)***: B.S., METU; M.S., London School of Economics;
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BAYIRBAĞ, Mustafa: B.S., M.S., METU; Ph.D., Carleton University.
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ALPAN, Başak: B.S. METU, M.S. METU, Ph.D. University of Birmingham
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BIRLER, Ömür: B.S., METU, M.S., Bilkent University; Ph.D., Carleton University.
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INSTRUCTOR

ÇAKMUR, Barış: ***(Vice Chair)***: B.S., M.S., Ph.D., METU.

GENERAL INFORMATION: The Department of Political Science and Public Administration offers B.S., M.S. and Ph.D. degrees in the fields of Political Science and Public Administration. The main objective of the department is to equip students with the necessary skills and resources for appointment in local, national and international administrative organizations. To achieve this aim, emphasis is placed on the scientific and comparative analysis of political and administrative decision-making processes.

The courses in the undergraduate program cover a wide range of areas such as social and political theory, political sociology, political parties, cultural studies, political history, media studies, political participation, administrative law, bureaucracy, urban politics, local government, personnel administration, public administration theories and organizational theory.

The first two years of the B.S. program aim to equip the students with the necessary theoretical, methodological, and empirical formation relevant in the spheres of political science and public administration. Most of the courses in these initial two years are thus must courses, with only a restricted number of elective courses. From the third year onwards, students are encouraged to specialize in issues and topics of most interest to them, by choosing from a range of departmental elective courses incorporated into the program. In the third and fourth years students can also take free elective courses from other social science, language, music and fine arts departments to broaden their perspectives and develop their language skills. More than 2000 students have graduated from the department of Political Science and Public Administration since 1956 and at present there are around 600 undergraduate students. The graduates are recruited by both public and private sector employers mostly as candidates for middle and top managerial and administrative positions. The banking sector and organizations such as the State Planning Organization, the Ministry of Foreign Affairs, the Ministry of Finance, other financial institutions, branches of local government and the media constitute main employers of graduates of the Department of Political Science and Public Administration.

The Department's graduate programs are designed to provide an academic atmosphere as well as advanced training to those who seek further education. The department offers courses which aim to equip graduate students with the necessary tools and scientific outlook for independent research and advanced knowledge. Currently there are more than 130 graduate students in the department; 70 of them in the M.S. program and the remaining 60 in the Ph.D. curriculum.

The department also contributes to various interdisciplinary graduate programs in METU. Among these are the graduate programs of Urban Policy Planning and Local Government (UPL), Gender and Women's Studies (GWS), Asian Studies, Latin and North American Studies, Center for Black Sea and Central Asia (KORA), Center for European Studies (CES) and Eurasian Studies (EAS) as well as Media and Cultural Studies (MCS).

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

ADM	1121	Introduction to Politics	(3-0)3
ADM	1323	Society and Culture	(3-0)3
ECON	101	Introduction to Economics I	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
MATH	117	Calculus I	(3-2)4
TURK	101	Turkish I	NC
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

ADM	1122	Introduction to Politics II	(3-0)3
ADM	1225	Administration and Organization in Public Context	(3-0)3
ECON	102	Introduction to Economics II	(4-2)5
ADM	1102	Introduction to Law for BA	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4
TURK	102	Turkish II	NC
MATH	118 or Restricted Elective		(3-2)4

*** Restricted Elective List**

ADM.1324-History of Civilizations – A. Aytekin
IR.206 Introduction to International Relations
Soc.132 Introduction to Anthropology
Phil.282History of Science
Phil.110 Introduction to Philosophical Concepts
Psy.100 General Psychology
Psy.150 Understanding Social Behaviour

SECOND YEAR

Third Semester

ADM	2401	Principles of Law	(3-0)3
ADM	2311	Foundations of Social Research	(3-0)3
ADM	2121	History of Political Thought I	(4-2)5
ADM	2242	Turkish Administrative System	(3-0)3
ADM	2437	Introduction to Law for IR	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

ADM	2402	Constitutional Law	(3-0)3
ADM	1326	Introduction to Statistics	(3-0)3
ADM	2122	History of Political Thought II	(3-0)3
ADM	2132	Comparative Government	(3-0)3

Restricted Elective List

ADM 2116 Social and Political History
ADM.4138 Theories & Practice of Nationalism
ADM 4220 Public Finance
ADM.2436 Introduction To Law for **Econ**. (3-0)3
HIST 2202 Principles of Kemal Atatürk II NC

THIRD YEAR

Fifth Semester

ADM	3161	Turkish Politics and Political Structure I	(3-0)3
ADM	3429	Administrative Law I	(3-0)3
ADM	3101	Approaches to State-Society Relations	(3-0)3
ADM		Departmental Elective	(3-0)3
XXX		Free Elective	(x-x)x

Sixth Semester

ADM	3162	Turkish Politics and Political Structure II	(3-0)3
ADM	3208	Organisational Theory	(3-0)3
ADM	3160	Political Sociology	(3-0)3
ADM		Departmental Elective	(3-0)3
XXX		Free Elective	(x-x)x

FOURTH YEAR

Seventh Semester

Minimum 2 departmental electives from GROUP I
Maximum 2 departmental electives from GROUP II

Eighth Semester

Minimum 2 departmental electives from GROUP I
Maximum 2 departmental electives from GROUP I
Free Elective
Free Elective

DEPARTMENTAL ELECTIVES GROUP I

ADM 3103 Political Participation and Electoral Systems (3-0)3
ADM 3205 Bureaucracy & Turkish Bureaucracy (3-0)3
ADM 4111 European Political Thought (3-0)3
ADM 4135 Migration (3-0)3
ADM 4137 Western European Politics (3-0)3
ADM 4145 Turkish Foreign Policy I (3-0)3
ADM 4151 Theories of Democracy (3-0)3
ADM 4159 Political Parties (3-0)3
ADM 4147 Media and Opinion (3-0)3
ADM 4155 Locating Europe in a Globalised World (3-0)3
ADM 4213 Policy Implementation & Evaluation (3-0)3
ADM 4150 Modernity and the Idea of Freedom (3-0)3
ADM 4185 European Identity and Turkish Westernization (3-0)3
ADM 4177 E-Government (3-03)3
ADM 4223 Local Government (3-0)3
ADM.4162 Democratization & Europeanization (3-0)3
ADM 4287 Regional Policy and Governance (3-0)3
BA 1401 Financial Accounting (3-0)3
ADM 3102 Comparative Political Analyis (3-0)3
ADM 3204 Public Policy (3-0)3
ADM 4117 Political Economy of the South (3-0)3
ADM 4114 Contemporary Political Theory (3-0)3
ADM 4146 Adm. of Turkish Foreign Policy (3-0)3
ADM 4180 Urban Politics (3-0)3
ADM 4182 Current Issues in Central Asian Politics (3-0)3
ADM 4189 Theories of Fascism (3-0)3

ADM 4202 Reform in Turkish Public Administration (3-0)3
ADM 4192 Globalization and Nation State (3-0)3
ADM 4344 Labour Market Issues in Turkey (3-0)3
ADM 3136 Forms of Modernity (3-0)3
ADM 3430 Administrative Law II (3-0)3

DEPARTMENTAL ELECTIVES GROUP II
ADM.4236 Tax Law & Taxation System (3-0)3
ADM 4430 Competition Law (3-0)3
ADM.4471 Law of Obligations (3-0)3
ADM 4486 Law of Property (3-0)3

MINOR PROGRAMS: "STUDIES IN ADMINISTRATION" and "STUDIES IN POLITICS"

The Department of Political Science and Public Administration receives much demand from students of other departments who either wish to enroll in its M.S. program, but are not suitably qualified, or wish simply to take political science or public administration courses without following a full Bachelor's or Master's program. It is to meet this demand that the minors in "Studies in Administration" and "Studies in Politics" have been designed.

Requirements of the Minor
"Studies in Administration"
ADM 1225 Administration and Organization in Public Context (3-0)3
ADM 3204 Public Policy (3-0)3
ADM 3208 Organizational Theory (3-0)3
Three ADM electives approved by the Department

Requirements of the Minor "Studies in Politics"
ADM 1121 Introduction to Politics I (3-0)3
ADM 2121 History of Political Thought I(3-0)3
ADM 2132 Comparative Government (3-0)3
Three ADM electives approved by the Department

DESCRIPTION OF UNDERGRADUATE COURSES

ADM 1102 Introduction to Law (3-0)3
This is an introductory course offered by the Department for the students of Business Administration. The course aims to provide and overview of some of the basic concepts of law and Turkish legal system. It focuses on some major issues such as characteristics of law, functions of law and branches of law.

ADM 1121 Introduction to Politics I (3-0)3
This course provides the introductory conceptual framework for the study of politics. Definition of the basic concepts of authority, power, sovereignty, legitimacy, and ideology will be followed by the examination of major political ideologies; classical liberalism, conservatism, Marxism and fascism. This course also studies political regimes and systems, pressure groups, political parties, elections and voting behavior.

ADM 1122 Introduction to Politics II (3-0)3
Continuation of ADM.1121 It focuses on the analysis of the major 20th century ideologies, such as democratic socialism, new right, new labour, environmentalism, fundamentalism, feminism.

ADM 1323 Society and Culture (3-0)3
This is an introductory course exploring issues of culture, social institutions and social relations from a sociological viewpoint. It aims to familiarize non-sociology majors (particularly students specialising in political science, economics and international relations) with the fundamental concepts and terminology of sociological analysis. In this context, topics such as culture, socialisation, family, marriage and divorce, gender, ethnicity, stratification and mobility, mass-media, education, religion and urbanisation are covered with the aim of comprehending the "world in change" through a comparative and historical perspective. The course also tries to relate the personal to the social and is particularly sensitive to such pressing concerns of contemporary life as gender issues.

ADM 1324 History of civilizations 3-0)3
For most of human history, humans lived in small groups who hunted and gathered their food, but around 8,000 B.C., things changed. Humans developed agriculture, settled in urban communities and eventually built huge empires, created religious institutions and explored the planet. In many areas of life, civilization brought about striking improvements and innovations. On the other hand,

oppression, exploitation, and massive human suffering accompanied civilizations.

The goal of this course is to provide you with a foundation for understanding the world in which we live, keeping in mind humanity's accomplishments as well as failures. Learning about history is not just memorizing a sequence of events, or a bunch of facts and dates; the point is to critically examine continuity and change over time. The large scope of this course will encourage more synthesis of ideas and integration of knowledge than thorough information on particular topics.

ADM 1116 Social and Political History (3-0)3
This course is an introduction to the history of the western world. It examines the social and political scenery the Western civilizations from 16th century to present. While the course follows a conventional periodic reading of the developments witnessed in the western world, it analyzes those developments within a thematic framework. The course aims to provide an insight to the near history of the western world as well as to develop an understanding of the key issues and concepts that make western culture the West today.

ADM 1225 Administration and Organization in Public Context (3-0)3
This is an introductory course in Public Administration which aims to introduce the student to the basic concepts of the field. First the concept of administration and organization with their relevant issues are discussed within a public context, and then they are related to Turkish Public Administration system. The course also aims to link theory and practice so as to provide a meaningful totality.

ADM 1326 Introduction to Statistics (3-0)3
The purpose of this course is to introduce students to the basic concepts and methods of statistics. Issues to be covered are data collection, measurement of central tendency and variability, probability and distribution, estimation, and simple regression and correlation.

ADM 2401 Principles of Law (3-0)3
This is an introductory course in which basic concepts of Turkish Law and the preliminary issues in Turkish Legal system are studied in order to provide an introduction to the legal concepts and institutions and to build a sound basis for the other courses dealing with legal studies. Some of the topics covered in this course are characteristics of law as compared to other rules of social conduct, functions of law, basic legal concepts and legal institutions, sources of Turkish Law, the court system in Turkey, capacity to act and to have rights and obligations and representation.

ADM 2402 Constitutional Law (3-0)3
This course surveys a conceptual and historical introduction to constitutional government and law. Within that framework, it also examines the constitutional movements of the Ottoman Empire and the early Republican period. In the final part of the course, the 1961 and 1982 Turkish Constitutions are analyzed with a comparative outlook.

ADM 2311 Foundations of Social Research I (3-0)3
The main objective of this course is to introduce the students to the basic concepts of social research and to provide them with an understanding of the relationship between theory, research and empirical evidence. Students will be introduced to a variety of research methods that are important to empirical political and administrative research such as survey research, observation, experimentation, content analysis and aggregate data analysis. The course also aims to provide the students with an understanding of the major approaches to the study of social, political and administrative phenomenon from a critical standpoint.

ADM 2121 History of Political Thought I (3-0)3
This two-semester course aims to give the students a broad perspective on the developments in the history of political philosophy. It starts with the pre-Socratic philosophers of nature and Socratic criticism of conventions through dialogue. Following the significant turn brought by the Platonic-Aristotelian tradition, the course examines Hellenistic worldviews and medieval outlook to political affairs. Some of the themes that are surveyed in this course are early philosophical reflection on nature and human essence, time and matter, theory of forms, questions of justice, equality and freedom, practices concerning the self and the good life, and, the rising or declining significance attributed to political participation.

ADM 2122 History of Political Thought II (3-0)3
This course is the continuation of ADM 2121 History of Political Thought I. It focuses on the major works of the political thinkers of Renaissance and modern eras. It analyses Renaissance Humanism, strategic approach to political action, scientific and intellectual revolution of the 17th Century, the birth of liberalism, the rise of democratic theory, modernity and politics, the conception of historicity and the philosophy of life.

ADM 2132 Comparative Government (3-0)3
This course provides a conceptual introduction to the field of Comparative Government. After briefly analyzing the legislative, executive and judiciary branches of government, it studies the governments of the United States, the United Kingdom, France, and the Russian Federation.

ADM 2436 Introduction to Law for Economists (3-0)3
This is an introductory course offered to the students of the Department of Economics. In this course, basic concepts of law and preliminary matters are studied. Following the general legal concepts and institutions of law, an overview of the Turkish Legal System and interaction of law and economics are covered. The course also deals with interrelated areas such as economic and social rights recognized in international legal documents and competition law.

ADM 2437 Introduction to Law for IR (3-0)3
Introduction to legal concepts, social environment and legal institutions by analyzing, evolution of legal systems, and societies, formation of modern legal society; actual effects and impact of legal issues; encounters of
20% 30% 25% 15%individuals with legal conflicts; fundamental rights; Sources of laws; charters, constitutions, statutes, customs and usages, governmental regulations by laws; rights, obligations and privileges of individuals; the violations of individual rights by government; abuse of governmental powers, checks and balances of government, forms of government; separation of church and state; separation of powers, Executive, Legislative and Judiciary powers, public and private laws, international treaties; legal entities, law of European Union.

ADM 2242 Turkish Administrative System (3-0)3
This course offers a critical evaluation of the present Turkish administrative system. The main emphasis is on the structuring and functioning of central and local administrations. The course also deals with branches of government, sub-governmental organizations, problems encountered at different levels of government and the need for reforming Turkish Public Administration.

ADM 3101 Approaches to State-Society Relations (3-0)3
This course is a critical survey of the major theories and literature in comparative politics, the logic of cross-national inquiry, and the major concepts and approaches.

ADM 3102 Comparative Political Analysis (3-0)3
This course is a general analytical framework for the comparative study of societies which are going through different phases of economic and political development.

ADM 3103 Political Participation and Electoral Systems (3-0)3
This course aims to familiarize the students with basic issues of political participation. A basic distinction is made between conventional means of participation such as political parties, interest and pressure groups, elections and voting on the one hand, and unconventional means of participation such as terrorism, new social movements, post-modernity and cyber democracy on the other.

ADM 3136 Forms of Modernity (3-0)3
This course aims to introduce and discuss changing conceptions of modernity in social and political theory from the mid-19th / early 20th to the early 21st century. The mediating dynamic of change between the conceptions of “early” and “late” modernity is described through changes in the political-economic organization of capitalism. This can be summed up as the transformation of nationally organized capitalism towards a disorganized, global capitalism. In the “new” sociology of the late-modern societies it is argued that contemporary societies take new forms and undergo new experiences as they are exposed to global uncertainties and complexity arising from the decomposition of “organized capitalism.” This course is designed with the expectation that the students will have a comprehensive understanding of changing forms of modernity from its inception to its novel forms in contemporary times.

ADM 3204 Public Policy (3-0)3
The aim of this course is to introduce you to the literature on Public Policy and to help you to develop a refined approach to the working of the government. In other words, we are interested in the state at work. The course, first, justifies the need to study public policy and gives a broader overview of what the terms ´policy process´ and ´policy analysis´ stand for. In doing so, it also concentrates on existing theories of the policy process. Next, we will have a closer look at the policy-making and formation process. In particular, we will examine the question of who makes public policy, the patterns of participation to policy-making, as well as the role played by institutions in this process, as facilitators or obstacles. Finally, we will discuss the instruments of public policy adopted by the government during the policy process. Especially, ´regulation´ and ´fiscal instruments´ of public policy

will constitute the centre of our concern. You are expected to prepare three (very) short reflection papers and an end-of-the-term project that will investigate a concrete policy problem in Turkey.

ADM 3208 Organizational Theory (3-0)3
This course offers a critical evaluation of the main trends and developments in classical, neo-classical, modern and post-modern theories of organization. The course also intends to analyze the works of prominent theorists and general principles characterizing various schools of thought.

ADM 3429 Administrative Law I (3-0)3
This course extends to two semesters and it deals with legal issues concerning administration. The basic focus of the course is the nature, subject matter and general characteristics of the Turkish Administrative Law. The course also deals with administrative organization and power, and general fundamental principles of administrative law.

ADM 3430 Administrative Law II (3-0)3
This course is the continuation of ADM 3429 Administrative Law I. In this course the themes formerly introduced are to be elaborated with a practical intend.

ADM 3161 Turkish Politics and Political Structure I (3-0)3
This course is designed for providing the students with a general scheme of Turkish politics between 1923-1960 by looking at both continuities and discontinuities with the Ottoman past. It also analyses several other basic themes such as modernization nationalism the construction of nation state secularism, military and politics and democracy.

ADM.3205 Bureaucracy & Turkish Bureaucracy (3-0)3

ADM 3160 - Political Sociology (3-0)3

ADM 3162 Turkish Politics and Political Structure II (3-0)3
This course follows ADM 3429 chronologically, and tells the political, social and economic history of contemporary Turkey from 1946 onwards. The DP era, the coups detat of 1960, 1971 and 1980 are all analyzed as part and parcel of a process which can best be described as economic development and re-structuring of the Turkish economy and society.

ADM 4111 Euorpean Political Thought (3-0)3
This course is an attempt to explore the main currents of 19th and 20th century political thought in Europe or on Europe. We will particularly focus on how critical thinking has developed and led to diverse conceptions of European modernity in the eyes of various thinkers of these two centuries. The main concern of the course is to investigate the responses given to the "promise of Enlightenment."

ADM 4138 Theories & Practice of Nationalism (3-0)3

ADM 4213 Policy Implementation and Evaluation (3-0)3
This course examines how public policy is created, implemented, evaluated and held accountable in the current social, economic and political environment. The course is designed to both promote an understanding of the theories and approaches to policy analysis and help the student to acquire a working knowledge of the skills involved in the practice of policy analysis in the area of public administration.

ADM 4223 Local Government (3-0)3
The objective of this course is to study the philosophy of decentralization and the concept of local administration. Role division between local and central authorities, local government structure models, and international charters will be covered. Special emphasis will be given to the Turkish case, comprising development history, administrative structure, current problems, several proposals for solution hitherto offered, and possible improvements.

ADM 4114 Contemporary Political Theory (3-0)3
This course is aimed to introduce the students to the works of major political thinkers of the 20th Century with the central focus on the problems of domination and inequality. It begins with the four major thinkers of the previous century who have influenced heavily the 20th Century political philosophy: Kant, Hegel, Nietzsche and Marx. It then examines, Arendt, Althusser, Foucault, Habermas, Rawls and Moufee with the aim of reaching certain generalizations and comparisons.

ADM.4177 E-Government (3-03)3
This course reviews the use of information technology in public administration, particularly the Internet, and its implications for public administration in general, public organizations, and the citizens. The course is meant to provide a historical, technical and practical framework for students of public administration to better understand the opportunities, challenges, and limitations associated with e-government and the use of technology in public administration. We will

particularly focus on the concept and applications of e-government and will cover related administrative, organizational, technological and major policy issues in this context, including a discussion of e-government in Turkey. In addition, the course will provide an overview of governmental web design and creation, and case study examples of different e-government applications around the world. Classes will be held in lecture and discussion format.

ADM 4117 Political Economy of the South (3-0)3

After a brief introduction to the different methodological approaches in the field of international political economy so as to highlight the alternative conceptualizations of the state-market relationships, this course will undertake a comparative analysis of alternative strategies of capilalist development and/or modes of integration into the world economy with special reference to Latin America, South and East Asia.

ADM 4220 Public Finance (3-0)3

The purpose of this course is to introduce the students to controversial issues of spending, taxing, financing and financial control activities of governments which affect resource allocation and income distribution in any economy. In addition, some issues concerning the public finance reform initiatives in modern economies are also discussed with a special reference to Turkey.

ADM 4430 Competition Law (3-0)3

The course intends to overview the basic concepts of competition law such as agreements, decisions and concerted practices of undertakings, monopolies and abuse of dominant power in the market, control of mergers and acquisitions which may affect competition. It covers a comparative introduction of Turkish, European Union and United States competition laws. Throughout the course the legislation and jurisprudence of the European competition law is also analyzed, since the competition law in Turkey is to a great extent in compliance with the European law.

ADM 4344 Labor Market Issues in Turkey (3-0)3

The course aims to familiarize students with the issues of neo-liberal transformation and changing understanding of labour market in Turkey throughout the 2000s, especially exacerbated with the heavy conditionality from international organisations such as the European Union, World Bank and International Monetary Fund. In this context, policy areas to be analyzed include labour market, labour relations and labour law, gender equality, social security, employment, informal labour market and child labour. For each issue, the course will lead to systematic exploration of the actual policy problems and situation in Turkey, the basic institutional and legal framework, as well as the policies made and implemented in Turkey, from a critical perspective.

ADM 4236 Tax Law and Turkish Tax System (3-0)3

The course addresses the principles of taxation and Turkish Tax System. It focuses on the sources of the Turkish tax legislation, procedures of taxation, tax laws and applications in Turkey and Turkish Tax Administration.

ADM 4137 Western European Politics (3-0)3

The aim of this course is to familiarize the students with the important issues in the political life of contemporary Western Europe. In this context, the course focuses on the structure and function of nation states, the development of their institutions, their autonomy in relation to specific social, economic and political forces, their international contradictions, tensions and dynamics of social change.

ADM 4145 Administration of Turkish Foreign Policy I (3-0)3

This course aims to analyze Turkey's ability to address new issues and challenges in the post-cold war period characterized by globalization, regional instabilities and integration and fragmentation in the foreign policy context. The main themes to be focused are decision-making process of Turkish foreign policy, international context of decision-making in the age of globalization, domestic context of decision-making, administration of foreign policy-search for security, administration of foreign policy and its normative, objective, domestic and bureaucratic politics of integration into European Union, administration of Turkey' foreign economic relations, administration of Turkish foreign policy issues related to Ottoman Legacy.

ADM 4146 Administration of Turkish Foreign Policy II (3-0)3

This course is the continuation of ADM.495 Administration of Turkish Foreign Policy I

ADM 4147 Media and Opinion (3-0)3

The aim of the course is to understand the ambiguity concerning the role of press and broadcasting in politics. It analyses the nature and role of public opinion, the dynamics of the public opinion process, analysis of the numerous factors which shape or influence opinion, an evaluation of

the mass media of communication (their role as molders and reflectors of public opinion and as instruments of propaganda, their structure of control, their performance), public opinion measurement, the competence of public opinion, the nature of propaganda, and consideration of several important types of propaganda (political propaganda, public relations, and advertising).

ADM 4150 Modernity and the Idea of Freedom (3-0)3

This course is a senior seminar in political theory. The purpose of this course is to explore one of the key questions of the modern age: the question of freedom. The Centrality of the notion of freedom and its definitive role in the political arena is undisputable. Nonetheless freedom appears a specifically modern question. From the 17th century onward thinkers, who formed the grand narrative of Western European political thought, have dealt with the question of how to define political freedom: Is it the freedom of the individual (Hobbes) or the freedom in harmony with the general will (Rousseau)? Does the concept of freedom change from one culture to another (Tocqueville) or should it defined by the universal assumptions of political liberalism (Mill)? Can human mind conceive freedom a priori (Kant) or does freedom reveal itself in human history (Hegel)? Is political freedom tantamount to human emancipation (Marx) or should one consider different/unconventional paths to pursue political freedom (Derrida)? The exploration of such dynamic and differing approaches to the question of freedom through the reading of political theory texts, is one of the primary aims of this course.

ADM 4151 Theory of Democracy (3-0)3

In this course the concept of democracy is studied from its genesis to our day. The analysis includes different theories and aims to provide the student the ability of critically comprehending and evaluating the practice(s) of democracy in the contemporary world.

ADM 4159 Political Parties (3-0)3

This course is composed of two main sections. In the first section, the role of political parties is discussed in relation to the political system and social structure. In this section main issues of interest are social class, interest articulation, election systems, parliamentary democracy, one party states, and the relations of social groups with the state. In the second section, political party as an institution is studied. The subject matters of this section are party organization, leadership, membership, fractions, inter party democracy, and the relationships of party structure and ideology are.

ADM 4471 Law of Obligations (3-0)3

This course is an evaluation of sources of obligations such as contracts, torts and unjust enrichment. It studies contractual obligations with regard to their effects, performance and termination as well as some cases to clarify the discussed topics.

ADM 4164 Ideological Courses in Turkey (3-0)3

This course maps the ideological discourses in modern Turkey with special emphasis on their representations of capitalist modernity, state, and the "people". It will mainly provide a discourse analysis on the political and cultural writings of a number of major intellectual figures from different ideological perspectives. Tracing the intellectual legacy of the late Ottoman Empire, the lectures will focus on the historical trajectories and modalities of ideological discourses including Kemalism, nationalism, socialism, conservatism, Islamism, and liberalism. The intertextual relations between those discourses and their role in the constellation of social and political forces will also be examined.

ADM 4180 Urban Politics (3-0)3

This course first introduces urban politics, and then discusses community power structure in the Turkish urban context. Next, issues like decision-making at local level, the pertaining legal framework, the main actors involved in the process, the formal and informal mechanisms and structures, political decentralization, social clusters and groups, the interaction between parochial and urban politics, urban social movements and their motives, obstacles to urban integration. The course finally discusses central responses to the dynamics of urban politics.

ADM 4182 Current Issues in Central Asian Politics (3-0)3

This course aims to provide a basic understanding of five Central Asian republics of Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan and Turkmenistan. These countries are analyzed both on an individual basis and from a historical perspective with specific emphasis on some of their common features. In the final part of the course, these republics are examined within a regional and global perspective.

ADM 4189 Theories of Fascism (3-0)3

The objective of this course is to give an overview of the actual theories of fascism. With a specific discussion of the twenties and thirties, the course also deals with certain attempts to analyze this phenomenon scientifically in order to develop effective antifascist strategies in this period especially in Italy and Germany.

ADM 4192 Globalization and Nation-States (3-0)3

This course focuses on the changing role of the government with a specific reference to Turkey. In the new phase of world capitalism, that is globalization, it analyses the increasing role of transnational actors in the international environment, the role of nation-states and their impact on economic, social, political and cultural lives of societies.

ADM 4287 Regional Policy and Governance (3-0)3

The aim of this course is to introduce you to the literature and on regional policy and governance to equip you with analytical tools necessary to understand the changing spatiality of public policies and administration in Turkey. Throughout the course, the international examples, and especially the case of the European Union countries will be discussed. The objective of these discussions is to help you grasp the dynamics that (will) influence and shape the path of the public administration system and the policy process in Turkey on the way to integration with the EU. The course will finally cover the recent developments in Turkey in light of these discussions.

ADM 4213 Policy Implementation and Evaluation (3-0)3

This course examines how public policy is created, implemented, evaluated and held accountable in the current social, economic, and political environment. The course is designed to both promote an understanding of the theories and approaches to policy analysis and help the student to acquire a working knowledge of the skills involved in the practice of policy analysis in the area of public administration.

premise of popular cultural studies. Special attention will be paid to the interplay of ideology, culture, and power, the transformations of the field of cultural practices, and the contestatory character of popular cultural forms. Among the themes to be explored are the elite/mass or high/popular culture binaryism, the dichotomies of resistance versus domination and opposition versus ideological incorporation, the so-called postmodern collapse of cultural hierarchies, the pragmatics of diversionary practices in everyday life, and the politics of cultural transgression.

ADM 4135 Migration (3-0)3

The aim of this course is to describe and analyze immigration policy as practiced in Germany today, found its basis in the fifties and sixties, especially along two sectors: On the one hand in the areas of politics and law. Rules about migration, residency and work permits were passed at a very early date,
long before the employment of foreign workers on a large scale was ever even considered. On the other hand in the area of economics, e.g. the actual opening of the Western German labor market to foreign workers. These two decades also illustrate a certain amount of continuity about the treatment of foreigners. This continues today along the administrative as well as the political level. As an example, one might mention at this point the regulations concerning residency permits, characterized by vagueness and complete flexibility when being interpretated and executed by German foreign authorities.

ADM 4185 European Identity and Turkish Westernization (3-0)3

The issues of European culture and identity gained a certain prominence in the contemporary stage of the process of European integration. This course, firstly, aims to introduce the prevailing initiatives and images of European identity within Western Europe. Secondly, the emerging patterns of politico-cultural differentiation within the European geography are going to be evaluated in relation to the ongoing relations between EU and Central, Eastern and Southeastern Europe. Lastly, the repercussions of these tendencies for the Turkish experience of modernization will be discussed.

GRADUATE PROGRAMS AT THE DEPARTMENT OF POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

M.S. PROGRAM IN POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

Required Courses

ADM	5500	Prothesis Seminar	NC
ADM	5599	Master's Thesis	NC
ADM	800-899	Special Studies	NC

Elective Courses

First Semester

ADM	5115	Politics of Urban Space	(3-0)3
ADM	5137	Classical Political Thought	(3-0)3
ADM	5142	Comparative Ethnicity	(3-0)3
ADM	5151	Politics of Social Policy	(3-0)3
ADM	5196	Cultural Politics	(3-0)3
ADM	5143	Human Rights and Political Power	(3-0)3
ADM	5224	Epistemology and Methodology in Soc. and Pol. Context	(3-0)3
ADM	5258	Advances in Organisational Theory	(3-0)3
ADM	5159	Politics of Society in Latin America	(3-0)3

Other approved electives

Second Semester

ADM	5104	State and Society in Europe	(3-0)3
ADM	5117	Issues in Turkish Cultural History	(3-0)3
ADM	5134	Media and Society	(3-0)3
ADM	5238	Theory of Public Administration	(3-0)3
ADM	5139	Authority, Power and Social Structure	(3-0)3
ADM	5144	Contemporary Theories of Political Science	(3-0)3
ADM	5154	Theories of the State	(3-0)3
ADM	5156	Critical Approaches in Political Theory	(3-0)3
ADM	5166	Turkish Politics	(3-0)3
ADM	5168	Modern Discourses on the Political	(3-0)3
ADM	5170	Political Economy of Communication	(3-0)3
ADM	5176	Comparative Perspectives to Ottoman & European History	(3-0)3
ADM.	5184	Ideas and Politics	(3-0)3

Other approved electives

Ph.D. PROGRAM IN POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

Required Courses

ADM	6699	Ph.D. Dissertation	NC
ADM	8001-8099	Special Studies	NC

Elective Courses

ADM	6110	Turkish Politics and Political Participation	(3-0)3
ADM	6114	Ideology and Culture	(3-0)3
ADM	6116	Reading Hannah Arendt	(3-0)3
ADM	6120	Ethics & Politics: Reading Aristotle, Kant and Hegel	(3-0)3
ADM	6126	Topics in Turkish Politics	(3-0)3
ADM	6230	Issues in Public Personnel Administration	(3-0)3
ADM	6136	Political Sociology	(3-0)3
ADM	6246	Current Issues in Public, Administration Theory	(3-0)3
ADM	6248	Technology and Organizations	(3-0)3
ADM	6150	Advanced Study in Political Theory	(3-0)3
ADM	6158	Politics & Social Movmeents	(3-0)3
ADM	6160	Eighteenth-Century Political Thought	(3-0)3

ADM 6165 Political Economy of Urban Space (3-0)3
ADM 6366 Advanced Studies in Comparative Government (3-0)3
ADM 6267 Ethics and Public Administration (3-0)3
ADM 6168 Theories of Nationalism and The Turkish Experience (3-0)3
ADM 6169 Contemporary Issues in Law Justice and Right (3-0)3
ADM 6171 Post Modernism and Radical Democracy (3-0)3
ADM 6173 Readings in Central Asian Perspectives (3-0)3
ADM 6178 Reading in Comparative Politics an Overview (3-0)3
ADM 6183 Ideology and Political Behaviour (3-0)3
ADM 6291 Advanced Policy Analysis (3-0)3
ADM 6293 Comparative Public Administration (3-0)3
ADM 6194 Law and Transgression (3-0)3
ADM 6297 Culture and Organizations (3-0)3

DESCRIPTION OF GRADUATE COURSES

ADM 5500 Prothesis-Seminar NC
This course is designed to provide fundamental methodological issues in social sciences, and more importantly, it aims the master students to carry research oriented towards their M.S. thesis and write down, present and submit their proposals. Students have to submit their proposals at the end of the course, and the successful completion of an acceptable thesis proposal is the most important requirement of the course.

ADM 5104 State and Society in Europe (3-0)3
This course is intended to familiarize the students with the major models of state-economy and state-capital-labour relations in the advanced capitalist systems of Europe, with a specific emphasis on "Anglo-Saxon", "organized market economy" and "state-centered" models. With this framework, the course also analyzes the key institutional structures of industrial relations, corporate governance and their relation to the welfare state, and the changes produced by globalization and European integration.

ADM 5108 Public Participation of Turkish Labor Migrants in Western Europe (3-0)3
The course basically deals with the organizational activities of Turkish migrants since the beginning of the 1960s. It further focuses on the controversy over the right of election for foreigners and the debate about consultatory participation forms on community level. Finally the course discusses the effect, (if any) of participation of Turkish Migrants on the process of "Europe building".

ADM 5117 Turkish Cultural History (3-0)3
The course aims to map the field of popular cultural practices in Turkey. Tracing the historical formation and transformation of Turkish popular culture, it examines the interplay of culture, power and subalternity. Particular emphasis is put on the distinction and relation between the official-high culture and the folk-popular culture, the formation of cultural distinctions and hierarchies, popular representations of the state, subalternity vis-à-vis power, and the questions of legitimacy and cultural hegemony.

ADM 5134 Media and Society (3-0)3
The course aims to examine the traditional structures of media systems challenged by the arrival of cable, satellite broadcasting and the other types of electronic media. Following a review of the historical development of the media systems and the normative theories in relation to the social and political systems, major issues and themes prevailing in different countries are considered.

ADM 5137 Classical Political Thought (3-0)3
This course involves the study of the major political ideas representing the most influential currents of thought. It confines itself to solely political theory and philosophical systems with special emphasis on the foundations of contemporary political thinking.

ADM 5238 Theory of Public Administration (3-0)3
This course is oriented towards a review of different schools and/or theorists of public administration theory from its genesis to contemporary ones. Special emphasis is given to methodology problem in this area.

ADM 5139 Authority, Power and Social Structure (3-0)3
This course discusses the concepts of political sociology in the light of recent literature and critically analyzes their theoretical/empirical significance. Some of the topics of concern are the role of individual in society and politics, alienation

in industrial society, middle class politics and its relevance to present day political systems, theories of mass society, the role of ideology in shaping the society and politics, the nature of power in industrial society, and corporatism and neo-corporatism.

ADM 5142 Comparative Ethnicity (3-0)3
This course examines the resurgence and persistence of ethnic conflicts and ethnic phenomena in the world by comparing and constrasting certain representative cases. Firstly, a general discussion on the concept of ethnicity is made by focusing upon certain identity factors such as race, gender, class, tribe, language, nationality and religion. Secondly, theories and concepts utilised in the study of ethnic conflict and ethnic political behaviour are analyzed.

ADM 5144 Contemporary Theories of Political Science (3-0)3
This course primarily focuses on modern theoretical debates within the confines of political science. Its main topics are structuralism, functionalism, systems approach, theories of underdevelopment, modernization theory, and the modern debates on the state.

ADM 5151 Politics of Social Policy (3-0)3
This course is designed to provide graduate students of political science with a solid understanding of historical and theoretical perspectives on the evolution and practice of social policy. For the purposes of the course, social policy is defined as regulatory and direct forms of public intervention to effect societal welfare. The course aims to familiarize students with the underlying causes, dynamics, changing forms and political economic outcomes of social policy.

ADM 5154 Theories of the State (3-0)3
This course focuses on the analysis of various historical forms of the state based on the views of different schools of thought. Also, a considerable part of the course dwells upon the modern debates on the controversial aspects and functions of the same phenomenon.

ADM 5166 Turkish Politics (3-0)3
This course aims to provide an analysis of the fundamental aspects of Turkish Politics and political parties within the Turkish political system. The course is composed of three parts. The first part deals with the factors affecting political structure in Turkey such as ideology, religion, culture, economy, development and consolidation of democracy. The second part deals with the political parties. The third part is about the analysis of various criteria of the voting behaviour such as ethnicity class and gender.

ADM 5170 Political Economy of Communication (3-0)3
Political economy is a major perspective in understanding the media of modern capitalism, which extensively operate as 'cultural industries'. The structure and operational logic of these organizations exhibit both similarities with and differences from other industries. Their common features with other areas of commodity production signify the fact that cultural industries are increasingly integrated into the general industrial structure and they explicitly operate within the field of economics. However, it is also obvious that the commodities they produce are extensively divorced from the commodity form produced in classical sectors of manufacturing industries. In other words, the commodities produced by cultural industries appear as symbols, which can be evaluated as one of the primary means in organizing the images and discourses through which people signify their own or others´ life. Through introducing the main perspectives in the political economy of communication and conveying how political economies approached to particular problem areas within the field, the ultimate objective of this course is to present a critical analytical framework of understanding the relation between symbolic and economic dimensions of cultural commodity production within contemporary capitalism.

ADM 5172 Gender in Politics and Political Participation (3-0)3
This course begins by the discussion of the distinction between private and public in politics and the implication of this distinction on citizenship, equality and democracy. The course also focuses on the factors that determine the gender differentials in political participation, both as a voter and as an activist. In the second section of the course, there is a special emphasis on the Turkish experience.

ADM 5196 Cultural Politics (3-0)3
The course is designed to provide students with analytical tools to conceptualise the field of popular cultural practices. It represents a critical review of contemporary theoretical positions on popular culture, particularly the ones developed by the Frankfurt School, neo-Gramscian Marxism and Birmingham School, Bakhtin, de Certeau, and Bourdieu. A brief introduction to the theory of ideology, with which most students are likely to be unfamiliar, will be made as it constitutes the basic analytical premise of popular culture studies. Special attention will be paid to the interplay of ideology, culture and power, the transformations of

the field of cultural practices, and the contestatory character of popular cultural forms. Among the themes to be explored are the elite/mass or high/popular culture binaryism, the dichotomies of resistance versus domination and opposition versus ideological incorporation, the so-called postmodern collapse of cultural hierarchies, the pragmatics of diversionary practices in everyday life, and the politics of cultural transgression. Within this context, various popular cultural forms, texts and narratives (e.g. popular music, sports, and folktales) will be referred to as well.

ADM 598 Term Project NC

ADM 5184 Ideas and Politics (3-0)3
This course aims to follow the philosophical and theoretical attempts that suggested or have been interpreted as to provide an ontological status to politics. In these attempts the problematic of the "dialectical" relationship between "structure" and "agency" have been postulated in various ways while the ideational, discursive and reflective capabilities of "the subjects" have been attributed a constitutive role regarding the construction of "reality". The recent constructivist "turn" especially in the fields of comparative politics and international politics has reflected the operationalisation of these perspectives in the social sciences with a growing body of empirical works. Throughout the classes a critical engagement with "political ontology" and political studies that take "the ideas" as their basis will be promoted.

ADM 6110 Turkish Politics and Political Participation (3-0)3
The main purpose of this course is to analyse various factors that constitute Turkish politics, and the political parties within the Turkish political system. The course has three parts: first, Turkish political system with respect to factors affecting the political structure in Turkey, such as ideology, religion, culture, economy, development and consolidation of democracy. Second, the political parties within the Turkish political system are examined. Finally, the analysis of voting behaviour in terms of various criteria such as ethnicity, class, gender are discussed.

ADM 6114 Ideology and Culture (3-0)3
This is an advanced course dealing with the key issues and debates over the relationship between ideas and social practices with an attempt to clarify the affinities binding disparate theorists who seek to comprehend the shape and prospects of modern social formations.

ADM 6116 Reading Hannah Arendt (3-0)3
This course is a detailed reading of the major works of Hannah Arendt. It analyzes the influence of Arendt on the debate between liberals and communitarians, critical theory, theories of social action and public sphere, citizenship, social movements and the crisis of modernity.

ADM 6120 Ethics and Politics: Reading Aristoteles, Kant and Hegel (3-0)3
This course will be devoted to a slow reading of one central book by Aristoteles, Kant and Hegel by evaluating their relevance for major problematics of contemporary political thought. In the course the realms of moral choice and ethnical judgement on the one hand, and political decision-making and the parameters of order-maintenance, on the other are analyzed. The course also focuses on various intellectual attempts of overcoming this split by heavy use of the works of these philosophers.

ADM 6126 Topics in Turkish Politics (3-0)3
"This is an advanced course to be organized as a comprehensive workshop in each semester to explore a certain period and/or a particular topic in Turkish politics."

ADM 6136 Political Sociology (3-0)3
This course is designed to encompass a detailed overall view of the field of political sociology. To this aim fundamental issues and areas of political sociology as well as the contributions of some of the path-breakers of the discipline will be discussed with reference to both their original works and interpretative material. In this context, Marx and Weber's work and state, economy and politics; Durkheim and de-Tocqueville's contribution on civil society and politics as well as their respective neo-versions will be reviewed. In the second part of the course basic forms of political rule (democratic, totalitarian and authoritarian regimes) and political participation, political parties and partisanship and political culture will be taken up with specific reference to contemporary world and Turkish cases.

ADM 6246 Current Issues in Public Administration Theory (3-0)3
In this course, in each semester different issues on the theory of public administration is selected and elaborated in detail. Topics range from "locus" to "focus" of public administration theory.

ADM 6248 Technology and Organizations (3-0)3
The aim of the course is to provide the students an elaborate study on the issues that advancements in technology bring to organizational life.

ADM 6150 Advanced Study in Political Theory (3-0)3
The aim of this course is to analyze the large and comprehensive field of political theory. It discusses and analyzes a selected field of interest within one or more theoretical approaches in political science, depending on the selected field of interest of the student.

ADM 6160 Eighteenth-century Political Thought (3-0)3
This course is about the mainstream debates, topics and thinkers of eighteenth-century western political thought.

ADM 6165 Political Economy of Urban Space (3-0)3
In this course the students are introduced to the main debates about geography and space and the ways in which space takes part in the constitution of political and economic processes and vice-versa. In the course main schools of thought in the field such as the Chicago School, Weberian and Marxist approaches are also analyzed.

ADM 6366 Advanced Studies in Comparative Government (3-0)3
This course basically aims to provide the student the necessary analytical tools in the field of comparative government. In the first section of the course, the students analyze the three main branches of state; the legislature, the executive, and the judiciary in a general and comparative perspective. In the second section, countries chosen by the students according to their own preference and/or areas of interest are analyzed in order to contribute to the term projects to be prepared by each student.

ADM 6267 Ethics and Public Administration (3-0)3
This is a course in which ethical issues in public administration theory and practice are elaborated. Emphasis is on both the philosophical grounds and the 'ethical code' for public administrators.

ADM 6169 Contemporary Issues in Law Justice and Right (3-0)3
This is a course on the twentieth century critical thought. It may include specific debates and/or advanced research on Frankfurt school, post-structuralism, post-modernism and a variety of topics on the twentieth century Marxist thought.

ADM 6171 Postmodernism and Radical Democracy (3-0)3
This course is a critical evaluation of the theory and practice of radical democracy. The main focus will be on identity politics, new social movements and new forms of participation in contemporary societies.

ADM 6173 Readings on Central Asian Perspectives (3-0)3
This course is to be offered to those students who have an interest in the newly emerged Central Asian republics of Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzistan and Turkmenistan. It aims to provide an in-dept analysis on an advanced level about the history of the area, and the socio-economic, political, cultural and religion factors shaping these countries.

ADM 6275 Bureaucracy, Politics and Public Policy (3-0)3
This course is designed to analyze public policy by giving special emphasis to the role played by public bureaucracy and the intricate interrelations between the policy making and other relevant actors. It provides an in-dept examination of social, economic, administrative and political environment in which the state operates. Particular emphasis is on the significance attributed to public bureaucracy in the complex and dynamic contextual framework of public policy.

ADM 6183 Ideology and Political Behaviour (3-0)3
This course aims to clarify how ideologies are used in politics with respect to different approaches to political behaviour. Its focus is how and why individuals develop certain ideologies and how these ideologies are reflected on their political behaviour. Main political and sociological approaches to ideology and political behaviour are also examined. The course also includes discussions on such concepts as modernity, post-modernity, and globalism.

ADM 6291 Advanced Policy Analysis (3-0)3
In this course advanced topics in policy-making process are studied.

ADM 6194 Law and Transgression (3-0)3
This course deals with the so-called dialectic of law and transgression that has been conceptualized in many different and offen contradictory ways. It refers to the theoretical frameworks developed by Bataille, Zizek, Foucault, Stallybross and White, Kristeva, Derrida etc., with a specific attention to certain notions such as "law-making and law-preserving violence", "inherent transgression", "carnivalesque economics of transgression" and "transgression as the disavowed foundation of law".

ADM 6249 Advanced Issues in Public Policy (3-0)3

This course deals with select policy areas, and analyzes each in the light of the theoretical framework built in the course 675. It further specifies processes involved in the policy Analysis and Evaluation of Policy Performance. The policy areas are selected from different socio-economic, political and administrative domains, focusing at the end on some specific Turkish Cases.

ADM 6297 Culture and Organizations (3-0)3

This course analyzes organizational culture as one of the major issues for the organizational analysis. In this course the notion of culture is taken both as an organizational variable from the perspective of the administrators and a constituent of societal life from the 'organizational sociology' perspective.

ADM 6399 Ph.D. Dissertation NC

ADM 800-899 Special Studies (4-2)NC

In these special studies, students are required to register into the special code of their thesis supervisors. In these studies, there is no course work, but regular meetings of the thesis student with his/her supervision are held.

FACULTY OF EDUCATION

Dean: SEFEROĞLU, Gölge; Prof. Dr.;
B.A., Boğaziçi University; M.A., M.Ed. Columbia University; Ed. D., Columbia University.
Associate Dean: ÇAKIROĞLU, Erdinç; Assoc. Prof. Dr.;
B.S., M.S., METU; Ph.D., Indiana University.
Associate Dean: HASER, Çiğdem; Assist. Prof. Dr.;
B.S., M.S., METU; Ph.D., Michigan State University.

GENERAL STATEMENT AND PROGRAMS OF STUDY

Founded in 1982, the Faculty of Education is METU's youngest faculty. The Faculty provides exemplary leadership in achieving excellence in education at all levels in meeting the educational challenges of a new millennium. High levels of scholarly activities, teaching and public service are equally encouraged and expected. The Faculty functions as an integral part of the University in its systematic inquiry concerning educational improvement.

The Faculty of Education has the following six departments:

- Department of Computer Education and Instructional Technology
- Department of Educational Sciences
- Department of Elementary Education
- Department of Foreign Language Education
- Department of Physical Education and Sports
- Department of Secondary Science and Mathematics Education

The primary mission of the Faculty of Education is to educate qualified teachers for elementary, secondary, and higher education in various disciplines. Students are provided with both sound theoretical foundations and practical skills which are demanded by the teaching profession.

In addition to the undergraduate programs, the Faculty also offers several masters and doctoral degree programs in collaboration with the Graduate Schools of Natural and Applied Sciences and Social Sciences.

The Faculty is also involved in research and consultancy activities in various aspects of education. The Ministry of National Education and several private schools are in close contact with staff members conducting research.

DEPARTMENT OF COMPUTER EDUCATION AND INSTRUCTIONAL TECHNOLOGY

PROFESSORS

ÇAĞILTAY, Kürşat, B.S., M.S., METU; Ph.D., Indiana University.
YILDIRIM, Soner ***(Department Chair):*** B.A., Hacettepe University; M.A., Michigan State University; Ph.D., University of Southern California.
YILDIRIM, Zahide: B.A., Ankara University; M.S., New York Institute of Technology; Ph.D., METU.

ASSOCIATE PROFESSOR

DELİALİOĞLU, Ömer: B.S., M.S., Ph.D., METU.

ASSISTANT PROFESSORS

AŞKUN, S. Cengiz: B.S., M.S., METU; Ph.D., Indiana University.
CAN, Gülfidan: B.S., M.S., METU; Ph.D., Utah State University.
TOKEL, S. Tuğba (Assistant Chair): B.S., M.S., METU; Ph.D., Texas A&M University.

INSTRUCTORS

AKILLI, KAPLAN Göknur (Assistant Chair): B.S., Hacettepe University; M.S., METU; Ph.D., Penn State University.
GÜNDOĞAN (SEZGİN), M. Banu: B.ID., METU, M.S., PhD., Anadolu University.
GÜRBÜZ, Tarkan: B.S., M.S., Ph.D., METU; MBA, MIB School of Management.
KARAASLAN, Hasan : B.S., M.S., Ph.D., METU.

GENERAL INFORMATION: Department of Computer Education and Instructional Technology (CEIT) offers three different programs for B.S., M.S. and Ph.D. degrees in computer education and instructional technology. The primary mission of the department is to prepare outstanding Information and Computer Technology (ICT) teachers to be employed both in public and private schools under the Ministry of National Education to provide technology education and to facilitate technology integration.

UNDERGRADUATE PROGRAM: The main aim of the undergraduate program is to provide prospective teachers with the necessary and sufficient training, knowledge and skills to enable them to guide and raise 21st century individuals. The graduates of the program receive a B.S. degree in CEIT along with a teaching certificate, which qualifies them to teach in primary and secondary schools.

GRADUATE PROGRAMS: With its graduate and doctorate programs, the Department aims to prepare educators, scholars, and researchers and to advance the profession of Instructional Design by combining the science and art of teaching and learning, the repertoire of research methods rooted in various paradigms, effective uses of technology and the analysis, design, development, implementation and evaluation of instructional practices.

PHYSICAL FACILITIES: Department possesses three classrooms for theoretical lectures and three computer laboratories for practical applications of the offered courses. One of these three classrooms is designed as a smart classroom that contains appropriate technologies for conference calls. All three classrooms have one instructor computer with Internet access, one projector, and one smart board. All three laboratories have about 20 user computers, along with one instructor computer and projector. One of the laboratories is reserved for undergraduate students' collaborative coursework.
Apart from these facilities, there is also one research lab enhanced with cutting edge technologies providing support for multiple research projects conducted in the department.

CAREER OPPORTUNITIES: Graduates of the programs offered in the department can choose among various career alternatives. Both public and private schools employ the graduates with the B.S. degrees

right after their graduation. The department also has a wide range of B.S., M.S., and PhD. graduates who became pioneer academicians, curriculum consultants, test and evaluation specialists, training experts, supervisors, entrepreneurs, etc., in various business branches and corporations.

MAJOR GRADUATE LEVEL RESEARCH ACTIVITIES

Computer-Based Instruction
Distance Education
Educational Uses of Games and Simulations
Instructional Design and Implementation
Instructional Material Development
Instructional Material Evaluation
Instructional Technology
Mobile Learning and Applications
Multimedia and Interactive Video Systems
Pre-Service and In Service Technology Literacy Training
Security and Ethical Issues related to IT in Education
Social Media in Education
Web 2.0 Tools and Educational Uses
Web Based Multimedia Applications

MAJOR PROJECTS UNDERTAKEN

Curriculum Development in Computer Education and Instructional Technology
Inservice-Training of Computer Teachers
Inservice-Training of Teachers from other Fields on Instructional Technology
Teaching-Learning Materials for Effective Technology Literacy Teaching

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

CEIT	111	Information Technology in Education II	(3-2)4
MATH	125	Basic Mathematics I	(3-2)4
ENG	101	English for Academic Purposes I	(4-0)4
EDS	200	Introduction to Education	(3-0)3
TURK	103	Written Expression	(2-0)2
HIST	2201	Principles of Kemal Atatürk I	NC

Second Semester

CEIT	112	Information Technology in Education II	(3-2)4
CEIT	133	Programming in Internet Environment	(3-2)4
MATH	126	Basic Mathematics II	(3-2)4
ENG	102	English for Academic Purposes II	(4-0)4
TURK	104	Oral Communication	(2-0)2
HIST	2202	Principles of Kemal Atatürk II	NC

SECOND YEAR

Third Semester

CEIT	210	Programming Languages I	(3-2)4
CEIT	207	Design and Use of Instructional Material	(2-2)3
CEIT	213	Computer Hardware	(2-2)3
EDS	220	Educational Psychology	(3-0)3
ENG	211	Academic Oral Presentations	(3-0)3
PHYS	181	Basic Physics I	(4-2)5

Fourth Semester

CEIT	211	Programming Languages II	(3-2)4
CEIT	216	Principles and Methods of Instruction	(3-0)3
CEIT	218	Graphics and Animation in Education	(2-2)3
CEIT	225	Instructional Design	(2-2)3
PHYS	182	Basic Physics II	(4-2)5
Elective I			(3-0)3

THIRD YEAR

Fifth Semester

CEIT	313	Use of Operating Systems	(2-2)3
CEIT	321	Foundations of Distance Education	(2-2)3
CEIT	341	Measurement and Evaluation	(3-0)3
CEIT	323	Multimedia Design and Development	(2-2)3
CEIT	380	Computer Education Teaching Methods I	(2-2)3
Elective II			(3-0)3

Sixth Semester

CEIT	314	Computer Networks and Communication	(2-2)3
CEIT	390	Database Management System	(2-2)3
CEIT	386	Community Work	(1-2)2
EDS	304	Classroom Management	(3-0)3
CEIT	382	Computer Education Teaching Methods II	(2-2)3
Elective-III			(3-0)3

FOURTH YEAR

Seventh Semester

CEIT	411	School Experience	(1-4)3
CEIT	419	Web Design	(2-2)3
CEIT	421	Research Methods	(2-0)2
CEIT	435	Project Development and Management I	(1-4)3
Elective IV			(3-0)3
Elective V			(3-0)3

Eighth Semester

CEIT	412	Teaching Practice	(2-6)5
CEIT	436	Project Development and Management II	(1-4)3
EDS	416	Turkish Educational System and School Management	(3-0)3
EDS	424	Guidance	(3-0)3
Elective VI			(3-0)3
Elective VII			(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

CEIT 100 Computer Applications in Education (2-2)3

(Service Course for Non-CEIT students) The major goal of this course is to familiarize the student with the technology frequently used in education, including operating systems, computer hardware and software, network, Internet, WWW, word-processing, spreadsheet, and presentation software. The course also facilitates understanding the role of computers in society, organizations and education; the issues of Internet security, and ethics.

CEIT 111 Information Technology in Education I (3-2)4

Information systems in education and introduction to computers. Evolution of computers. Data presentation. Components of computer systems: the CPU, input-output devices, auxiliary storage devices, microcomputers, operating systems and environments, Windows. Managing text: processors. Managing numbers: spreadsheets. Impact of computers on society, computer ethics, security.

CEIT 112 Information Technology in Education II (3-2)4

Telecommunications and computer networks. Internet fundamentals. Data and database structures. Programming languages. Structured program design. Programming basics, arithmetic and logical operations, basic control structures, modularizing programs. Use of computers in school education.

CEIT 133 Programming in Internet Environment (3-2)4

Fundamentals and functions of the Internet. Common Internet applications used in Education: WWW, e-mail, gopher, ftp. Principles of using Internet applications in education.

CEIT 207 Design and Use of Instructional Material (2-2)3

This course underlines major implications of learning theories as they are applied into development of instructional materials. The course introduces all major types and formats of instructional media including audio, visual, audio-visual, computers, and so on. The course also provides the necessary background and skills in

selection, development, and assessment of all types of instructional media and materials.

CEIT 210 Programming Languages I (3-2)4
General structure of a programming language, data types, variables, standard functions, subprograms, selection statements, loops, text files, user-defined data types, records, pointers, dynamic data structures.

CEIT 211 Programming Languages II (3-2)4
This course introduces the underlying concepts and principles of object-oriented programming (OOP). The course emphasizes the design and implementation of an OOP. General structure, data types, variables, standard functions, subprograms, selection statements, loops, text files, user-defined data types, records, pointers, dynamic data structures.

CEIT 213 Computer Hardware (2-2)3
This course presents information about the installation, operation, maintenance and support of PC hardware. It will enable students to learn more about maintaining a personal computer system. The course provides fundamental information about personal computers, microprocessors, RAM, power supplies, motherboards, BIOS, CMOS, the expansion bus, input/output devices and other critical hardware components of an idealized PC.

CEIT 216 Principles and Methods of Instruction (3-0)3
The course introduces basic concepts and principles of teaching and learning. It offers applicable know-how on planning instruction (yearly plan based on units, daily plan and examples of activities) as well as detailed information on teaching and learning strategies, the importance and benefits of instructional planning and a myriad of methods and techniques along with their relation to practice. It provides a repertoire of various instructional tools and materials. Finally, it also offers insights about a teacher's qualifications, and his/her duties and responsibilities in improving the quality of instruction.

CEIT 218 Graphics and Animation in Education (2-2)3
Communication through graphics, graphic design, design process and principles of design, history of graphic design, creativity in graphic design, basic design elements of graphic, application areas of graphic design (typography, signs, emblems, icons, logo and trademarks, visual identity design, poster design); basic graphic terminology (pixel depth, compression, picture layout, resolution); graphical software packages (Photoshop, Fireworks, etc.) and tools (toolbox, layers, filters, effects); animation, scripting languages in animation; animation in education. Both, 2D and 3D design issues and development tools are covered.

CEIT 225 Instructional Design (2-2)3
Principles of instructional design. Analysis of content, learner, and resources. Selecting instructional objectives and sequencing instruction. Instructional treatments, matching treatments and conditions of instructional events and selection of instructional media. Evaluation of instruction.
Prerequisite: CEIT 207

CEIT 313 Use of Operating Systems (2-2)3
Comparative Anatomy of Operating Systems, Computer System Structures. Basic concepts and the evolution of operating system. Operating system functions and characteristics. Standard operating systems and structures (NT, WINxx, UNIX (Linux)). Using operating systems: monitor programs and shells; system calls and the programmer interface. Processes, memory management, file systems.

CEIT 314 Computer Networks and Communications (2-2)3
The course introduces the underlying concepts and principles of computer networks. It presents different components of a network and how these components fit together. The course emphasizes the design and implementation of network software that transforms raw hardware into a highly functional communication system. Simulated networks will be used as examples to reinforce the concepts and demonstrate various protocols. Layered models, OSI and TCP/IP will be used as to group the functions in an internetworking environment including circuit switched and packet switched communication.

CEIT 319 Instructional Technology and Material Development (2-2)3
(Service Course for Non-CEIT students) The course underlines major implications of learning theories as they are applied into development of instructional materials. The course introduces all major types and formats of instructional media, such as visuals, audio, video, multimedia, computer-based, and online materials. It also provides the necessary background and skills in selection, preparation, development and assessment of all types of instructional methods and media.

CEIT 321 Foundations of Distance Education (2-2)3

Historical development of distance education, definition and functions of distance education, technologies used within distance education: TV, VCR, radio, printed materials, computers, and the Internet. Typology of distance education teaching systems. Techniques and methods used in planning, development, and implementation of distance education teaching systems.

CEIT 323 Multimedia Design and Development (2-2)3

Introduction of course development software, electronic courseware planning, design and development stages, screen design principles, digital image/audio/video software, animation, user interaction, feedback techniques, navigation, multimedia courseware packaging, evaluation.
Prerequisite: CEIT 225

CEIT 341 Measurement and Evaluation (3-0)3

This course is designed to provide introductory measurement and evaluation knowledge and skills for prospective teachers. The main topics of the course are: Educational testing and assessment in teaching, instructional goals and objectives, validity, reliability, constructing test items, measuring complex achievement, portfolios, assessment procedures, administering tests and assessments, grading and reporting, achievement and aptitude tests. This course also provides necessary information on descriptive statistics.

CEIT 351 Instructional Feedback Design and Development (3-0)3

(Departmental Elective) This course will help students build their skills, knowledge, and confidence in designing, developing, and evaluating effective instructional feedback in a variety of instructional contexts and environments. Main topics include designing instructional feedback based on question/task, learner characteristics, and learning environment; developing instructional materials that utilize effective feedback; evaluate the effectiveness of instructional feedback in learning environments, specifically CBI, online learning environments, traditional classroom, and workplace.

CEIT 360 Introduction to Visual Design/Basic Elements of Visual Design (2-2)3

(Departmental Elective) The main objective is to introduce prospective teachers/instructional technologists to the basic terminology and understanding of 2D (two dimensional) design as a communication tool. 2D design is any designed communication item, which has an order in two dimensions, namely the x and y-axis. This could be a business letter, a greeting card, a billboard or a web page. This course introduces the underlying concepts and principles of design regarding visual communication. Major concepts are; line, shape, mass, texture, information architecture, light, color, balance, rhythm, harmony, contrast and consistency. By defining and applying these keywords to their own projects, students will be forming their own understanding of visual design.

CEIT 376 Introduction to C++ and Object Oriented Programming (3-0)3

Introduction to computers and C++ programming, control structures, functions, arrays, pointers and strings, classes and data abstraction, operator overloading, inheritance, virtual Functions and polymorphism, C++ stream input/output, templates, exception handling, file processing, data structures, bits, characters, strings and structures, the preprocessor, C legacy code topics, class string and string stream processing, standard template library (STL), standard C++ language additions.

CEIT 378 Development of Advanced Applications in Distance Education with Free/Open Source Software (2-2)3

(Departmental Elective) This course provides students with hands-on experience, developing web sites and advanced applications using selected Open-Source operating systems, web servers, databases. They will develop web-based Distance Education applications using the FOSS programming languages such as PHP and Python, Django, Perl,etc..

CEIT 380 Computer Education Teaching Methods I (2-2)3

This is an introductory course to inform prospective ICT teachers about general teaching strategies. This course introduces macro teaching methods, materials, and techniques employed in classroom settings with a special emphasis on computer education at secondary education.

CEIT 382 Computer Education Teaching Methods in II (2-2)3

This is a follow-up course succeeding CEIT 380, which specifically focuses on both micro strategies of teaching and learning as well as procedures and strategies that can be used while developing lesson plans. It introduces main principles of learning from multiple perspectives and strategies used in student-centered active learning environments and procedures for designing lesson plans, unit plans

and their components, concepts and functions in the microteaching applications.
Prerequisite: CEIT 380

CEIT 386 Community Service (1-2)2
This course aims to create and sustain awareness about the importance of community service; to identify and prepare projects for possible solutions to current problems or an educational issue in society; to organize, present, or participate in panel discussions, conferences, conventions, and/or symposia; to conduct voluntary work in various social responsibility projects and to gain required skills and knowledge for the implementation of community services in schools.

CEIT 388 Open Source Educational Software (2-2)3
(Departmental Elective) Philosophy of free/liber open source software (FLOSS). Open source educational software. Platforms to host open source educational software. WAMP and LAMP software packages: Installation and management. Properties of open source learning management systems and their management. Open source content management software. Design and implementation of Educational applications of CMSs. The course will focus on both the philosophical and practical aspects of FLOSS.

CEIT 390 Database Management Systems (2-2)3
Foundations of database systems, data and data models, design of relational database, SQL, Basic SQL commands, SQL functions, using multi-tables with SQL, SQL programming and function, transaction and errors in SQL, DBMS installation and administrative operations, doing SQL queries in a DBMS.

CEIT 411 School Experience (1-4)3
School experience is a course based on teaching methods courses (CEIT 380 and CEIT 382), where students get a chance to make observations and discussions based on their prior learning. The aim of the course is to give students an opportunity to observe authentic teaching. The tasks and activities performed by student-teachers enable them to observe their mentor teachers at work within the classrooms along with different aspects of teaching and introduce them to the ecology of school environment.
Prerequisite: CEIT 382

CEIT 412 Teaching Practice (2-6)5
This is a follow-up course succeeding CEIT 411, which provides students with the opportunity to observe authentic teaching and the chance to conduct teaching practice at schools under supervision. The students get the chance to apply what they have learned from their undergraduate education by field experience and teaching practice; including class observation, adjusting to classroom conditions, planning and preparation for teaching.
Prerequisite: CEIT 411

CEIT 415 Routing Basics and WAN Protocols (2-2)3
(Departmental Elective) This course introduces the basic concepts and principles of router, routing terminology and Wide Area Network protocols. The course covers topics related to Ethernet frames, TCP/IP basics, IPv4 and IPv6 distance vector and link state routing protocols. RIPv2, RIPng, EIGRP, and OSPF will be investigated and configured in a simulated environment. It also covers some of the Wide Area Network technologies, such as Frame Relay, HDLC, PPP.

CEIT 419 Web Design (2-2)3
Fundamentals and functions of the Internet. Common Internet applications used in education: e.g., WWW, e-mail, chat, ftp, etc. Principles of using Internet applications in education.

CEIT 421 Research Methods (2-0)2
This course aims to provide prospective teachers with necessary skills and knowledge in planning, conducting and reporting a research in social sciences. This course focuses on such main issues as the nature of scientific inquiry, phases of educational research, intellectual property rights and ethics in educational research, forming research questions, data collection and analyses techniques and preparing a research report.

CEIT 422 Educational Technology And New Media (2-2)3
(Departmental Elective) This course provides students with hands-on experience in developing a portfolio of various educational applications for K-12 to higher education by utilizing designated Web 2.0 and Web 3.0 technologies. The course also covers the fundamental and contemporary elements of this new digital culture and social media that is increasingly dependent on digital media and computer-mediated forms of production, distribution, and communication.

CEIT 435 Project Development and Management I (1-4)3
This course underlines main components of project management in the field of instructional technology. This course will offer students with necessary background and skills in project management by providing with an understanding of the theory and practice of project management process. The course

will cover project management context and processes, project integration, project management, time management, cost management, quality management, team management, risk management and project planning in the process of design development and evaluation of instructional software.

CEIT 436 Project Development and Management II (1-4)3
This course underlines major steps and techniques used in design development and evaluation of instructional software. It also provides the necessary knowledge and skills to apply project management life cycle to instructional software design, development and evaluation process.
Prerequisite: CEIT 435

CEIT 440 Special Problems in Computer Education and Instructional Technology (2-2)3
(Departmental Elective) Research projects carried out under the supervision by a CEIT instructor to give students the necessary skill and experience in carrying out scientific research. Students are expected to complete a written report on their topics and give a seminar.

CEIT 450 Advanced Programming in Visual Environments (2-2)3
The course introduces the underlying concepts and principles of programming in visual environments. The course emphasizes the design and implementation of visual software, such as Visual Basic. In the course students have to complete a complete instructional material prepared by Visual Basic.

CEIT 461 Professional Practice I (2-2)3
(Departmental Elective) The course addresses issues related to career planning and portfolio preparation, interview techniques, copyright issues, national and worldwide intellectual property legislation, entrepreneurship, TQM procedures, types of contracts and national labor legislation.

CEIT 462 Professional Practice II (2-2)3
(Departmental Elective) The major goal of this course is to create/enhance awareness regarding global state of the art issues within the scope of Instructional Technology. The course addresses issues related to communication theories, sustainability, culture/culture industries, and problem solving techniques.

CEIT 471 The Business Of E- Learning (3-0)3
(Departmental Elective) This course aims to explore the emerging business side of e-learning. Discusses organizational and strategic issues associated with developing and delivering e-learning. Participants examine private and publicly traded companies that are marketing e-learning products and services to the consumer market. Explains strategies for funding new e-learning enterprises to support the development and implementation of effective e-learning programs.

CEIT 472 Knowledge Management In Education and Research (3-0)3
(Departmental Elective) This course aims to explore the framework for knowledge management in education and research. Discusses potential of knowledge management in support of education and research for increasing the capacity of identifying, distilling, harnessing and using information to improve student and institutional success. Offers necessary resources and practices to enable participants to design and implement a knowledge management strategy.

GRADUATE PROGRAMS AT THE DEPARTMENT OF COMPUTER EDUCATION AND INSTRUCTIONAL TECHNOLOGY

GRADUATE CURRICULUM

M.S. In Computer Education and Instructional Technology

CEIT	500	M.S. Thesis	NC
CEIT	522	Seminar in Instructional Technology	NC

7 Elective Courses**

Total Minimum Credit: 21
Number of Courses with Credit: 7

**Departmental approval is required

Ph.D. In Computer Education and Instructional Technology

If admitted by M.S. degree:

CEIT	600	Ph.D. Thesis	NC
CEIT	622	Seminar in Instructional Technology	NC

7 Elective Courses**

Total Minimum Credit: 21
Number of Courses with Credit: 7

**Departmental approval is required

If admitted by B.S. degree:

CEIT	522	Seminar in Instructional Technology	NC
CEIT	600	Ph.D. Thesis	NC
CEIT	622	Seminar in Instructional Technology	NC

14 Elective Courses**

Total Minimum Credit: 42
Number of Courses with Credit: 14

**Departmental approval is required

GRADUATE COURSES

CEIT	500	M.S. Thesis	NC
CEIT	502	The Business Case for E-learning	(3-0)3
CEIT	503	Educational Statistics	(3-0)3
CEIT	504	Instructional Message Design: Theory Research and Practice	(3-0)3
CEIT	506	Serious Games and Simulations: Theories and Applications	(3-0)3
CEIT	508	Technology Enhanced Learning Theory into Practice	(1-4)3
CEIT	519	Computer Mediated Learning in Network Environment	(1-4)3
CEIT	520	Research Methods in Computer Education	(3-0)3
CEIT	521	Distance Education: Theory, Research and Practice	(2-2)3
CEIT	522	Seminar in Instructional Technology	NC
CEIT	525	Leadership and Planning in Instructional Technology	(3-0)3
CEIT	530	Computers as Cognitive Tools: Theory, Research and Practice	(3-0)3
CEIT	566	Telecommunications and Educational Applications	(3-0)3
CEIT	600	Ph.D. Thesis	NC
CEIT	607	Human Performance Technology: Theory into Practice	(3-0)3
CEIT	609	Virtual Worlds in Education: Theory and Design	(3-0)3

CEIT	620	Research Seminar in Instructional Technology	(3-0)3
CEIT	622	Seminar in Instructional Technology	NC
CEIT	626	Advanced Readings in Instructional Technology	(3-0)3
CEIT	627	Advanced Readings in Instructional Design and Technology	(3-0)3
CEIT	652	Theories of Learning and Instruction	(3-0)3
CEIT	672	Practices in Learning System Design	(3-0)3
CEIT	705	Design and Development of Open Learning Environments	(3-0)3
CEIT	710	Communities of Practice in Higher Education	(3-0)3
CEIT	755	Mobile Learning: Foundations and Applications	(3-0)3
CEIT	712	Qualitative Research in Instructional Technology: Theory & Applications	(3-0)3
CEIT	724	Gamification and Instructional Design: Theory and Applications	(3-0)3
CEIT	799	Orientation Graduate Seminars	(0-2)0
CEIT	7XX	Special Topics in Instructional Technology	(3-0)3
CEIT	8XX	Special Studies	(4-2) NC
CEIT	9XX	Advanced Studies	(4-0) NC

DESCRIPTION OF GRADUATE COURSES

CEIT 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between student and faculty member. Students register for this course in all semesters starting the beginning of their second or third semester while the research program or write-up of thesis is in progress.

CEIT 502 The Business Case for E-learning (3-0)3
This course aims to explore the impact of e-learning in business and the business impact of e-learning. Explains investing in e-learning, organizational capabilities for successful e-learning solutions and business success with e-learning. Discusses and evaluates the e-learning industry landscape, success factors in e-learning business, and the future of e-learning business.

CEIT 503 Educational Statistics (3-0)3
Descriptive and Inferential Statistics techniques for carrying out educational research such as coding and organizing data, sampling, correlation, t test, simple linear regression, and ANOVA.

CEIT 504 Instructional Message Design: Theory Research and Practice (3-0)3
Underline 'instructional message design' concerned with presenting and structuring information to promote learning. Examine research-based principles of instructional message design, and how to apply these principles into using signs and symbols to create effective instructional communications in multimedia, online lessons and print materials for diverse learners, in different content areas, and in variety of contexts. Application of information processing theory, cognitive load theory, motivation theory and communication theory to the design and evaluation of instructional media.

CEIT 506 Serious Games and Simulations: Theories and Applications (3-0)3
This course will provide students with a sound introduction to the theories of gaming/simulations and examine cognitive/social factors and the design of computer games/simulations. So, the course will have a more psychological and social focus rather than a technical one. It will be organized around a collection of readings and real-world exercises. The format of this course is problem-centered. The lectures, presentations and other resources will be used to support the problems that students are working on throughout the semester.

CEIT 508 Technology Enhanced Learning Theory into Practice (1-4)3
This course aims to provide students necessary strategies and tactics to apply the theories and models of instructional technology to the solutions of real life instructional problems. The students will utilize state of the art learning technologies in the scope of this course. The course will have both theoretical and technical dimensions. It will be organized around a collection of readings and real-world instructional problems. New technologies and other resources will be used to help designing and developing state of the art solutions to the instructional problems.

CEIT 519 Computer Mediated Learning in Network Environment (1-4)3
In this course students will learn how to design and

evaluate an educational Web site. Major outcome of the course will be a full function educational Web site. Class participation, professional quality research and products, collaborative work, high quality documentation will be major items of success in this course.

CEIT 520 Research Methods in Computer Education (3-0)3
An overview of educational research processes and procedures. Review and assessment of qualitative and quantitative research methods including experimental research methods and case studies in computer education.

CEIT 521 Distance Education: Theory, Research and Practice (2-2)3
Historical development of distance education, definition and function of distance education, technologies used within distance education. Typology of distance education teaching systems. Techniques and methods used in planning, development, and implementation of distance education teaching systems. Research in distance education. Distributed learning environments; promoting student interaction.

CEIT 522 Seminar in Instructional Technology NC
Investigation and group discussion of current issues and research areas in the field of computer education and instructional technology. Review of current literature in the field.

CEIT 525 Leadership and Planning in Instructional Technology (3-0)3
Fundamentals of technology planning for educational organizations. Instructional and administrative issues in IT planning. Characteristics of technology managers vs. technology leaders. Hardware & Software & Peopleware planning and assessment strategies. Staff development models for innovative organizations. Maintenance, upgrading & follow-up issues for IT and diffusion of innovation models for long-term planning.

CEIT 530 Computers as Cognitive Tools: Theory, Research and Practice (3-0)3
Alternative ways of using computers in education to engage students in critical thinking, problem solving and higher order thinking. Rationale for using computers as cognitive tools, and conceptual foundations. Examine the major cognitive tools including databases, spreadsheets, semantic networking tools, expert systems, computer-mediated communication, and multimedia and hypermedia, and the way they are used as cognitive tools. Provide the necessary background in challenges to implementing cognitive tools in classrooms, new roles for educators and administrators, and different types of assessments.

CEIT 566 Telecommunications and Educational Applications (3-0)3
Function of educational telecommunications. Technologies used within educational telecommunications. Techniques and methods used in the planning, development and implementation of educational telecommunications. Research in educational telecommunication.

CEIT 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree in the field of computer education and instructional technology, arranged between the student and a faculty member from the department.

CEIT 607 Human Performance Technology: Theory into Practice (3-0)3
Provide a vehicle for foundations of Human Performance Technology (HPT) field. Highlight techniques, procedures, and approaches intended to solve problems involving human performance at organizational level. Examine HPT models, HPT processes, instructional / non-instructional and employee / organizational level interventions, management of HPT projects, standards and ethics in HPT, and future trends of HPT. Provide with practice to apply and critique HPT processes.

CEIT 609 Virtual Worlds in Education: Theory and Design (3-0)3
Introduction to opportunities and challenges of virtual worlds for learning and teaching. Examine the recent research issues in virtual worlds. Research approaches and methods in virtual worlds. Implementation of the research tools in virtual worlds. Conducting research on the virtual worlds.

CEIT 620 Research Seminar in Instructional Technology (3-0)3
This course aims to provide necessary research skills and a review in Instructional Technology as applied to the development of doctoral dissertation proposals. This course is offered for Ph.D. students who are in the process of developing a research proposal for their dissertations. The course involves an advanced review of current literature and research trends in the files of Instructional Technology.

CEIT 622 Seminar in Instructional

Technology NC

Investigation and group discussion of current issues and research areas in the field of computer education and instructional technology. Review of current literature in the field.

CEIT 626 Advanced Readings in Instructional Technology (3-0)3

Advanced review of theory and research in the field of Instructional Systems Technology. Review of all of the major trends, theories and future issues of the field. In addition to these, revisiting of both historical and current issues of the Instructional Technology.

CEIT 627 Advanced Readings in Instructional Design and Technology (3-0)3

The course focuses on contemporary issues and theoretical aspects of Instructional Design and Technology. The emerging research issues of the field are also covered by the readings. Topics include technology, learning and cognition, Instructional Technology related theories, design theories, technology and its impacts on educational change.

CEIT 652 Theories of Learning and Instruction (3-0)3

Understanding of when and how different approaches should be utilized for learning and instruction. Review of learning and instructional theories concerned with their implications for instruction and the field of instructional technology. Explore a variety of theories that are important for understanding learning and instruction in different types of settings. Examine variety of behaviorist, cognitivist, developmental, social and humanistic approaches to learning, and instructional theories. Develop understanding of when and how different approaches should be utilized in learning and instructional settings.

CEIT 672 Practices in Learning System Design (3-0)3

The course has a case-based approach to learning adult training principles and instructional design (ID) skills. Students engage in authentic design and development activities via participation in a community of practice, simulating an ID apprenticeship shop. ID apprentices benefit by co-analyzing instructional design problems, having access to a wide range of ideas and perspectives, working with diverse teams and individuals, creating real instructional design products or cases, and giving and receiving constructive feedback.

CEIT 705 Design and Development of Open Learning Environments (3-0)3

Examine theoretical foundations and components of open learning environments. Models and methods for designing open learning environments. Current status of constructivism and its application to the design and development of open learning environments. Designing effective scaffolds for such environments by considering several factors including type, timing, fading, and delivery of scaffolds. Research issues in these environments.

CEIT 710 Communities of Practice in Higher Education (3-0)3

Communities of Practice theory and applications in higher education and organizations. Professional CoP in academia. Coaching, apprenticeship, and mentoring models. Interdisciplinary approaches. Designing and sustaining face-to-face and Online Communities of Practice.

CEIT 712 Qualitative Research in Instructional Technology: Theory and Applications (3-0)3

The course aims to provide necessary and sufficient skills to doctoral students; especially those who want to conduct qualitative research in their dissertations, since it offers a detailed overview of both theoretical foundations and practical applications of various qualitative research methods. It also aims to address the need for guidance on how to conduct qualitative data collection as well as qualitative analysis of the collected data.

CEIT 724 Gamification and Instructional Design: Theory and Applications (3-0)3

The course aims to provide students with the basics of gamification with a highly practical approach. Along with the theoretical background of gamification; fundamental elements, design processes, design principles and real-life examples of gamification will be covered in detail. The students will conclude the course by designing a gamified experience themselves.

CEIT 755 Mobile Learning: Foundations and Applications (3-0)3

The theoretical framework and practical applications for the use of mobile technologies for learning. Underlying philosophy and theories of mobile learning, recent research topics and research papers on mobile learning are investigated. Trends, techniques, development and application tools used to create and utilize learning environments with mobile device support are under the focus of the course.

CEIT 799 Orientation Graduate Seminars (0-2)0

The course is constructed from seminars that will be organized by Graduate School of Natural and Applied Sciences. The seminars will cover technical, cultural, social and educational issues to prepare the graduate students following the PhD programs.

CEIT 7XX Special Topics in Instructional Technology (3-0)3

These are the courses that not yet listed in catalogue. Contents vary from year to year according to the interest of student and instructor in charge.

CEIT 8XX Special Studies (4-2)NC

M.S. students choose and study a topic under the guidance of a faculty member, normally his/her adviser.

CEIT 9XX Advanced Studies (4-0)NC

Graduate students as a group, or a Ph.D. student, choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

DEPARTMENT OF EDUCATIONAL SCIENCES

PROFESSORS

AKSU, Meral: B.S., METU; M.S., Ph.D., Hacettepe University.
DEMİR, Ayhan ***(Department Chair)***: B.S., METU; M.S., Ph.D., Hacettepe University.
GÜNERİ, Oya (Yerin): B.S., M.S., Ph.D., METU.
KİRAZ, Ercan: B.A., Ankara University; M.A., Ph.D. University of Southern California.
TEZER, Esin: B.A., Ankara University; Postgraduate Diploma in Institute of Social Studies, Netherlands; M.A., Ph.D., Hacettepe University.
YILDIRIM, Ali: B.A., Ankara University; M.A., M.Ed., Ed.D., Columbia University.

ASSOCIATE PROFESSORS

AKAR, Hanife***:*** B.A., Anadolu University; M.S., Ph.D., METU.
DEMİR, Cennet (Engin) ***(Vice Chair)***: B.S., M.S., Ph.D., METU.
ERDUR BAKER, Özgür B.A., Ankara University; M.S., Ph.D., University of Texas at Austin.
OK, Ahmet: B.S., M.S., Ph.D., METU.
KONDAKÇI, Yaşar: B.S., M.S., METU; Ph.D. Ghent University.

ASSISTANT PROFESSORS

BARAN, Evrim: B.S., M.S., METU; Ph.D., Iowa State University.
ÇAPA AYDIN, Yeşim: B.S., M.S., METU; M.A., Ph.D., Ohio State University.
GÖKALP, Gökçe: B.A., M.A. California State University, Northridge; Ph.D., University of Southern California.
SÜMER, Zeynep (Hatipoğlu): B.S., M.S., Ph.D., METU.

INSTRUCTORS

BOŞGELMEZ, Meral: B.S., METU; M.S., Ph.D., Hacettepe University.
EMİL, Serap ***(Vice Chair)***: B.S., M.S. METU; Ed.D. Portland State University.

GENERAL INFORMATION: Department of Educational Sciences offers graduate programs leading to M.S. and Ph.D. degrees in Educational Administration and Planning, Curriculum and Instruction or Psychological Counseling and Guidance, and a non-thesis M.A. degree in Human Resource Development in Education.

M.S. degree programs offer students theoretical and research courses in the respective areas, and help them carry out a systematic research study as master's thesis. Some of our master's degree holders continue their studies at the doctoral level while others work at schools, and other government and private organizations as specialist in their areas. Ph.D. degree programs prepare students for more advanced theory and research in their specializations leading to a dissertation research that aims to contribute to scientific literature and improve practice. Most of our Ph.D. program graduates become academician at universities, and others work in various governmental and private organizations.

Non-thesis M.A. program in Human Resource Development in Education offer courses in the evenings and weekends, and aims to prepare individuals as training and development specialists in human resources units of schools, government and private agencies, and organizations. The program is practitioner-oriented, that is, it aims to equip students with the perspectives and skills in applying what they learn to practical cases in human resources area, and to develop a problem solving orientation in its graduates.

Another main function of the department is to offer undergraduate and non-thesis master program courses to prepare students from various departments of the Faculty of Education for teaching at the primary and/or secondary school level. In addition, the department offers elective courses to students of other departments and faculties to broaden their understanding of concepts, theories and applications in the field of education.

Finally, the department faculty regularly offer in-service training for teachers and administrators in schools, and for trainers in public and private organizations; and are actively involved in European Union projects and exchange programs.

RESEARCH INTERESTS AND FACILITIES: The academic staff carries out both basic and applied research in various areas of educational sciences, and cooperates with national and international educational institutions in conducting research projects. Major areas of research includes strategic planning, higher education, educational management, internationalization in higher education, sociology of education, measurement and evaluation, student achievement, curriculum development and evaluation, teaching of social studies and mathematics, student attitudes, teaching methods, learning, teacher education, staff development, professional education, study and thinking skills, constructivism, school counselling, loneliness, individual and group counselling, preventive activities, assertiveness, and self-identity. The department has a laboratory specifically designed and equipped for psychological counselling.

COURSES OFFERED TO UNDERGRADUATE TEACHER TRAINING PROGRAMS

EDS 119 Introduction to Teaching Profession (3-0)3
Characteristics and principles of teaching profession, school and classroom contexts, alternative perspectives in education, social, psychological, philosophical and historical foundations of education, Turkish education system.

EDS 200 Introduction to Education (3-0)3
Characteristics and principles of teaching profession, school and classroom contexts, alternative perspectives in education, social, psychological, philosophical and historical foundations of education, Turkish education system.

EDS 220 Educational Psychology (3-0)3
Various dimensions of human development (cognitive, social, psychological, moral and physical), approaches to learning and learning process, learning styles, motivation and individual differences in learning.

EDS 221 Development and Learning (3-0)3
Various dimensions of human development (cognitive, social, psychological, moral and physical), approaches to learning and learning process, learning styles, motivation and individual differences in learning.

EDS 222 Instructional Planning and Evaluation (3-2)4
Basic curriculum development concepts and processes, course curriculum, development of yearly, unit and daily plans, strategies in content selection and organization, teaching methods and strategies, basic characteristics of teaching and learning materials, material selection, measurement and evaluation, approaches to evaluation, different types of tests, development of follow-up and achievement tests, procedures and strategies in writing test questions and grades.

EDS 304 Classroom Management (3-0)3
Social and psychological factors that influence student behaviour, basic characteristics and functions of classroom context, designing the physical environment, starting a new school year, developing and teaching rules and routines for classroom management, gaining student cooperation, protecting and restoring order, creating a positive learning environment, managing seatwork, group work, recitations and discussions, productive and effective use of time in class, motivation and communication, problem behaviours and ways of dealing with them.

EDS 320 Instructional Principles and Methods (3-0)3
Basic curriculum development concepts and processes, course curriculum, development of yearly, unit and daily plans, strategies in content selection and organization, teaching methods and strategies, basic characteristics of teaching and learning materials, material selection, measurement and evaluation, approaches to evaluation, different types of tests, development of follow-up and achievement tests, procedures and strategies in writing test questions and grades.

EDS 416 Turkish Educational System and School Management (3-0)3
This course is designed for prospective teachers to develop the perception and skills related to education systems, Turkish Education System, and school management. It aims to increase understanding of Turkish Education System and other basic concept of education management such as organizational structure, organizational culture,

motivation, leadership, decision-making, communication, organizational change, finance, and personnel administration.

EDS 424 Guidance (3-0)3
Purposes of student personnel services and their place in education, introduction to guidance and counselling services in schools, principles of guidance, diagnosing and guiding students, collection and use of data on student counselling, placement, follow-up, research and evaluation, relations with parents and beyond the school community, vocational guidance, purposes of special education, identifying students with special learning needs.

COURSES OFFERED TO GRADUATE TEACHER TRAINING PROGRAMS

(Without-Thesis)

EDS 506 Introduction to Teaching Profession (3-0)3
Characteristics and principles of teaching profession, status of teaching profession, school and classroom contexts, alternative perspectives in education, social, psychological, economical, philosophical and historical foundations of education, Turkish education system, induction into teaching, teacher development, supervision of teaching, teaching at different contexts.

EDS 507 Development and Learning (3-0)3
Basic research methods in education, psychological foundations of education, various dimensions of human development (cognitive, social, psychological, moral and physical), approaches to learning and learning process, intelligence, learners with special needs, learning styles, individual differences in learning, motivation theories.

EDS 509 Instructional Planning and Evaluation (3-2)4
Basic curriculum development concepts and processes, course curriculum, development of yearly, unit and daily plans, strategies in content selection and organization, teaching methods and strategies, basic characteristics of teaching and learning materials, material selection, measurement and evaluation, approaches to evaluation, different types of tests, development of follow-up and achievement tests, procedures and strategies in writing test questions and assigning grades.

EDS 510 Classroom Management (2-2)3
Theories on classroom management, group development, social and psychological factors that influence student behaviour, basic characteristics and functions of classroom context, designing the physical environment, starting a new school year, developing and teaching rules and routines for classroom management, gaining student cooperation, protecting and restoring order, creating a positive learning environment, managing seatwork, group work, recitations and discussions, productive and effective use of time in class, motivation and communication, problem behaviors and ways of dealing with them, common discipline problems in class and school, producing discipline and classroom management plans.

EDS 522 Guidance (3-0)3
Theoretical approaches to guidance. Purposes of student personality services and their place in education, introduction to guidance and counselling services in schools, principles of guidance, diagnosing and guiding students, collection and use of data on students, counselling, placement, follow-up, research and evaluation, relations with parents and beyond the school community, vocational guidance, purpose of special education, identifying students with special learning needs, dealing with students with special needs in classrooms, designing instructional activities for students with special needs.

EDS 123 Student Personnel Services in Practice (3-0)3
Historical perspectives of student personnel services, traditional and current activities in school, the school counselor's roles and functions, guidance outside the public secondary school settings, non-standardized and standardized techniques for human assessment, counseling with individuals and groups, career guidance and placement and evaluation of guidance programs.

EDS 226 Educating Exceptional Children and Youth (3-0)3
Concept of exceptionality, different exceptionality groups, mental deviations, learning disabilities, hearing impairment, visual impairment, communication disorders, behavior disorders, physical and health impairments, parental training and counseling and technological advances in special education.

EDS 234 Study and Thinking Skills (3-0)3
Development and application of basic and advanced study and thinking skills to be successful in school setting. Study skills: self management, reading, note-taking, locating information, writing and preparing for exam, communication and group work. Thinking skills: memorizing, information processing, questioning problem solving, critical thinking and decision making. Helping students with these skills at different levels of schooling.

EDS 253 Psychology of Adolescence (3-0)3
A detailed account of various theories of adolescent development emphasizing physical, social, cognitive, and emotional changes in adolescence. Adolescents and their families, adolescents in schools and at work. Guidance services for adolescents.

EDS 255 Educational Philosophy (3-0)3
Introduction to fundamentals of philosophy, such as ontology, epistemology, methodology, and axiology. Extensive discussions of various philosophical theories and their implications for and applications to the field of education. Explanation of the philosophical nature of educational processes, such as planning, implementation and evaluation.

EDS 301 Organizational Behavior (3-0)3
Information about the field of Organizational Behavior, organizational perspectives, the character of the work group organizational climate, organizational leadership, decision making, motivation, job satisfaction, morale, types of conflict and conflict resolution, maintaining the adaptability of employee, organizational effectiveness, organizational change, basic communication skills, discussion on the students projects.

EDS 306 Gender and Education (3-0)3
An introduction to the gender issues as related to the process of informal and formal education. Discussion of genetics and social bases of gender differentiation in the process of schooling. Gender inequalities throughout various levels of educational attainments. Gender-based intellectual, motivation, aspiration and expectation differences.

EDS 310 Comparative Education (3-0)3
An investigation of educational processes and practices in other societies. Area studies will be carried out and selected topics, issues and problems will be examined. Comparisons will be made with the Turkish education.

EDS 313 Theories of Counseling (3-0)3
Introduction and overview of the counseling theories in terms of the emphasis placed upon the cognitive, affective and behavioral domains. Basic philosophy, key concepts, goals of counseling, relationship between counselor and client, clients and counselors work and techniques of various approaches in counseling are compared.

EDS 314 Methods and Techniques of Counseling (3-0)3
Some perspectives on effective helping. Characteristics of effective helpers. Various methods and skills used in individual counseling such as attending and observing, asking questions, encouraging paraphrasing and summarizing, reflecting feelings, selecting and structuring skills to meet clients' needs, confrontation, focusing, influencing and information giving at different stages of counseling are.

EDS 327 Issues and Trends in the Teaching Profession (3-0)3
Teaching as a profession, in-service and pre-service training of teachers in Turkey and abroad. Changing qualities and characteristics of teachers' problems, organizations and ethics of the teaching profession

EDS 330 Measurement and Evaluation in Education (3-0)3
The role of evaluation in teaching, relating evaluation to instructional objectives. Constructing tests, validity, reliability and other characteristics of tests. Marking and reporting.

EDS 332 Group Dynamics (3-0)3
Introduction to basic concepts in group dynamics: primary and secondary groups. Role theory, in-groups and out-groups, interaction.

EDS 337 Assessment Techniques in Affective Domain (3-0)3
Miscellaneous measurement techniques in affective domain. Problems of attitude, interest and personality measurements. Characteristics of checklists, rating scales and inventories. Test item writing and item analysis techniques.

EDS 340 History of Turkish Education (3-0)3
Historical foundations of Turkish Education with emphasis on recent Ottoman and early Republican periods. The analysis of traditional and modern elements of Turkish Education within a historical context. A comparison and contrast of the Islamic Nationalist and Westernist lines in Turkish education. A brief sketch of pedagogical developments in Turkish primary, secondary and higher education.

EDS 350 Marriage and Family Counseling (3-0)3
A conceptual analysis of disfunctionality in marriage and family relationships; a survey of different theoretical approaches to marriage and family relationships including individual, dyadic, and family systems approaches; assessment of and intervention in marriage and family relationships; research on intervention in marriage and family relationships.

EDS 363 Measurement and Evaluation in Guidance (3-0)3
Basic elements of testing. Methods and techniques used for the measurement and evaluation of student behavior in various domains.

EDS 364 Appraisal of Students (3-0)3
Use of non-test and test techniques in student personnel services. Specifically, the discussion and administration of observational techniques, group assessment techniques, interest inventories, and personality tests.

EDS 385 Rehabilitation Counseling (3-0)3
The concepts of rehabilitation. Aims of rehabilitation services for people with exceptionalities. Different approaches in rehabilitation counseling and their applications. Issues in rehabilitation counseling, different rehabilitation models for exceptional people.

EDS 400 Field Practice in School Guidance Services (1-4)3
Field Practice in School Guidance Services. In this practicum course, students attend the secondary school's guidance services where they are expected to observe and practice guidance activities based on the needs of a particular school, every student administers a test or non test guidance technique, writes observation reports about the schools and carries out a research project.

EDS 401 Vocational Guidance (3-0)3
Survey and critical analysis of theory and research on vocational choice and adjustment. Definition and correlates of vocational aspirations, preferences, choices, motivation, success and satisfaction. Developmental trends in career decision making and career patterns.

EDS 410 Field Practice in Individual Counseling (1-4)3
In this practicum course, students attend to the secondary schools or prep-schools and conduct interviews with students. Each session of these interviews is tape-recorded and transcribed. Theoretical discussions and providing feedback are also essential elements of the course.

EDS 415 Behavior Disorders (3-0)3
Misconceptions about abnormal behavior, criteria for abnormality, the problem of classification, main approaches to behavior disorders, the basic nature of neurosis (the neurotic nucleus and paradox, anxiety disorders, somatoform disorders, affective disorders, sexual dysfunction and variants).

EDS 432 Educational Administration (3-0)3
An organizational perspective to schools such as school as a social system, schools and their external environment, bureaucratic and professional dimensions of schools as well as motivation, leadership, decision making and communication in school organizations.

EDS 438 Group Counseling (2-4)4
A survey of different theoretical approaches to group counseling. Group leadership. Early and later stages in the development of a counseling group. Application of different techniques used in group counseling.

EDS 450 Educational Statistics I (3-0)3
An introductory course in statistics, including measures of central tendency, frequency distributions, measures of variability, correlation, regression analysis.

EDS 451 Managing Interpersonal Conflicts (3-0)3

Introducing conflict. Win-lose and win-win approaches to conflict. Skills for conflict resolution: empathy, appropriate assertiveness, co-operative power, managing emotions, mapping the conflict designing options, negotiation, and mediation.

EDS 460 Guidance and Counseling in Primary Education (3-0)3

Guidance and counselling needs of children in elementary education. Child counselling. Play media in counselling. Group counselling procedures with children. Consultation with parents and teachers.

GRADUATE PROGRAMS AT THE DEPARTMENT OF EDUCATIONAL SCIENCES

MASTER OF SCIENCE PROGRAMS (M.S.)

Required Courses

EDS	502	Research Methods in Education	(3-0)3
EDS	504	Educational Statistics I	(3-2)4
or			
EDS	508	Educational Statistics II	(3-2)4
EDS	505	Prothesis Seminar	NC
EDS	599	Master's Thesis	NC
EDS	800-899	Special Studies	(4-2)NC
EDS	900-999	Special Topics	(4-0)NC

M.S. PROGRAM IN EDUCATIONAL ADMINISTRATION AND PLANNING

EDS	511	Supervisory Techniques I	(3-0)3
EDS	512	Administrative Processes	(3-0)3
EDS	513	Administrative Problems in Education	(3-0)3
EDS	515	Organizational Psychology	(3-0)3
EDS	516	Group Dynamics and Leadership	(3-0)3
EDS	517	Educational Organizations and Design	(3-0)3
EDS	520	Strategic Planning in Higher Education	(3-0)3
EDS	525	Systems Analysis in Education	(3-0)3
EDS	526	Economics of Education	(3-0)3
EDS	527	Finance and Educational Planning	(3-0)3
EDS	531	Introduction to Educational Planning	(3-0)3
EDS	533	Total Quality Management in Education	(3-0)3

M.S. PROGRAM IN CURRICULUM AND INSTRUCTION

EDS	540	Fundamentals of Curriculum Development	(3-0)3
EDS	541	Instructional Designs	(3-0)3
EDS	542	Theories of Learning	(3-0)3
EDS	544	Theories of Instruction	(3-0)3
EDS	545	Research on Teaching	(3-0)3
EDS	546	Contemporary Issues in Curriculum & Instruction	(3-0)3
EDS	547	Curriculum Evaluation	(3-0)3
EDS	548	The Fundamentals of Social Studies Curriculum	(3-0)3
EDS	549	Teaching and Learning Process	(3-0)3
EDS	550	Needs Assessment	(3-0)3

Area Courses in Measurement and Evaluation

EDS	554	Scale Construction in Affective Domain	(3-0)3
EDS	555	Theories and Techniques in Measurement and Evaluation	(3-0)3
EDS	556	Elements of Test Theory	(3-0)3
EDS	558	Non-Parametric Statistics	(3-0)3
EDS	559	Test Construction	(3-0)3
EDS	560	Elements of Scaling	(3-0)3
EDS	562	Theory, Measurement and Research in Affective Domain	(3-0)3
EDS	564	Theories of Measurement and Research Designs in Psychomotor Domain	(3-0)3
EDS	565	Practicum in Measurement and Evaluation	(3-0)3
EDS	566	Elements of Factor Analysis and Related Techniques	(3-0)3
EDS	567	Item Response Theory	(3-0)3
EDS	569	Norms and Test Equating	(3-0)3

M.S. PROGRAM IN PSYCHOLOGICAL COUNSELING AND GUIDANCE

EDS	523	Theories of Counseling	(3-0)3
EDS	570	Counseling with Children	(3-0)3
EDS	581	Student Personnel Services in Schools	(3-0)3
EDS	582	Principles and Techniques of Counseling	(3-0)3
EDS	583	Group Counseling	(3-0)3
EDS	584	Field Practice I	(3-0)3
EDS	585	Field Practice II	(3-0)3
EDS	586	Interpersonal Relations	(3-0)3
EDS	587	Counseling the Parents of Exceptional Children	(3-0)3
EDS	588	Counseling Needs of Exceptional Children	(3-0)3
EDS	589	Couple and Family Counseling	(3-0)3
EDS	590	Counseling in Higher Education	(3-0)3
EDS	591	Recent Developments in Counseling	(3-0)3
EDS	592	Counseling for Elderly	(3-0)3
EDS	593	Crisis Counseling	(3-0)3
EDS	594	Counseling in Industrial Settings	(3-0)3
EDS	595	Career Development Counseling	(3-0)3

EDS	596	Assessment Techniques in Counseling	(3-0)3

Ph.D. PROGRAMS

Required Courses

EDS	695	Research Seminar in Educational Sciences	(3-0)3
EDS	699	Ph.D. Dissertation	NC
EDS	800-899	Special Studies	(4-2)NC
EDS	900-999	Special Topics	(4-0)NC

Ph.D. PROGRAM IN EDUCATIONAL ADMINISTRATION AND PLANNING

EDS	602	Educational Finance	(3-0)3
EDS	603	Personnel Administration	(3-0)3
EDS	605	Advanced Seminar in Supervision	(3-0)3
EDS	606	Supervisory Techniques II	(3-0)3
EDS	607	Issues in Educational Administration	(3-0)3
EDS	610	Educational Leadership and Change	(3-0)3
EDS	617	Restructuring Educational Organizations	(3-0)3
EDS	625	Educational Planning for Social Development	(3-0)3
EDS	630	Seminar in Educational Planning	(3-0)3
EDS	631	The Processes and Problems of Educational Planning in Turkey	(3-0)3

Ph.D. PROGRAM IN CURRICULUM AND INSTRUCTION

EDS	640	Instruction: Theory and Research	(3-0)3
EDS	641	Curriculum: Theory and Research	(3-0)3
EDS	643	Curriculum and Society	(3-0)3
EDS	644	The Pre-School Curriculum	(3-0)3
EDS	645	The Elementary School Curriculum	(3-0)3
EDS	646	The Secondary School Curriculum	(3-0)3
EDS	647	Comparative Higher Education	(3-0)3
EDS	648	The Social Studies Curriculum: Theory into Practice	(3-0)3
EDS	649	A Comparative Study of Teacher Education	(3-0)3
EDS	651	Practicum in Designing Curriculum and Instruction	(3-0)3
EDS	653	Seminar in Teaching Methods	(3-0)3
EDS	654	Practicum in Curriculum Evaluation	(3-0)3
EDS	655	Paradigms in Curriculum	(3-0)3
EDS	657	A Comparative Study of Secondary School Programs	(3-0)3

Ph.D. PROGRAM IN PSYCHOLOGICAL COUNSELING AND GUIDANCE

EDS	681	Advanced Individual Counseling	(3-0)3
EDS	682	Advanced Group Counseling	(3-0)3
EDS	683	Contemporary Approaches to Counseling	(3-0)3
EDS	684	Adjustment Problems	(3-0)3
EDS	685	Advanced Seminar in Guidance and Counseling	(3-0)3
EDS	686	Group Counseling With Children	(3-0)3
EDS	687	Special Topics in Guidance	(3-0)3
EDS	688	Counseling Needs of Exceptional Children	(3-0)3
EDS	689	Counseling and Training of Parents with Children of Special Needs	(3-0)3
EDS	690	Application of Psychology to Education	(3-0)3

ELECTIVE GRADUATE COURSES for M.S. and Ph.D. PROGRAMS

* *In addition to the courses below, students may take the area courses as "elective" with the permission of their advisors, the course instructor, and the department.*

EDS	501	Social Theories as Applied to Education	(3-0)3
EDS	503	Use of SPSS in Educational Research	(3-0)3
EDS	514	School as a Social System	(3-0)3
EDS	518	Major Trends in Sociology of Education	(3-0)3

EDS	519	Contemporary Theories in Sociology of Education	(3-0)3
EDS	521	Studies in Gender and Education	(3-0)3
EDS	571	Comparative Education	(3-0)3
EDS	572	Advances in Psychological Foundations of Education	(3-0)3
EDS	573	Current Issues in Turkish Education	(3-0)3
EDS	574	Mental Health Issues	(3-0)3
EDS	575	Ethical Issues in Counseling	(3-0)3
EDS	578	Contemporary Philosophies of Education	(3-0)3
EDS	579	Independent Study in Education	(3-0)3
EDS	580	Adult Education	(3-0)3
EDS	601	Qualitative Research Methods in Education	(3-0)3
EDS	604	Multivariate Statistical Techniques in Education	(3-0)3
EDS	609	School and Society	(3-0)3
EDS	620	Current Issues in Higher Education	(3-0)3
EDS	656	Changing World Perspectives in Education	(3-0)3
EDS	660	Teaching in Higher Education	(3-0)3

M.A. PROGRAM IN HUMAN RESOURCE DEVELOPMENT IN EDUCATION (HRDE)

(Without-Thesis)

Required Courses

HRDE	505	Inquiry Methods	(3-0)3
HRDE	510	Educational Organizations and Design	(3-0)3
HRDE	515	Designing Training Programs	(3-0)3
HRDE	520	Training Strategies and Techniques	(3-0)3
HRDE	525	Assessment of Training Programs	(3-0)3
HRDE	530	Performance Evaluation	(3-0)3
HRDE	589	Term Project/Internship	NC
HRDE	800-899	Special Studies	NC
HRDE	900-999	Special Topics	NC

Elective Courses

HRDE	550	Interpersonal Relations	(3-0)3
HRDE	552	Career Development Counselling	(3-0)3
HRDE	554	Total Quality Management in Education	(3-0)3
HRDE	556	Strategic Planning in Education	(3-0)3
HRDE	558	Web-Based Training: Design and Implementation Strategies	(3-0)3
HRDE	560	Needs Assessment	(3-0)3
HRDE	562	Organizational Psychology	(3-0)3
HRDE	564	Adult Education	(3-0)3
HRDE	566	Educational Leadership and Change	(3-0)3
HRDE	568	Computer Mediated Learning in Network Environment	(3-0)3
HRDE	570	Leadership and Planning in Instructional Technology	(3-0)3
HRDE	572	Conflict Management in Human Resource Education	(3-0)3
HRDE	574	Special Topics in Human Resource Education	(3-0)3
HRDE	576	Trends and Issues in Human Resource Education	(3-0)3
HRDE	578	Supervision in Human Resource Education	(3-0)3

DESCRIPTION OF GRADUATE COURSES

EDS 501 Social Theories as Applied to Education (3-0)3

Introduction to philosophies of education. Discussion of major social theories of education by emphasizing their implications for Turkish education.

EDS 502 Research Methods in Education (3-0)3

An overview of educational research process and procedures; understanding and developing competence in research methods; application of different research designs.

EDS 503 Use of SPSS in Educational Research (3-0)3
Basic concepts, steps and procedures in analyzing quantitative data; preparing open and close ended data for computer entry; processing data using Statistical Package for Social Sciences (SPSS); determining appropriate statistical procedures; interpreting statistical data and preparing them for presentation.

EDS 504 Educational Statistics I (3-2)4
Basic statistical techniques for carrying out an educational research. Coding and entering data, use of descriptive statistics for data tabulation and summarization. Percentiles and standard scores, normal distribution, sampling distribution and central limit theorem, correlation and simple linear regression analysis, hypothesis testing for one and two sample cases, z, t, F, chi-square distributions, one and two way analyses of variance.

EDS 505 Prothesis Seminar NC
Development of master's thesis and presentation of thesis proposal. The course involves design, methods and other matters of concern in the preparation of an acceptable master's thesis proposal.

EDS 508 Educational Statistics II (3-2)4
Students with some educational statistics background learn advanced statistical techniques with the aid of computer packages, such as SPSS and LISREL. The course focuses on multiple linear regression, multivariate analysis of variance (MANOVA), repeated measure analysis, analysis of covariance (ANCOVA), factorial analysis of variance, discriminant analysis, principle component analysis, and path analysis.

EDS 511 Supervisory Techniques I (3-0)3
Different approaches to supervision and supervision education, supervision of classroom activities and disciplinary matters.

EDS 512 Administrative Processes (3-0)3
Analysis of major administrative processes such as planning, organization, staffing, coordination and decision-making, with the consideration of student interest and needs.

EDS 513 Administrative Problems in Education (3-0)3
Review of educational institutions in their relationship to other institutions, the community and the pressure groups and the problems related to these relationships with special emphasis on the identification of the problem areas for individual students towards their thesis preparation.

EDS 514 School as a Social System (3-0)3
Analysis of educational institutions as social systems. Review of modern organizational theory as well as organizational typologies. An analysis of role, responsibility, authority and status systems in educational organizations. And also organizational climate, motivation incentives and job satisfaction in education.

EDS 515 Organizational Psychology (3-0)3
Human problems in organizations. Organizational perspectives of human nature and motivation. Leadership and participation. Inter group problems in organizations. Organizations as dynamic and developing systems.

EDS 516 Group Dynamics and Leadership (3-0)3
An analysis of primary and secondary group dynamics. Dynamics of organizational behavior. Conflict in organizations. Several leadership theories and their applicability in Turkey and other developing countries.

EDS 517 Educational Organizations and Design (3-0)3
An investigation in organizations in terms of their design, climates and the other characteristics as well as the theories, with the emphasis on educational organizations. Study of various issues and problems in Turkish educational organizations.

EDS 518 Major Trends in Sociology of Education (3-0)3
Examination and understanding of major Sociological Theories. Reflections and implications of Durkheimian, Weberian and Marxian discourses for education. An analytical examination of Structural Functionalist and Conflict Theories concerning their implications for education Reconceptualization of education in the process of production and reproduction of the social order.

EDS 519 Contemporary Theories in Sociology of Education (3-0)3
The investigation of recent theoretical approaches and dilemmas in sociology of education with emphasis on cross-cultural comparisons. Economic, political, cultural and technological inequalities in the light of Human capital, schooling for equality, economic growth, Development and Modernization versus Underdevelopment and Dependencia theories.

EDS 520 Strategic Planning in Higher Education (3-0)3
Theoretical background of strategic planning, basic steps of carrying out a strategic planning in public

institutions. Based on a case study design, this course provides hands-on experience on strategic planning through which students can apply a similar framework in carrying out a strategic planning process in school organizations as well as in other public and nonprofit organizations.

EDS 521 Studies in Gender and Education (3-0)3
Conceptual and empirical analysis of gender issues. Gender differentiation in historical, social and cross-cultural contexts. Cross-cultural analysis of gender differences in various levels and fields of education. The role of education in the process of formation and reproduction of gender and other types of inequalities in contemporary society.

EDS 523 Theories of Counseling (3-0)3
This graduate level course is designed to familiarize students with several major theoretical approaches in counseling and psychotherapy and help them integrate these approaches with practice. A secondary goal is to introduce the wide variety of styles and practices used by leaders in the field of counseling and psychotherapy.

EDS 525 Systems Analysis in Education (3-0)3
An in-depth study of the concepts: Systems and Systems Analysis, A reconsideration of education as a system. Meaning and development of MIS in education. Introduction to techniques in Systems Analysis: Flow Charts, Simulation, PERT, CPM, Linear Programming, Game Theory, and other applications.

EDS 526 Economics of Education (3-0)3
Theory of the Formation of Human Capital. Contribution of education to economic growth. Microeconomics of Education: Study of the effectiveness of educational systems.

EDS 527 Finance and Educational Planning (3-0)3
Analysis of the relation between educational systems and financial systems. Investigation of the issues of private and public finance of education.

EDS 531 Introduction to Educational Planning (3-0)3
An introductory course involved with an overview of various aspects of educational planning.

EDS 533 Total Quality Management in Education (3-0)3
Acquire an adequate understanding of the theory of total quality management as a way of continuous improvement and the skills necessary to implement it in the field of education.

EDS 540 Fundamentals of Curriculum Development (3-0)3
Analysis of the basic concepts and components of curriculum and the study of several curriculum designs.

EDS 541 Instructional Designs (3-0)3
Systems approach to instructional designs. Heuristics for instructional design. Theory base, analysis, synthesis and evaluation.

EDS 542 Theories of Learning (3-0)3
A comparative study of learning backgrounds and contemporary theories of learning and discussion of learning-teaching relationships.

EDS 544 Theories of Instruction (3-0)3
Study of the emergence and the present status of instructional theories and the discussion of the relationship between learning theories, instructional theories and practical applications.

EDS 545 Research on Teaching (3-0)3
Focuses on a critical study of contrasting approaches to the study of teaching process. Designed to survey research issues to help students develop a more critical perspective, to increase awareness of the variety of approaches to studying teaching and to provoke thought about the relationship between research and practice.

EDS 546 Contemporary Issues in Curriculum and Instruction (3-0)3
Contemporary issues in relation to curricular sources and influences. Conflicting educational theories. Need for a paradigm in the field. Innovations and reforms. Curriculum improvement.

EDS 547 Curriculum Evaluation (3-0)3
Theory and research related to curriculum/program evaluation. Study and analysis of various standards and models in curriculum/program evaluation. Application of research designs in evaluation process.

EDS 548 The Fundamentals of Social Studies Curriculum (3-0)3
Basic objectives, concepts, problems and issues in social sciences/studies curriculum. Study of historical developments, related theory and research.

EDS 549 Teaching and Learning Process (3-0)3
Philosophical, psychological, curricular applications in teaching learning process.

EDS 550 Needs Assessment (3-0)3
Theoretical and practical basis of needs assessment in preservice and in-service training programs; quantitative and qualitative approaches applied to determining needs.

EDS 554 Scale Construction in Affective Domain (3-0)3
Techniques of attitude and related characteristics measurement. Item writing and questionnaire design. Checklists, rating scales. Statistical analysis of an attitude scale. Reliability and validity of attitude scales.

EDS 555 Theories and Techniques of Measurement and Evaluation (3-0)3
Basic principles of Classical Test Theory. Interpretations of test results. Topics: nature of measurement, reliability, validity, norms and measuring units, construction of teacher-made tests, marks and marking systems, recent developments.

EDS 556 Elements of Test Theory (3-0)3
Classical test theory, item analysis, test assembly, scoring and equating, matrix sampling, introduction to latent trait theory.

EDS 558 Non-Parametric Statistics (3-0)3
Practical non-parametric statistics including probability theory, statistical inference, tests on binomial distribution, contingency tables, ranks, Kolmogoro-Simirnov type statistics. Applications drawn from the field of education.

EDS 559 Test Construction (3-0)3
Practicum providing experience in the construction of educational and psychological measuring instruments.

EDS 560 Elements of Scaling (3-0)3
Construction of scales from a wide variety of data, such as "yes-no", multiple choice, ranking and categorical data. Discussion of the major techniques such as scalogram analysis, Likert scaling, information theory, methods of ranking, paired comparisons.

EDS 562 Theory, Measurement and Research in Affective Domain (3-0)3
Theories on affective characteristics and change, discussion of selected measurement techniques, review of empirical research on measurement and change of affective characteristics.

EDS 564 Theories of Measurement and Research Designs in Psychomotor Domain (3-0)3
Discussion of basic measurement techniques, review of empirical research and measurement techniques used in psychomotor domain. Investigations of change in psychomotor domain characteristics.

EDS 565 Practicum in Measurement and Evaluation (3-0)3
Application of different measurement and evaluation models.

EDS 566 Elements of Factor Analysis and Related Techniques (3-0)3
Introduction to basic concepts of factor analysis and related statistical methodology with illustrations using empirical data on SPSS and LISREL statistical packages. Topics: relevant matrix algebra and statistics, multiple and partial correlation, structural analysis of correlation matrices, component analysis, common factor models, comparative factor analyses. Exploratory versus confirmatory analysis.

EDS 567 Item Response Theory (3-0)3
Comprehensive study of item response models and their applications in educational measurement in relation to classical test theory, including the assumptions of the models, estimation of ability parameters, calibration of tests. Investigations of model data fit statistics and other applications. Use of statistical packages, such as BILOG, LISREL, RASCAL, ASCAL.

EDS 569 Norms and Test Equating (3-0)3
Concept of reliability and validity. Different procedures for score conversion, such as linear z, transformations, and nonlinear normalized z, T and stanine transformations Establishing test norms. Test equating methodology. Anchor test design, vertical, horizontal equating, Current research in the establishment of norms and test equating.

EDS 570 Counseling with Children (3-0)3
Basic approaches to child counseling, utilizing play media in counseling, research on counseling and psychotherapy with children.

EDS 571 Comparative Education (3-0)3
Investigation and comparison of educational systems. A review of the literature related to developments, issues and problems in education across different societies. A comparison and contrast of structure, organization, content, curricula, implementation, evaluation, selection and allocation, quality and quantity of elementary,

secondary and tertiary education in various societies.

EDS 572 Advances in Psychological Foundations of Education (3-0)3
Current theory, research and practice in educational psychology to help students analyze problems and develop situations based on psychological principles. Major topics include educational psychology and the classroom teacher, cognitive, language, personal, social and moral development, impact of culture and community, behavioral, cognitive learning theories and their application, classroom management and communication.

EDS 573 Current Issues in Turkish Education (3-0)3
Analysis of micro and macro level problems of Turkish Education, including structural and organizational problems; teacher-training problems; problems of elementary education; problems of secondary education, problems of higher education; transitional problems between the various levels of education; education and market relationships; economic, political, juridical and philosophical problems.

EDS 574 Mental Health Issues (3-0)3
Modern theories and approaches of mental health are presented and compared. Using these processes, students analyze the processes by which people cope with the realities of life, intrapsychic, interpersonal and institutional demands. Adaptive processes from clinical, field and laboratory and health issues and counseling are also evaluated and discussed.

EDS 575 Ethical Issues in Counseling (3-0)3
This course is designed to equip students with the knowledge they need to deal effectively with the complex ethical issues they will confront in practice. This course covers material that expands the students learning beyond the content of the professional codes of ethics to include knowledge of the more important scholarly writings in the field and by examining emerging ethical issues.

EDS 578 Contemporary Philosophies of Education (3-0)3
Analysis of contemporary theories and philosophies of education in relation to various issues, problems.

EDS 579 Independent Study in Education (3-0)3
Study of various topics related to theory and research in education, with the cooperation of the advisor.

EDS 580 Adult Education (3-0)3
A study of and practice in the education of adults based on anthropological theory and adult psychology. Including consideration of concepts of education as a continuing process and of international strategies for the realization of this concept.

EDS 581 Student Personnel Services in Schools (3-0)3
Development and basic principles of student personnel services in different educational settings. Organizational patterns of student personnel services and elements of student personnel services

EDS 582 Principles and Techniques of Counseling (3-0)3
Understanding counseling as a process, goals of counseling, stages of the counseling process with special reference to the techniques used in each stage. Theories and research findings.

EDS 583 Group Counseling (3-0)3
Overview of the counseling group. Different theoretical approaches and techniques in group counseling. Stages in group counseling. Ethical and professional issues in group practice.

EDS 584 Field Practice I (3-0)3
Opportunity for advanced students to obtain practical experience. Identification of significant problems in an educational environment and other related settings.

EDS 585 Field Practice II (3-0)3
Continuation of Field Practice I

EDS 586 Interpersonal Relations (3-0)3
The process of relationship formation, maintenance, dissolution and investigating such relationship phenomena as self-disclosure, equity, power and conflict.

EDS 587 Counseling the Parents of Exceptional Children (3-0)3
Concept of exceptionality, the states of exceptional parents, family dynamics and relationships, parental counseling and training programs, the helping process and to understand and help to the parents of exceptional children.

EDS 588 Counseling Needs of Exceptional Children (3-0)3
Research, current trends in counseling the exceptional children concerning the educational, social, psychological and vocational needs.

EDS 589 Couple and Family Counseling (3-0)3
The family as a system, the family life cycle, dealing with families with young children and adolescents. The process of systems counseling.

EDS 590 Counseling in Higher Education (3-0)3
Growth and status of student services, theories of student development, models for higher education, essential competencies and techniques of counselor in higher education, organization and management, current trends.

EDS 591 Recent Developments in Counseling (3-0)3
Recent approaches to counseling with special reference to cognitive and developmental perspectives. Research on process and outcome in counseling and behavior change. Specialized counseling concerns.

EDS 592 Counseling for Elderly (3-0)3
Research and current trends in counseling the elderly concerning the psychological, social and leisure time needs.

EDS 593 Crisis Counseling (3-0)3
Intervention techniques used in a crisis situation such as drug induced crisis, family crisis, death of a loved one, loss of a job, retirement, financial problems, unwanted pregnancy and so on. Research on crisis counseling.

EDS 594 Counseling in Industrial Settings (3-0)3
Counseling techniques used in industrial settings and personnel selection with special emphasis to job satisfaction, workers' attitudes, group cohesiveness and employer-employee relations.

EDS 595 Career Development Counseling (3-0)3
Developmental patterns in career choice. Components of career development counseling. Different approaches to career development counseling.

EDS 596 Assessment Techniques in Counseling (3-0)3
Practice in the administration of individual tests and preparation of psychological reports. Psychological and educational assessment procedures used with counselee(s).

EDS 599 Master's Thesis NC

EDS 601 Qualitative Research Methods in Education (3-0)3
The main purpose of this course is to introduce a number of qualitative research methods commonly used in educational research and improve participants' skills in using them. The methods mainly include interview, observation, and document analysis. This course is offered primarily for those who are contemplating to use qualitative inquiry in their doctoral dissertations and/or as part of their job responsibilities.

EDS 602 Educational Finance (3-0)3
Fundamental theories of finance and how they relate to education. Introduction and discussion of controversial issues such as: Selectivity in education, student loans, education vouchers, tuition fees, etc.

EDS 603 Personnel Administration (3-0)3
The concepts of power and authority in relation to bureaucratic models. Hierarchical relation-ships. Staffing in educational systems. Analysis and review of laws, rules and regulations related to educational (public) personnel. Specific attention will be given to Public Employee Law No.657. In-Service education, evaluation of personnel, job classification, incentives in organizations. On-the-job training. Career Systems.

EDS 604 Multivariate Statistical Techniques in Education (3-0)3
Introduction to multivariate methods as principal components and factor analysis, multidimensional scaling and cluster analysis; multi-way contingency table analysis and discriminant analysis. Focus on research problems in education. Structural equation models. The explanation and use of SPSS for various topics.

EDS 605 Advanced Seminar in Supervision (3-0)3
Discussion of problems related to supervision in Turkish schools with the participation of various level ministry supervisory in discussions. Visits to several education institutions with supervisors.

EDS 606 Supervisory Techniques II (3-0)3
Supervisory roles and responsibilities. Clinical supervision and related analyses and strategies.

EDS 607 Issues in Educational Administration (3-0)3
A course on international and national aspects of transformation, innovation, and critical issues in school administration in the 1990s.

EDS 609 School and Society (3-0)3
Study of the relationships between education and other societal subsystems, as including economy, politics, culture, technology and demography. More particularly examination of the relationships between school and other societal facts, as including family, gender ethnicity religion locality and social class.

EDS 610 Educational Leadership and Change (3-0)3
A course on educational leadership. Theoretical approaches to educational leadership, organizational development. The importance of leadership as a change in educational setting with a special reference to reforming Turkish educational system.

EDS 617 Restructuring Educational Organizations (3-0)3
An in-depth study of organizational change and restructuring in education. Information age, `The new world order,` and education, emerging theoretical issues in the concept of education, magnitude and scale of emerging issues and problems related to educational organizations, and the explorations of change alternatives for the Turkish education al system.

EDS 620 Current Issues in Higher Education (3-0)3
Examinations of higher education in changing national and international context. Investigation of various dimensions of higher education: policy-making, personnel recruitment, research, promotion, etc.

EDS 625 Educational Planning for Social Development (3-0)3
Examination of the linkages between education and social development of nature. Concepts of social development and approaches to determine optimal type and levels of educational systems. Discussion of controversial issues leading to social development policy.

EDS 630 Seminar in Educational Planning (3-0)3
Analysis and study of current issues in educational planning, especially related to Turkey.

EDS 631 The Processes and Problems of Educational Planning in Turkey (3-0)3
In-depth discussion of the process and problems of educational planning since the formation of the Turkish Republic. The five year plans and educational planning and its implementation.

EDS 640 Instruction: Theory and Research (3-0)3
Theories of instruction and research in the learning process, human relations, group dynamics, communication, thought process and other fields contributing to a theory of instruction.

EDS 641 Curriculum: Theory and Research (3-0)3
Theories of curriculum development, and a survey of curriculum research and patterns of curriculum management in various systems.

EDS 643 Curriculum and Society (3-0)3
A social and philosophical frame of reference for the education system and its implications for the functioning of the curriculum development as it is related to the society.

EDS 644 The Pre-school Curriculum (3-0)3
Identification and empirical investigation of selected topics, problems and issues and innovations in pre-school curriculum.

EDS 645 The Elementary School Curriculum (3-0)3
Identification and empirical investigation of selected topics, problems, issues and innovations in elementary school curriculum.

EDS 646 The Secondary School Curriculum (3-0)3
Identification and empirical investigation of selected topics, problems issues and innovations in secondary school curriculum.

EDS 647 Comparative Higher Education (3-0)3
Comparative study of higher education systems; a review of historical and practical applications.

EDS 648 Social Studies Curriculum: Theory into Practice (3-0)3
A review of related theory and research in teaching social sciences/studies and an analysis of practical implications in Turkey.

EDS 649 A Comparative Study of Teacher Education (3-0)3
Study and improvement of teacher quality. A comparative study of teacher training programs; a review of historical and practical applications of staff development.

EDS 651 Practicum in Designing Curriculum and Instruction (3-0)3
Designing in curriculum and instruction using one or more models.

EDS 653 Seminar in Teaching Methods (3-0)3
Study of the development and improvement of teaching methods.

EDS 654 Practicum in Curriculum Evaluation (3-0)3
Curriculum/program evaluation by using different models and research designs.

EDS 655 Paradigms in Curriculum (3-0)3
An analysis and a comparison of major paradigms, orientations and their practical implications.

EDS 656 Changing World Perspectives in Education (3-0)3
Demographical, economical, sociocultural, technological changes as reflected in educational philosophies and systems with an analysis of Turkish case in this context.

EDS 657 A Comparative Study of Secondary School Programs (3-0)3
A study of secondary school programs in social sciences, science, mathematics and humanities in various systems.

EDS 660 Teaching in Higher Education (3-0)3
This course is designed for prospective faculty to improve the perceptions and skills related to instructional planning, effective teaching and evaluation. It aims to increase awareness of university course planning, teaching and learning, valuing student differences, learner motivation, student assessment, university culture and ethics, and self improvement in an academic context.

EDS 681 Advanced Individual Counseling (3-0)3
Opportunity for advanced students to obtain practical experience in individual counseling. Each student is required to carry out twenty individual counseling sessions under supervision.

EDS 682 Advanced Group Counseling (3-0)3
Opportunity for advanced students to obtain practical experience in group counseling. Each student is required to carry out at least 10 group sessions under supervision.

EDS 683 Contemporary Approaches to Counseling (3-0)3
Discussion of new approaches and their applications to different counseling settings.

EDS 684 Adjustment Problems (3-0)3
Review of theoretical approaches on the problems of adjustment. Typical adjustment problems in different developmental period. Prevention of adjustment problems.

EDS 685 Advanced Seminar in Guidance and Counseling (3-0)3
Presentation of different topics related to different areas of guidance and counseling practices. Such as vocational counseling, family counseling, counseling in schools, counseling in special education rehabilitation counseling and so on.

EDS 686 Group Counseling with Children (3-0)3
Theory and process of group counseling with children with a special emphasis on preventive group guidance procedures. Research related to group work with children.

EDS 687 Special Topics in Guidance (3-0)3
Recent approaches and special issues and problems in guidance practices with special reference to guidance services and activities in Turkey.

EDS 688 Counseling Needs of Exceptional Children (3-0)3
The special needs of gifted and handicapped children and different training and counseling approaches

EDS 689 Counseling and Training of Parents with Children of Special Needs (3-0)3
The psychology of exceptional parents, and the practice of different counseling and training approaches with parents.

EDS 690 Applications of Psychology to Education (3-0)3
Different applications of psychological principles to different educational settings.

EDS 695 Research Seminar in Educational Sciences (3-0)3
Development of doctoral dissertations and projects and presentations of plans. The course which is intended for students who have identified a reasonably narrow area for research will assist them in design, methods and other matters of concern in the preparation of an acceptable dissertation or project proposal. The course involves presentations, group discussions, and critiques.

EDS 699 Ph.D. Dissertation NC

EDS 800-899 Special Studies (4-2)NC

EDS 900-999 Special Topics (4-0)NC

DESCRIPTION OF GRADUATE COURSES IN HUMAN RESOURCE DEVELOPMENT IN EDUCATION

HRDE 505 Inquiry Methods (3-0)3
Application of qualitative and quantitative inquiry methods and techniques to human resources area to identify and solve training and development problems. Survey of inquiry methods that would help human resources education specialists to gain information to make more informed decisions. Regarding training, to assess training needs, to design and implement inquiry to meet these needs, and to communicate their findings to inform and influence future plans. Problem identification, searching and reviewing literature, research design, design of data collection instruments like questionnaires and interview guides, data collection and analytical techniques, and report preparation. Basic statistical procedures as used in quantitative inquiry methods and needs assessment.

HRDE 510 Educational Organizations and Design (3-0)3
An investigation into educational organisations in terms of their design, climates and the other characteristics as well as the related theories. Leadership, power and authority in relation to bureaucratic models, and hierarchical relationships. Organisation and management of the training function. Establishing mission for training. Developing policies and procedures for training in organisational perspective. Design for long term policies. Alternative structures for training activities. Emphasis on educational institutions/organisations, study of various issues and problems in Turkish educational institutions/organisations.

HRDE 515 Designing Training Programs (3-0)3
Examination of training and development in organisations, the purpose and role of training in increasing individual and organisational effectiveness. Nature and design of educational activities like meetings, conferences, workshops and seminars. Role of training design in human resource education process. Current research and practice in program development. Application of various models and approaches in designing training programs. Methods for conducting needs assessment, defining training objectives, determining and organising content, formulating instructional and evaluation strategies. Designing in-service training programs for various settings. Designing a training program (consisting of objectives, content and skills, implementation and evaluation) based on a small scale needs assessment.

HRDE 520 Training Strategies and Techniques (3-0)3
Various aspects of adult learning and thinking. Concepts and practices related to staff development and in-service education, review of trends in staff development and training to examine implications for the workplace. Use of various training techniques toward the purpose of achieving specific training objectives. Developing training skills through a broad range of training session activities including formal presentation, discussion and peer interaction, modelling, role-playing, case study, problem based learning, simulation, using media, warm-up activities, facilitation, developing customised activities, and modification of packaged activities. Use of informal learning processes (job assignments, mentoring, coaching, and self-directed learning) in training. Preparation of training materials for a specific target audience. Preparing a project outlining training strategies and techniques to be used for a specific training need.

HRDE 525 Assessment of Training Programs (3-0)3
Theory and research related to training program evaluation. Study and analysis of various standards and models in program evaluation. Application of various designs in evaluation process. Phases in evaluation, formative and summative evaluation, values and the evaluation process. Internal and external validity in evaluation. Developing evaluation criteria considering its many dimensions. Practical and scientific importance of evaluation. The role of evaluation and measurement in program assessment. Connecting evaluation to long term planning of training and development activities. Designing a program evaluation plan.

HRDE 530 Performance Evaluation (3-0)3
Various roles of performance evaluation. Operational measures of job performance. Performance evaluation process and procedures, evaluation instrument development and implementation, measuring training achievement.

Validity and reliability of evaluation instruments. Characteristics of performance evaluation. Scoring performance tests. Use of the results of performance evaluation for identifying weaknesses and strengths and opportunities for improvement and skills development.

HRDE 550 Interpersonal Relations (3-0)3
Understanding the importance of interpersonal relations and social skills. The process of relationship formation, maintenance, and dissolution. The association of interpersonal relationships and personal well-being. Social emotions such as feelings about relationships and other people. Expressing feelings verbally and non-verbally. Communication skills and the languages of interpersonal relationships including self-disclosure, developing and maintaining trust, ways of increasing communication skills and helpful listening and responding. Managing feelings, resolving interpersonal conflicts and barriers to interpersonal effectiveness. The application of social science research to interpersonal relations. Roles, gender, power and change in relationships.

HRDE 552 Career Development Counselling (3-0)3
Different theories of career development and application of theories to career development issues. The nature of career choice, development patterns in career choice, components of career success and satisfaction, group cohesiveness. Role of organisational awareness and commitment. Role of occupational information in career choice. Techniques and methods of career planning.

HRDE 554 Total Quality Management in Education (3-0)3
Definitions of the concept of "quality" and "total quality management". Application of the total quality management principles and procedures to educational processes. Stakeholders in total quality management. Team formation, problem solving, and policy implementation through total quality management process for the purpose of continuous organisational improvement. Daily management tools for effective total quality management. Students in this course acquire an adequate understanding of total quality management as a way of continuous improvement and the skills necessary to implement it in the field of education. Through case studies they develop their own strategies for making educational settings totally dedicated to high performance, quality and satisfaction of

HRDE 556 Strategic Planning in Education (3-0)3
Theoretical background of strategic planning, basic steps in carrying out a strategic planning in public and private organisations. Training objectives and the organisational strategy. Teamwork, process management, planning research, training, marketing and retention strategies used for growth in educational organisations.

HRDE 558 WEB-Based Training: Design & Implementation Strategies (3-0)3
This course aims to provide necessary skills and background in construction and implementation criteria, and procedures for selection and evaluation of web-based training materials; synthesis of research and resources in the field. The course also underlines major steps and techniques used in design, development and evaluation of web-based training environments. Such contemporary issues as e-learning and WBT for human resource development and professional development also receive a considerable attention in this course.

HRDE 560 Needs Assessment (3-0)3
Theoretical and practical basis of needs assessment in in-service training programs, qualitative and quantitative approaches applied to determining needs. Micro and macro training needs and their assessment. Task, knowledge, skill and ability analysis. Study of various needs analysis techniques, task analysis, competency studies, training need survey and interviews. Prioritising needs. Use of various data collection and analysis techniques for needs assessment. Linking needs analysis to training design.

HRDE 562 Organizational Psychology (3-0)3
Human values and problems in organisations (perception, personality, interpersonal transactions), organisational perspectives of human nature and motivation, leadership and participation, decision making, team management, group dynamics in organisations, conflict resolutions in organisational context, organisation as dynamic and developing systems (structure, process, change, development), implications of theory and research that underlie the field of organisational psychology in various organisational contexts. Examination of the individual as a functioning member of the groups and organisations in public and private sectors.

HRDE 564 Adult Education (3-0)3
A study of and practice in the education of adults based on anthropological theory and adult psychology including consideration of concepts of education as a continuing process and of international strategies for the realization of this concept. The concept of andragogy. Characteristics

of adults as learners, cognitive development, interpersonal development, individual differences and change. Adult learning and motivation principles. Diagnosing learning needs of adults. Designing learning experiences for adults. Tools for training adults. Working with adults in educational settings. Assessing adult learning.

HRDE 566 Educational Leadership and Change (3-0)3
Scope and influence of leadership in educational organisations. Leadership and organisational development. Leadership role descriptions. Theoretical approaches to educational leadership, trait approach, power and influence approach, behaviour approach, situational approach. Recent research and practice on educational leadership. Strategies for improving leadership. The importance of leadership in educational change process with special reference to Turkish educational system.

HRDE 568 Computer Mediated Learning in Network Environment (3-0)3
In this course students learn how to design and evaluate an educational Web site. Major outcome of the course will be a full-function educational web site. Class participation, professional quality research and products, collaborative work, high quality documentation will be major items of success in this course.

HRDE 570 Leadership and Planning in Instructional Technology (3-0)3
This course underlies a variety of innovative ideas and new ways of thinking about the value and use of technology in a school setting. The main goal of this course is to provide school administrators and leaders of educational settings with applications of educational technology to restructure their learning environments and improve schools and school programs with the merits of instructional technology. This course also covers planning, funding, and staff development models to provide the school administrators and leaders with site-based models.

HRDE 572 Conflict Management in Human Resource Education (3-0)3
An examination of conflict management processes and skills with an emphasis on interaction patterns, interpersonal relationships, and communication skills. A study of conflict, its origins, theories, sources and types, as well as the concepts and skills of conflict resolution. Factors affecting facilitation and processes of conflict resolution. Negotiation, mediation, and problem solving processes. Competence in organizational conflicts.

HRDE 574 Special Topics in Human Resource Education (3-0)3
Focuses on a variety of special topics within the spectrum of Human Resource Education. Special emphasis on the concept of team as vital part of the organization. Team building as the key to increase performance in all kinds of organizations. A unique effort to introduce the human factor of the team concept make up. Communication, conflict management, presentation skills, meeting management, critical thinking, and questioning. Action research, and e-research and its application in Human Resource Education field.

HRDE 576 Trends and Issues in Human Resource Education (3-0)3
An exploration of the contemporary and future developments, trends and issues related to Human Resource Education (HRE) field and implications for HRE professionals and adult educators. Topics will be selected from current and future workplace, societal, demographic, technological, educational, economic, political and global trends and issues affecting training and development. Students also explore the implications of future developments, trends and issues in theory and practice in HRE. They forecast future models of work, family and community and the future role of HRE specialists and adult educators.

HRDE 578 Supervision in Human Resources Education (3-0)3
An investigation of both role and function of supervisors in public and private educational settings with emphasis on supervisory skills for future school leaders, department chairs, and human resources specialists. Foundations of supervision, supervision as professional development, clinical supervision, human resource supervision and education connections, and supervision and summative evaluation are the key issues to be covered. The relationship among skills, functions, and effective human resources supervision and their implementation to the evolving nature of supervision as an emerging field in the operation of educational settings.

HRDE 589 Term Project/Internship NC
First-hand experience in the work settings for 6 hours a week to work with professionals related to the area of interest, production of a major plan, program and instrument for assessment and a written report based the internship experience. Periodic assessment of internship experience.

HRDE 800-899 Special Studies NC

HRDE 900-999 Special Topics NC

DEPARTMENT OF ELEMENTARY EDUCATION

PROFESSORS

ÇAKIROĞLU, Jale: B.S., M.S., METU; Ph.D., Indiana University.
ÖZTEKIN, Ceren ***(Department Chair)***: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

ÇAKIROĞLU, Erdinç: B.S., M.S., METU; Ph.D., Indiana University.
TANTEKİN-ERDEN, Feyza: B.S., M.S., METU; Ph.D., Florida State University.
IŞIKSAL-BOSTAN, Mine: B.S., M.S., Ph.D., METU.
SUNGUR-VURAL, Semra: B.S., M.S., Ph.D., METU.
TEKSÖZ, Gaye; B.S., M.S., Ph.D., METU.
YILMAZ-TÜZÜN, Özgül ***(Vice Chair)***: B.S., M.S., METU; M.S., Ph.D., Indiana University.

ASSISTANT PROFESSORS

AKYÜZ, Didem : B.S., Ankara University; M.S., Gazi University; Ph.D., University of Central Florida.
DEMİRCAN, Hasibe Özlen: B.S., M.S., Ph.D., METU.
HASER, Çiğdem: B.S., M.S., METU; Ph.D., Michigan State University.
OLGAN, Refika ***(Vice Chair)***: B.S., Hacettepe University; M.S., Texas A&M University; Ph.D., Florida State University.
ŞAHİN, Elvan: B.S., M.S., Ph.D., METU.

GENERAL INFORMATION: The Department offers B.S. degrees in Elementary Science Education, Elementary Mathematics Education, and Early Childhood Education. Our programs aim to raise teachers who have a strong background in theories about teaching and learning, disciplinary and content knowledge, and practicum experience. We observe the standards of teaching and learning set by the Ministry of National Education as well as universally recognized values of contemporary teaching practices and philosophies. Our programs emphasize systematic inquiry into teaching practices, integration of technology into instruction, innovative teaching methods and applications, and communicative and self-help demands of teaching profession. The department aims to cultivate an academic milieu that offers guidance, cooperation, and intellectual challenges for the students.

UNDERGRADUATE PROGRAMS: The Department runs three major undergraduate programs leading to B.S. degrees in elementary science, mathematics, and early childhood education. Graduates are qualified to teach in elementary schools and early childhood centers.

LABORATORIES AND EQUIPMENT: Science Education, Early Childhood Education, Mathematics Education, and Computer Laboratories owned by the Faculty are equipped with necessary materials to enrich the theoretical background of prospective teachers and to carry out researches in effective teaching.

CAREER OPPORTUNITIES: The career opportunities for students graduating from the department of Elementary Education according to the programs offered are as follows:

Elementary Science Education: The graduates are mainly employed as science teachers, and when needed as mathematics teachers in public, private and international schools; as well as academicians at universities. They can be employed as consultants by private and media companies working on material development for elementary science and mathematics education.

Elementary Mathematics Education: The graduates are mainly employed as mathematics teachers, and when needed as science teachers in public, private and international schools; as well as academicians at universities. They can be employed as consultants by private and media companies working on material development for elementary mathematics and science education.

Early Childhood Education: The graduates are employed as teachers and administrators in private and public childcare centers, preschools, child clubs, child development and education centers, special education institutions which are governed by the Ministry of National Education and Social Services Child Protection Agency and as academicians at universities as well as having their own institutions. Besides they can be employed by private and public institutions as consultants to develop radio, television and magazine programs for the development and education of 0-6 year-old children.

UNDERGRADUATE CURRICULUM

1) B.S. IN EARLY CHILDHOOD EDUCATION

FIRST YEAR

First Semester				Second Semester			
ECE	100	Introduction to Early Childhood Education	(3-0)3	ECE	104	Maternal and Child Health and First Aid	(3-0)3
ECE	120	Anatomy and Physiology	(3-0)3	ECE	110	Child Development and Psychology	(4-0)4
PSY	100	General Psychology	(3-0)3	ECE	126	Maternal and Child Nutrition	(2-0)2
TURK	103	Written Expression	(2-0)2	ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC	TURK	104	Oral Communication	(2-0)2
ENG	101	English for Academic Purposes I	(4-0)4	SOC	104	Principles of Sociology	(3-0)3
EDS	200	Introduction to Education	(3-0)3				

SECOND YEAR

Third Semester				Fourth Semester			
ECE	201	Music I	(1-2)2				
ECE	206	Mental Health and Adaptation Disorders	(2-2)3	ECE	202	Music II	(2-2)3
				ECE	208	Children's Literature	(3-0)3
ECE	215	Play in Early Childhood	(3-0)3	ECE	214	Teaching Science in Early Childhood	(3-0)3
ECE	250	Basic Science	(3-0)3	ECE	220	Physical Education and Games	(2-2)3
CEIT	100	Computer Applications in Education	(2-2)3	ECE	230	Curriculum in Early Childhood Education	(3-0)3
EDS	220	Educational Psychology	(3-0)3	ELE	240	Probability and Statistics	(2-2)3
ENG	211	Academic Oral Presentation Skills	(3-0)3				
Elective I			(3-0)3				

THIRD YEAR

Fifth Semester

ECE	213	Teaching Mathematics in Early Childhood	(2-2)3
ECE	303	School Experience	(1-4)3
ECE	306	Visual Arts and Material Development in ECE	(2-2)3
ECE	326	Methods of Teaching in ECE	(2-2)3
ECE	340	Classroom Management and Discipline in ECE	(2-2)3
ELE	301	Research Methods	(3-0)3
ELE	310	Community Service	(1-2)2
HIST	2201	Principles of Kemal Atatürk I	NC

Sixth Semester

ECE	302	Drama in Early Childhood Education	(2-2)3
ECE	315	Children with Special Needs	(1-2)2
ECE	325	Parent Involvement and Education	(3-0)3
ECE	466	Instructional Principles and Methods	(3-0)3
ELE	310	Community Service	(1-2)2
HIST	2202	Principles of Kemal Atatürk II	NC
CEIT	319	Instructional Technology and Material Development	(2-2)3
Elective II			(3-0)3

FOURTH YEAR

Seventh Semester

ECE	409	Creativity and Children	(2-2)3
ECE	410	Assessment and Evaluation in Early Childhood Education	(3-0)3
ECE	411	Practice Teaching I	(2-6)5
ENG	311	Advanced Communication Skills	(3-0)3
Elective III			(3-0)3

Eighth Semester

ECE	430	Practice Teaching II	(2-6)5
ECE	480	School Readiness and Transition to Elementary School	(2-0)2
EDS	424	Guidance	(3-0)3
EDS	416	Turkish Educational System and School Management	(3-0)3
Elective IV			(3-0)3

DEPARTMENT OF ELEMENTARY EDUCATION
DESCRIPTION OF UNDERGRADUATE COURSES
(EARLY CHILDHOOD EDUCATION)

ECE 100 Introduction to Early Childhood Education (3-0)3
Major approaches to and basic principles of early childhood education, educational environments, development of fundamental skills, impact of mass media and early childhood education, teacher education and school/family collaboration.

ECE 104 Maternal and Child Health and First Aid (3-0)3
Defining mother and child health, factors affecting their health in the community, growth and development, common diseases in childhood: diarrhea, upper respiratory infections, infectious diseases such as hepatitis, meningitis and parasites; immunization; common accidents in childhood and preventive care; drug usage, emergencies and special applications; health problems of women in different periods of lifetime, sexual maturation, major issues related to menopause and aging. Lecture and demonstration of first-aid for wounds and bleeding, burns and scalds, sprains, dislocation, fractures, unconsciousness conditions, suffocation, drowning and poisoning with skill training in all procedures.

ECE 110 Child Development and Psychology (4-0)4
Description, theories and principles of development, the factors affecting development, pre-natal, birth and post-natal periods, cognitive development.

ECE 120 Anatomy and Physiology (3-0)3
Basic principles of human anatomy and the fundamental mechanisms of human physiology. Structure and the functions of human body, its organization, regulation and maintenance systems,

support, movement and integration-control systems, nervous system, hormones.

ECE 126 Maternal and Child Nutrition (2-0)2
Fundamental concepts and principles of nutrition. Components of nutrients, enrichment of nutrients with respect to nutrient value, nutrition of pregnant and lactating women, malnutrition, energy balance, nutrient requirements during pregnancy, malnutrition in children, nutrition of 0-6 year old children and hygienic rules in preparation of food.

ECE 201 Music I (1-2)2
Music and education, using music in early childhood education, discriminating natural voices, becoming familiar with instruments, selection of appropriate materials, developing expression through music, developing desirable behavior via music education, getting children to participate in musical activities, construction of a music center in classroom, repertoire studies.

ECE 202 Music II (2-2)3
Continuation of ECE 201.
Prerequisite: ECE 201

ECE 206 Mental Health and Adaptation Disorders (2-2)3
The concept of mental health; various theories; psychological maturity, mental health in children and stages of mental development, definition, causes and symptoms of mental disorders, defense mechanisms, mental health in family, adaptation problems in children, childhood neurosis and psychosis.

ECE 208 Children's Literature (3-0)3
The importance of books for the growing child, development of children's literature in the world and Turkey; characteristics of children's publications; stories, folk tales, fairy tales, fable, biography, poem, riddle, etc.

ECE 213 Teaching Mathematics in Early Childhood (2-2)3
Logico-mathematical and spatio-temporal learning by the child's own experience with objects (learning by discovery), creating and inventing relationships between objects and symbols and resulting integration and reorganization of ideas by the child. Spatial relations, time concepts, number concepts, one-to-one correspondence, comparing sizes, comparing amounts, comparing and evaluating different points of view, classification, seriation, conservation.

ECE 214 Teaching Science in Early Childhood (3-0)3
Importance of science and nature in early childhood education. Methods of teaching science and nature concepts in early childhood, construction of concept maps and hands on activities; basic concepts in science and nature; living-nonliving concepts; distinction of sky and space; basic events about heat and light.

ECE 215 Play in Early Childhood (3-0)3
Description, importance and social role of play. Factors affecting play, different phases of play parallel to child development, ways to encourage play, diagnosing behavioral disorders through play.

ECE 220 Physical Education and Games (2-2)3
Movement education in early childhood education centers; the characteristics of gymnasium where the programs will be performed; facilities/equipment and their areas; exercises with equipment, programs, games. Exercises that are suitable to 3-6 year old children's movement development; games that are preparatory to sport games, musical games and practice. The teaching methods of movement education in early childhood. The basic principles in game education and teaching.

ECE 230 Curriculum in Early Childhood Education (3-0)3
Basic concepts in curriculum development and its processes; development of lesson plan, unit plan, annual and daily plan; selection of content and organization. Teaching methods and strategies; properties of materials and their selection.

ECE 250 Basic Science (3-0)3
Characteristics and classification of living organisms, structure of cell and organels, and genetics are the topics that will be taught in biology part. Atoms, molecules, chemical reactions units in chemistry. Force, motion and energy units in physics.

ECE 302 Drama in Early Childhood Education (2-2)3
Definition of drama, comparison of different types of drama, history of educational drama, importance of play and drama in the development and education of child, drama techniques, integration of pedagogic drama into daily and weekly plans in the early childhood education.

ECE 303 School Experience (1-4)3
Introducing students to the field, and gaining experience with young children. Opportunities including class observation, adaptation to classroom conditions, planning and preparation. Guided teaching practice in Early Childhood Education.

ECE 306 Visual Arts and Material Development (2-2)3
Definition, meaning and the purpose of visual arts. Art criticism, the history of the visual arts and aesthetic judgements. Preparation and application of different kinds of paints using different materials, such as crayons, water coloring, clay and ceramics. Construction of musical instruments and toys, puppets; finger puppet, cloth puppets, wooden puppet, string puppet by using waste materials. Principles and standards of toy construction, design of a kindergarten or playground.

ECE 315 Children with Special Needs (1-2)2
Definition and history of special education, definition of being handicapped. The principles of special education, educational management and integration in special education. Education of exceptional children: Children with mental retardation, learning disorders, speech disorders, adaptation and behavioral disorders, visual disorders, hearing disorders, physical disorders and gifted children. Education of parents with exceptional children. The special education system in world and Turkey.

ECE 325 Parent Involvement and Education (3-0)3
Effect of family on child development and learning; importance of intra-family relationships in psychological and social development of child; adult psychology.

ECE 326 Methods of Teaching in Early Childhood Education (2-2)3
Methods of teaching related to the specific subject-matter, teaching and learning processes, application of general methodological principles to the teaching of subject-matter, critical study and analysis of textbooks in terms of methods and strategies to be used. Micro-teaching applications and critical assessment.

ECE 340 Classroom Management and Discipline in ECE (2-2)3
Study of organizing the preschool and kindergarten classroom environment including the students, time, space and materials and basic models of classroom of classroom management and discipline.

ECE 409 Creativity and Children (2-2)3
Definition of creativity and related theories; properties of creative environment; relationship between creativity and art education; shape and concept development in art; development of drawing ability, color and proportion in children's art work, various creativity activities using re-cycled materials.

ECE 410 Assessment and Evaluation in ECE (3-0)3
Understanding the role of measurement and assessment in educational process with special attention to observation and recording methods. To define educational goals and objectives in ways those facilitate curriculum planning and student evaluation. The means of observing and recording the behaviors of young children. To use observation methods to describe children's behaviors by relating to developmental theories. Methods, including anecdotal records, running records, time samples, and frequency charts to gather information for the development of a children's development portfolio.

ECE 411 Practice Teaching I (2-6)5
Field experience and teaching practice (minimum 12 weeks) including class observation, adaptation to classroom conditions, planning and preparation for teaching. Guided teaching practice in Early Childhood Education. Discussion of these applications in class (2 hours per week seminar at the university)
Prerequisite: ECE 303

ECE 430 Practice Teaching II (2-6)5
Continuation of ECE 411
Prerequisite: ECE 411

ECE 466 Instructional Principles and Methods (3-0)3
Definition of various teaching methods that can be used in early childhood years. Methods of Teaching related to the specific subject-matter, teaching and learning processes, application of general methodological principles to the teaching of subject matter. Overview of the teaching methods in the field of early childhood education, stimulation of interest, and developing awareness for putting the theory into practice. Critical analysis of young children's learning and development and a more thorough understanding of teaching young children.

ECE 432 Gifted Children (3-0)3
A negotiation-based course designed to provide a theoretical understanding of gifted young children. Investigation of current research studies on gifted children education and their applications in classroom settings. To the extent practical, students are expected to develop activities for gifted young children.

ECE 435 Worldwide Implications of Early Childhood Education (3-0)3
In-depth examination of "best practices" with young children (birth through elementary school age) across the world as well as the issues related to the preparation and ongoing professional development of caregivers and teachers of young children.

ECE 440 Gender Equity in Early Childhood and Elementary Education (3-0)3
Introduction of the theories and empirical research in the field of gender equity in education. Analysis of sources of the gender differentiation in early childhood and elementary classrooms. Discussion of gender equity in the classrooms.

ECE 472 Strategies for Educational Research in Early Childhood Education (3-0)3
Inquiry course intended to orient early childhood education students to the conduct of social science inquiry in general and educational inquiry in particular to acquaint them with the basic information needed to understand the research process, from idea formulation through data analysis and interpretation.

ECE 480 School Readiness and Transition to Elementary School (2-0)2
Definition of school readiness and contributing factors, different domains of school readiness; being physically, socially, emotionally, and cognitively ready to school, construction of classroom activities supporting healthy transition to elementary school. Examination of Elementary school curriculum and its comparison with early childhood education curriculum. Supporting young children's emergent literacy skills, and assessment of school readiness.

2) B.S. IN ELEMENTARY SCIENCE EDUCATION
FIRST YEAR

First Semester

PHYS	181	Basic Physics I	(4-2)5
CHEM	101	General Chemistry I	(4-2)5
MATH	117	Calculus I	(4-2)5
EDS	200	Introduction to Education	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

PHYS	182	Basic Physics II	(4-2)5
CHEM	102	General Chemistry II	(4-2)5
MATH	118	Calculus II	(4-2)5
ENG	102	English for Academic Purposes II	(4-0)4
CEIT	100	Computer Applications in Education	(2-2)3

SECOND YEAR

Third Semester

BIO	101	General Biology	(4-4)6
CHEM	281	Fundamentals of Analytical and Inorganic Chemistry	(3-0)3
PHYS	283	Optics and Modern Physics	(3-0)3
ELE	240	Probability and Statistics	(2-2)3
EDS	220	Educational Psychology	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

BIO	102	General Biology II	(4-4)6
CHEM	282	Fundamentals of Organic Chemistry	(3-0)3
ASTR	201	Astronomy I	(3-0)3
ELE	225	Measurement and Assessment	(3-0)3
ELE	221	Instructional Principles and Methods	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

BIO	252	Physiology	(3-0)3
ELE	329	Instructional Technology and Material Development	(2-2)3
ELE	331	Laboratory Applications in Science	(2-2)3
ELE	343	Methods of Teaching Science I	(2-2)3
TURK	305	Oral Communication	(2-0)2
Elective I			(3-0)3

Sixth Semester

ELE	310	Community Service	(1-2)2
EDS	304	Classroom Management	(3-0)3
GEO	231	Elements of Geology	(3-0)3
TURK	306	Written Communication	(2-0)2
ELE	344	Methods of Teaching Science II	(2-2)3
BIO	317	Molecular Biology	(3-0)3
Elective I			(3-0)3

FOURTH YEAR

Seventh Semester

ELE	419	School Experience	(1-4)3
ELE	440	Science Technology and Society	(3-0)3
ELE	411	Environmental Sciences	(3-0)3
Elective II			(3-0)3
Elective III			(3-0)3

Eighth Semester

BIO	433	Introduction to Evolution	(3-0)3
EDS	424	Guidance	(3-0)3
ELE	420	Practice Teaching in Elementary Education	(2-6)5
EDS	416	Turkish Educational System and School Management	(3-0)3
Elective IV			(3-0)3

3) B.S. IN ELEMENTARY MATHEMATICS EDUCATION

FIRST YEAR

First Semester

MATH	111	Fundamentals of Mathematics	(3-0)3
MATH	117	Calculus I	(4-2)5
MATH	115	Analytic Geometry	(3-0)3
ENG	101	English for Academic Purposes I	(4-0)4
EDS	200	Introduction to Education	(3-0)3
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	112	Discrete Mathematics	(3-0)3
MATH	118	Calculus II	(4-2)5
MATH	116	Basic Algebraic Structures	(3-0)3
ENG	102	English for Academic Purposes II	(4-0)4
CEIT	100	Computer Applications in Education	(2-2)3

SECOND YEAR

Third Semester

PHYS	181	Basic Physics I	(4-2)5
STAT	201	Introduction to Probability and Statistics I	(3-0)3
MATH	219	Introduction to Differential Equations	(4-0)4
ELE	221	Instructional Principles and Methods	(3-0)3
EDS	220	Educational Psychology	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

MATH	201	Elementary Geometry	(3-0)3
PHYS	182	Basic Physics II	(4-2)5
STAT	202	Introduction to Probability and Statistics II	(3-0)3
ELE	225	Measurement and Assessment	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

MATH	260	Linear Algebra	(3-0)3
ELE	341	Methods of Teaching Mathematics I	(2-2)3
TURK	305	Oral Communication	(2-0)2
Elective I			(3-0)3
Elective II			(3-0)3

Sixth Semester

ELE	310	Community Service	(1-2)2
ELE	329	Instructional Technology and Material Development	(2-2)3
ELE	342	Methods of Teaching Mathematics II	(2-2)3
EDS	304	Classroom Management	(3-0)3
TURK	306	Written Communication	(2-0)2
Elective III			(3-0)3

FOURTH YEAR

Seventh Semester

ELE	301	Research Methods	(3-0)3
ELE	419	School Experience	(1-4)3
ELE	465	Nature of Mathematical Knowledge for Teaching	(3-0)3
Elective IV			(3-0)3
Elective V			(3-0)3

Eighth Semester

ELE	420	Practice Teaching in Elementary Education	(2-6)5
EDS	416	Turkish Educational System and School Management	(3-0)3
EDS	424	Guidance	(3-0)3
Elective VI			(3-0)3

DEPARTMENT OF ELEMENTARY EDUCATION
DESCRIPTION OF UNDERGRADUATE COURSES
(SCIENCE AND MATHEMATICS EDUCATION)

ELE 221 Instructional Principles and Methods (3-0)3

Basic concepts and principles of teaching and learning. The importance and benefits of instructional planning. Planning instruction (yearly plan based on units, daily plan and examples of activities). Teaching and learning strategies. Instructional methods and techniques and their relation to practice. Instructional tools and materials. Teacher's duties and responsibilities in improving the quality of instruction. Teachers' qualifications.

ELE 224 Instructional Planning and Evaluation (3-2)4

Basic concepts in curriculum development and its processes; development of lesson plan, unit plan, annual and daily plan; selection of content and organization. Teaching methods and strategies; properties of materials and their selection; measurement and evaluation; approaches in evaluation; types of tests; developing achievement tests.

ELE 225 Measurement and Assessment (3-0)3

Focuses on construction and use of classroom tests to assess student learning in relation to instructional objectives, test interpretation, basic psychometric statistics and reporting.

ELE 240 Probability and Statistics (2-2)3

Data collection, sampling, sampling distribution and estimation, permutation and combination, probability, continuous random variables and distribution, estimated value, data analysis, hypothesis testing, Chi-square test, regression and correlation.

ELE 301 Research Methods (3-0)3

Provides a fundamental understanding about the principals of carrying out research in social sciences, methods of science, and basic concepts used in research and scientific endeavor (fact, knowledge, absolute, theory, praxis, axiom, paradigm, etc.). During the course, different research methods (experimental, associational, descriptive, action research), different data collection instruments (tests, questionnaires, interviews, observations), different data analyses strategies (qualitative, quantitative), and different

sampling strategies (purposive, random, systematic, etc.), conducting a literature review are examined. Discussion of the writing a research report.

ELE 310 Community Service (1-2)2
The importance of community service, identifying the recent problems in society and preparing projects for possible solutions, participating in panels and conferences as an audience or speaker or organizing them, conducting voluntary job in projects regarding the social responsibility, gaining knowledge and skills regarding the implementation of community services in schools.

ELE 317 Instructional Development and Media in Mathematics Education (3-2)4
Characteristics of various instructional technologies, the place and the use of technologies in instructional process, development of teaching materials through instructional technologies (worksheets, transparencies, slides, videotapes, computer-based course materials, etc.) and assessment of the qualities of various teaching materials.
Prerequisite: CEIT 100

ELE 329 Instructional Technology and Material Development (2-2)3
Characteristics of various instructional technologies, the place and use of technologies in instructional process, development of teaching materials through instructional technologies (worksheets, transparencies, slides, videotapes, computer-based course materials, etc.), and assessment of the qualities of various teaching materials.
Prerequisite: CEIT 100

ELE 331 Laboratory Applications in Science (2-2)3
Laboratory experiments in science education. Improvement of skills in setting up experiments in science courses for elementary schools through 6-8.

ELE 332 Laboratory Applications in Science II (2-2)3
Laboratory experiments in science. Developing skills to design and conduct experiment and activities in science courses for elementary school students.

ELE 336 Methods of Science and Mathematics Teaching (3-4)4
Concepts of methods and teaching strategies in elementary education. Different methods of instruction, such as expository, inquiry, discovery, demonstration, discussion, problem solving and cooperative learning as applied to the teaching and learning process in teaching science and mathematics at elementary schools.
Prerequisite: ELE 224

ELE 341 Methods of Teaching Mathematics I (2-2)3
Basic concepts of school mathematics and their relationship to mathematics teaching, basic principles of mathematics teaching and its roots in laws and education policy, main purposes of mathematics teaching, and methods, techniques and materials in mathematics teaching. Analysis of the elementary school mathematics curriculum (goals, outcomes, themes, units, activities, etc). Analysis of student textbooks and workbooks, and teacher editions.

ELE 342 Methods of Teaching Mathematics II (2-2)3
Mathematics problems and mathematical problem solving. Importance of mathematical problem solving, categorization of mathematics problems, purposes and processes of problem solving. Teaching how to solve word problems and ill-structured mathematics problems. Teaching whole numbers, operations with whole numbers, fractions, ratio and proportion, data analysis, and geometry in elementary school. Problem-based learning. Lesson planning, presentation and evaluation.

ELE 343 Methods of Teaching Science I (2-2) 3
Concepts of science process skills, scientific inquiry, nature of science, conceptual understanding, graphical organizers, such as concept map, V-diagram, KWHL, and roundhouse, and teaching strategies and their applications in elementary science education. Analysis of science textbooks will also be the focus of course.

ELE 344 Methods of Teaching Science II (2-2) 3
Teaching strategies for elementary science including project-based learning, problem-based learning, peer instruction, role playing, teaching with analogy, laboratory and field work and use of technology in science teaching. Designs and implements classroom lesson plans, and microteaching.

ELE 356 Activity-Based Mathematics Instruction (2-2)3
Presents a variety of mathematics teaching techniques and activities that can be used in 4-8 classrooms. A focus is placed upon the possibilities of making math classes motivating and enjoyable for young learners. Topics include teaching via problem solving, appropriate instructional

sequences for activities, assessing learning, and use of technology.

ELE 411 Environmental Sciences (3-0)3
A course designed to help students to develop a concern for the environment and sustainable use of natural resources in line with the following concepts: the history of the environmental science and environmental problems; people, population and the environment; global and local environmental problems; sources of pollution, air, water, soil, radioactive pollution problems, loss of biological diversity and to help students to develop an insight about individual and public responsibilities in line with introducing activities of Non Governmental Organizations, case studies and environmental education practices.

ELE 420 Practice Teaching in Elementary Education (2-6)5
Field experience and teaching practice (minimum 12 weeks) including class observation, adaptation to classroom condition, planning and preparation for teaching. Guided teaching practice in science in elementary schools. *Prerequisite: ELE 437*

ELE 421 History and Nature of Science (3-0)3
Provides a fundamental understanding about the main issues and approaches in history, philosophy and nature of science. Discussions related to nature of science include what is science?, features of science, aims of science, origins of modern science, and growth of scientific knowledge. Discussions related to philosophy of science include logical positivism, analytic philosophy, existentialism, and postmodernism. Discussions related to history of science include development of major understanding and discoveries in physics, biology, and earth science while comprising the characteristics of scientific method. Further discussions include ethics, epistemology, ontology, logic, and science, technology and society.

ELE 430 Exploring Geometry with Dynamic Geometry Applications (2-2)3
This course will be important for preservice mathematics teachers in terms of gaining variety of perspectives in teaching and learning of geometry and mathematics. It will be helpful for students to become familiar main issues in elementary mathematics education in order to support an understanding of the important concepts, principles, approaches and theories of teaching and learning mathematics and geometry in classroom settings.

ELE 419 School Experience I (1-4)3
Classroom observation including Organization and management of school, daily activities in the school, group activities, a day of a teacher, a day of a student, school-family cooperation, observation of major and non-major courses, school and related problems, various teaching learning activities, examination of materials and written sources.

ELE 420 School Experience II (1-4)3
Classroom observations including teaching methods, various teaching learning activities, and conducting microteaching.

ELE 439 Methods of Science Teaching (3-0)3
Concepts of methods and teaching strategies in elementary education. Different methods of instruction, such as expository, inquiry, discovery, demonstration, discussion and cooperative learning as applied to the teaching and learning process in teaching science at elementary schools.
Prerequisite: ELE 336

ELE 440 Science, Technology and Society (3-0)3
A course targets to introduce students with alternative views of science and technology through reading materials outside of education, such as sociology and history of science, to reveal the meaning of STS based science education instruction, to present the rationale of such an approach, to help students to compare STS approach in science education with traditional approaches, to create STS based lesson plans and to develop students' intellectual accumulation related to science, technology and society.

ELE 443 Methods of Mathematics Teaching (2-2)3
Concepts of methods and teaching strategies in elementary education. Different methods of instruction, such as expository, inquiry, discovery, demonstration, discussion, problem solving and cooperative learning as applied to the teaching and learning process in teaching mathematics at elementary schools.
Prerequisite: ELE 336

ELE 445 Textbook Analysis in Science Education (2-2)3
Examination of science textbooks and educational programs, approved by Ministry of Education, in terms of student's level, content, language, format, and contribution to learning.
Prerequisite: ELE 224

ELE 448 Textbook Analysis in Mathematics Education (2-2)3
Examination of mathematics textbooks and educational programs, approved by Ministry of Education, in terms of student's level, content, language, format, and contribution to learning.
Prerequisite: ELE 224

ELE 455 Disaster Risk Management Education (3-0)
The philosophy of disaster risk management (DRM) in global and Turkish applications; the training for DRM /disaster risk reduction (DRR) activities, the social and economic aspects of DRM; the national and international DRM strategies

ELE 463 Special Topics in Science Education (4-0)4
A course covering the interaction of organisms with their biotic and physical environment from an evolutionary perspective. Topics follow the organisation of life through the levels of population, community and ecosystem, emphasizing diversity at each level. Terrestrial and aquatic systems are equally represented throughout the course, and the relationship of ecological theory and practice with environmental problems are highlighted.

ELE 465 Nature of Mathematical Knowledge for Teaching (3-0)3
Focus on the questions regarding the nature of mathematical knowledge needed in mathematics teaching. Exploring mathematical content knowledge and its relationship to pedagogical content knowledge and pedagogical knowledge. Investigation of the nature of knowledge types through theoretical foundations and practical implications.

ELE 467 Creative Drama in Elementary Mathematics and Science Education (3-0)3
A course targets to teach definition of creative drama; international and local historical developments of creative drama; basic concepts and techniques in creative drama; creative drama applications in elementary mathematics and science education; creative drama as discipline and art; using creative drama as teaching methodology in elementary mathematics and science education; using creative drama in alternative spaces.

ELE 473 Environmental Education (1-4)3
Develop conceptions in environmental education by using a range of strategies designed to integrate an individual's environmental knowledge, attitudes/values, and behavior. Includes opportunities to build skills that enhance learners' problem-solving abilities, critical thinking and socio-affective skills.

ELE 474 Education and Awareness for Sustainability (3-0)3
To develop environmental insights in young people and to contribute to the development of an environmentally oriented behavior with purposeful awareness building and practical conversion. To offer an insight especially for people-society-technology-nature-sustainability relationship. To introduce the concept of environmental education with emphasis on the European Union's policy.

ELE 475 Climate Change Education for Sustainability (3-0)3

The course is comprised of innovative educational approaches to help students understand, address, mitigate, and adapt to the impacts of climate change, encourage the changes in attitudes and build a new generation of climate change-aware citizens.
The course provides an introduction to climate change science and shows how the international and national communities are responding. Starting with a scientific perspective, the course content explains the causes and possible impacts of climate change; it also explores ways of coping and dealing with the problem by means of presenting real cases of both national and international context. The course also provides an insight for the individual responsibilities to cope with the problem.

ELE 477 Laboratory Applications in Environmental Education (3-0)3
Provides opportunities for students to be equipped with necessary skills and knowledge to access and evaluate science and environmental information upon which sound judgments can be made in conserving the environment through sustainable development and integrating basic principles into the real life cases.

ELE 482 Projects in Elementary Science and Mathematics Education (2-2)3
A project-based course designed to help presevice teachers to work on a theoretical or practical needs related to elementary science and mathematics education and their applications in classroom settings. To the extent practical, students are expected to develop projects related to their own primary area of study and give a seminar.

ELE 486 Methods of Teaching Current Issues on Sustainable Development (3-0)3

Interactions among environment-society-economics-technology in the context of sustainable development. Reflections of the ESD Decade on Science and Technology Curriculum in Turkey. Instructional methods and techniques pertaining to teaching and learning issues on sustainable development to be used in elementary science education. Key skills required for creating sustainable schools.

ELE 490 Project Management for Teachers (3-0)3

The proposed course embraces the general principles of the project management while addressing the specific examples of its application in education sector by teaching how to prepare, manage and finalize educational projects. Besides, it will create an opportunity for students to prepare an educational institution's development plan which is very important for educational institutions in order to make a sustainable development and increase their competitiveness. In addition, the proposed course provides information on EU and its educational activities and funds in terms of project management so that the students are able to learn how to reach educational opportunities both to develop their personal skills and to provide improvement at the educational environment they are in.

GRADUATE PROGRAMS AT THE DEPARTMENT OF ELEMENTARY EDUCATION

M.S. PROGRAM IN EARLY CHILDHOOD EDUCATION

The graduates of this program earn an M.S. degree in Early Childhood Education.

GRADUATE CURRICULUM

ECE	500	Seminar in Early Childhood Education	(0-2) NC
ECE	501	Historical and Theoretical Bases of Early Childhood Education	(3-0)3
ECE	503	Advanced Child Theory	(3-0)3
ESME	506	Quantitative Data Analysis in Education	(3-0)3
ESME	509	Educational Inquiry	(3-0)3
ECE	599	Master's Thesis	NC
ECE	8XX	Special Studies	(4-2) NC

4 Elective Courses*

Total minimum credit: 21

No of Courses with credit: 7

- These electives are approved by the Department.

GRADUATE COURSES

ECE	599	MS Thesis	NC
ECE	500	Seminar in Early Childhood Education	(0-2) NC
ECE	502	Organization and Administration of Early Childhood Programs	(3-0)3
ECE	505	Independent Study in Early Childhood Education	(3-0)3
ECE	519	Parent-Teacher-Child Relationships	(3-0)3
ECE	523	Techniques of Classroom Management and Child Study	(3-0)3
ECE	542	Early Childhood Cognitive Development	(3-0)3
ECE	544	Early Childhood Social and Moral Development	(3-0)3
ECE	552	Early Childhood Language Arts	(3-0)3
ECE	553	Infants and Toddlers	(3-0)3
ECE	554	Observing Young Children	(3-0)3

DESCRIPTION OF GRADUATE COURSES

ECE 500 Seminar in Early Childhood Education NC

Current interests of students and synthesizing experiences. An interdisciplinary approach to explore current issues and problems in early childhood education, current happenings as they relate to the issues, and major research efforts to support programs.

ECE 501 Historical and Theoretical Bases of Early Childhood Education (3-0)3

Different philosophical and psychological theories that form the foundation of early childhood education programs and practices. Historical events that influenced the direction and nature of the care and education of young children.

ECE 502 Organizationand Administration of Early Childhood Programs (3-0)3

Different organizational plans for early childhood programs. Discussion of school philosophy, goals, curriculum, housing, staffing, budget, and policies for admission, grouping, health, licensing requirements, and school-community relations.

ECE 503 Advanced Child Theory (3-0)3

In depth study of theories and theoreticians of maturationist, behaviorist, psychoanalytical, cognitive and ecological and other modern theories

ECE 505 Independent Study in Early Childhood Education (3-0)3

Project-based course designed to provide the student with the opportunity to explore and study an area of

early childhood education under the guidance of the instructor. The student is expected to produce a scholarly paper or a project related to the topic chosen and to make an oral presentation upon the completion of the paper or the project.

ECE 519 Parent-Teacher-Child Relationships (3-0)3
To assist those in the field of early childhood education in the understanding and effective handling of questions arising from parent-child relationships and teacher-parent-child relationships. Through the use of readings, case histories, and data drawn from individual experiences, an understanding is sought of the dynamics of the most frequently encountered problems of children in classrooms. Development of methods of forming constructive relationships with children, parents, and ancillary school or social agency personnel.

ECE 523 Techniques of Classroom Management and Child Study (3-0)3
Identifying and analyzing theories, programs, and essential components in classroom management. Exploring techniques for classroom teachers to use in developing a child study with emphasis on educational implications.

ECE 542 Early Childhood Cognitive Development (3-0)3
Cognitive functioning from infancy through the preschool years. Study mental development by exploring changes in thinking and problem solving in children, as well as typical and atypical neurological changes which provide (or undermine) the foundation for cognitive development. Focus on topics such as concept formation, the paradoxical nature of preschoolers' thinking styles, and the acquisition of the fantasy/reality distinction. Major cognitive theories considered in the light of current research findings of the cognitive abilities of children.

ECE 544 Early Childhood Social and Moral Development (3-0)3
Advanced study of Piaget and Kohlberg’s moral development focusing on early childhood children. A developmental perspective is applied to the study of behavioral patterns, feelings, and attitudes that early childhood children manifest in relation to other people. Topics include attachment, prosocial and antisocial behavior, gender development, and the consequences of social experience.

ECE 552 Early Childhood Language Art (3-0)3
Learning to teach letter names, letter sounds, word patterns and recognizing sight words. Different genres of literature and developing pre-reading skills of predicting sequencing and getting the meaning from printed language. Create developmentally appropriate illustration, labels and stories, choral speaking, recitation and retelling methods used to develop speaking skills to enable students to effectively communicate with others. To discover listening to various types of literature and communication. Comprehensive exploration of young children's communicative processes: listening, speaking, reading and writing. An integrated "whole language" approach, to design language arts activities that enable them to provide a language-rich environment while facilitating language growth in young children.

ECE 553 Infants and Toddlers (3-0)3
Approaches, techniques, and materials to use in caring for infants and toddlers in a program setting. Methods for developing age-appropriate curricula and setting up environments. The components of quality care and education for children ages 0-3. Physical, motor, language, cognitive, social and emotional characteristics of infants and toddlers, enhancing and supporting their development through activities, instructional materials and environmental arrangements.

ECE 554 Observing Young Children (3-0)3
The means of observing and recording the behavior of young children. To use observation methods to describe children's behavior by relating to developmental theories. Methods, including anecdotal records, running records, time samples, and frequency charts to gather information for the development of a student's children's development portfolio.

ECE 599 Master’s Thesis NC

ECE 8XX Special Studies (4-2) NC

M.S. IN ELEMENTARY SCIENCE AND MATHEMATICS EDUCATION

The graduates of this program earn an M.S. degree in Elementary Science and Mathematics Education

GRADUATE CURRICULUM

M.S. in Elementary Science and Mathematics Education

ESME	500	M.S. Thesis	NC
ESME	506	Quantitative Data Analysis in Education	(3-0)3
ESME	509	Educational Inquiry	(3-0)3
ESME	550	Seminar in Elementary Science and Mathematics Education	(0-2) NC
ESME	8XX	Special Studies	(4-2)NC

5 Elective Courses*

Total minimum credit: 21

No of Courses with credit: 7

* These electives are approved by the Department.

GRADUATE COURSES

ESME	500	MS Thesis	NC
ESME	510	Argumentation in Science Teaching and Learning	(3-0)3
ESME	525	Nature of Science in Elementary Education	(3-0)3
ESME	538	Assessment in Science and Mathematics Teaching	(3-0)3
ESME	547	Curriculum in Elementary Mathematics and Science Education	(3-0)3
ESME	557	Learning and Knowing in Mathematics and Science	(3-0)3
ESME	560	Analysis of Research in Elementary Mathematics and Science Education	(3-0)3
ESME	563	Issues in Environmental Education	(3-0)3
ESME	568	Science, Technology and Society in Education	(3-0)3
ESME	572	Independent Study in Elementary Mathematics and Science Education	(3-0)3
ESME	585	Problem Solving and Recreational Mathematics	(3-0)3
ESME	550	Seminar in Elementary Science and Mathematics Education	(0-2)NC
ESME	8XX	Special Studies	(4-2)NC

DESCRIPTION OF GRADUATE COURSES

ESME 500 MS Thesis NC

ESME 510 Argumentation in Science Teaching and Learning (3-0)3

Argumentation in science and science education; Strategies for defining and supporting argumentation; written argumentation; practical inquiry and argumentation; argumentation in socio-scientific contexts; exploring assessment related to argumentation.

ESME 525 Nature of Science in Elementary Education (3-0)3

Exploring the aspects of the Nature of Science, functions and relationships of scientific theory and laws, values and assumptions inherent to science and scientific knowledge. Specifically, emphasis is on the strategies that lead to accurate conceptions of science among elementary students.

ESME 538 Assessment in Science and Mathematics Teaching (3-0)3

A variety of assessment techniques, especially applicable to hands-on or experiential learning, will

be presented. The focus will be on developing and adapting authentic assessment for all learners of science and mathematics.

ESME 547 Curriculum in Elementary Mathematics and Science Education (3-0)3
Conceptions and definitions of curriculum. Various philosophical trends, which have influenced modern mathematics and science curriculum and instruction. Introduces basic concepts of curriculum design and provides opportunities for curriculum development.

ESME 557 Learning and Knowing in Mathematics and Science (3-0)3
Different approaches to theorizing and studying mathematics and science learning and epistemology as represented by developments in mathematics and science, educational research, and other social science fields. Theories of learning mathematics and science towards the goal of understanding and advancing students' learning, classroom interactions, and schools.

ESME 560 Analysis of Research in Elementary Mathematics and Science Education (3-0)3
Examines the current state of theory and research on learning, instruction, and curriculum in school science and mathematics. Review of selected research studies in mathematics and science education.

ESME 563 Issues in Environmental Education (3-0)3
Basic principles of environmental and conservation education stressed in grades K-8. Methods and techniques for integrating these principles into existing curricula. Designed for the development and evaluation of new interdisciplinary teaching materials.

ESME 568 Science, Technology and Society in Education (3-0)3
Emphasize interrelationships among science, technology and society. Enhance the students understanding of natures, social relations and cultural significance of science and technology. Ethical issues involving science and technology will be discussed.

ESME 572 Independent Study in Elementary Mathematics and Science Education (3-0)3
Individual research or study with a faculty member, arranged in advance of registration. A one- or two-page written proposal should be submitted to the instructor during the first week of the term specifying the scope of the project, project activities, meeting times, completion date, and student products.

ESME 585 Problem Solving and Recreational Mathematics (3-0)3
Problem-solving activities that model desired instructional strategies while examining mathematical content through various topics. Allows students to experience a hands-on approach to learning new content that can also be incorporated into elementary mathematics lessons.

ESME 550 Seminar in Elementary Science and Mathematics Education NC
Provides a forum for students to present and discuss proposals for master's theses.

ESME 8XX Special Studies (4-2)NC

Ph.D. PROGRAM IN ELEMENTARY EDUCATION

The graduates of this program earn a Ph.D. degree in Elementary Education .

GRADUATE CURRICULUM

ELE	603	Advanced Educational Research	(3-0)3
ELE	600	Ph.D. Thesis	(NC)
ELE	9XX	Advanced Studies	(NC)

6 Elective Courses*

* These electives are approved by the Department.

Total minimum credit: 21
No of courses with credit: 7

GRADUATE COURSES

ELE 565 New Trends in Education: Education for Sustainability (3-0)3
ELE 603 Advanced Educational Research (3-0)3
ELE 605 Qualitative Research in Elementary Education (3-0)3
ELE 606 Classroom Management and Effective Discipline in Early Childhood and Elementary Education (3-0)3
ELE 610 Current Issues in Elementary Education (3-0)3
ELE 611 Self-Regulation in Elementary School Settings (3-0)3
ELE 612 Motivation in Elementary School Settings (3-0)3
ELE 613 Disciplinary Knowledge and Elementary School Subjects (3-0)3
ELE 615 Mathematics Related Beliefs in Education (3-0)3
ELE 616 Pedagogy of Elementary Mathematics (3-0)3
ELE 617 Elementary Mathematics Teaching as a Learning Profession (3-0)3
ELE 618 Knowledge Base for Teaching Elementary Mathematics (3-0)3
ELE 622 Advanced Study in the Teaching of Mathematics (3-0)3
ELE 623 Technology in Mathematics Education (3-0)3
ELE 632 Advanced Study in Teaching of Elementary School Science (3-0)3
ELE 636 Science Teacher Education (3-0)3
ELE 641 Philosophical Issues in Science Education (3-0)3
ELE 642 Epistemic Issues in Science Education (3-0)3
ELE 643 Science, Technology, Environment and Society in Education (3-0)3
ELE 651 Foundations and Contemporary Issues in Early Childhood Education (3-0)3
ELE 652 International Early Childhood Education: Comparing Commonalities and Differences (3-0)3
ELE 666 Advanced Curriculum Study in Early Childhood Education (3-0)3
ELE 669 Program Development for Early Childhood Education (3-0)3
ELE 680 Science Education in Sociological Context (3-0)3

DESCRIPTION OF GRADUATE COURSES

ELE 565 New Trends in education: Education for Sustainability (3-0)3

Theoretical review and practice on the implementation of Education for Sustainable Development (ESD). Basic issues covered are, national and international agenda, national and international applications, practice on teaching methods and preparing a research proposal.

ELE 603 Advanced Educational Research (3-0)3

An advanced educational research course providing the competencies required for understanding, critically analyzing and utilizing research in early childhood and elementary science and mathematics education. Emphasis on designing the research methodology for dissertation proposals with in-depth coverage of selected topics in the design of research and the collection and analysis of data

ELE 605 Qualitative Research in Elementary Education (3-0)3

This course aims to introduce qualitative research methods and trends widely used in research concerning elementary science, elementary mathematics, and early childhood education. Special attention to the growing literature about the use of qualitative research methods in these areas is given. Students gain in-depth understanding of epistemological base of theories in qualitative research and they are encouraged to develop skills and proficiency in understanding of the research strategies such as observation, interview and document analysis and use of them in doctoral studies and further research activities.

ELE 606 Classroom Management and Effective Discipline in Early Childhood and Elementary Education (3-0)3

Study and discussion of discipline and classroom management theories. Methods of establishing an effective early childhood and elementary classroom organization to promote appropriate behavior.

ELE 610 Current Issues in Elementary Education (3-0)3

Study and discussion of current topics and issues in mathematics, science and early childhood education. Areas might include curriculum, history, research, and teacher education.

ELE 611 Self-Regulation in Elementary School Settings (3-0)3

Study of theories and research pertaining self-regulation in educational settings. Critical analysis and creation of theory, research and practice in elementary school level. Development of a broad and in-depth understanding of self-regulation.

ELE 612 Motivation in Elementary School Settings (3-0)3

Study of theories, principles and research findings pertaining to motivation in educational settings. Analysis of cases, discussions, writing reflection papers to understand the complexity of the motivational process with its implications in learning and teaching in elementary schools.

ELE 613 Disciplinary Knowledge and Elementary School Subjects (3-0)3

Analysis of philosophical base for the nature of knowledge, its creation and refutation. Cross-disciplinary comparisons of the nature of knowledge, its creation, refutation, and use in mathematics and science. Analysis of the structures of disciplines and how these structures are reflected on school subjects. Correspondence between disciplinary knowledge and knowledge as represented in schools.

ELE 615 Mathematics Related Beliefs in Education (3-0)3

Perspectives on beliefs in educational settings and their influence in teaching and learning mathematics. Beliefs about the nature of, teaching, and learning mathematics held by students, preservice teachers, and inservice teachers. School mathematics and its effect on mathematics related beliefs. Influence of teacher education programs on preservice teachers' mathematics related beliefs.

ELE 616 Pedagogy of Elementary Mathematics (3-0)3

Development of elementary mathematical thinking and knowledge in schools and other settings. Types and the historical development of mathematical understanding. Analysis of how mathematical understanding is represented in elementary mathematics. Review of research regarding the development of mathematical thinking and understanding.

ELE 617 Elementary Mathemtics Teaching as a Learning Profession (3-0)3

Research about beliefs of prospective, beginning, and experienced mathematics teachers about mathematics teaching as a profession. Influence of teachers' beliefs on their mathematics teaching practices. The relationship between perceptions of nature of mathematics and perceptions of elementary mathematics teaching.Analysis of opportunities for teacher learning in different instructional settings. Observation, conversation, writing, and classroom research as tools for improving mathematics teaching.

ELE 618 Knowledge Base for Teaching Elementary Mathematics (3-0)3

Analysis of teaching elementary mathematics in terms of knowledge to perform it. Exploring content knowledge, pedagogical content knowledge, and pedagogical knowledge for teaching elementary mathematics. Special types of knowledge to teach elementary mathematics. The relationship between types of knowledge for teaching elementary mathematics. The usage of knowledge base in the practice of teaching elementary mathematics.

ELE 622 Advanced Study in the Teaching of Mathematics (3-0)3

Combines theory of learning, curriculum development, and research in the teaching of elementary school mathematics with instructional strategies. Special attention will be given to teaching strategies that are specific to mathematics. Include a study on establishing foundations on which to build instructional strategies. Opportunities will be provided for individual and group study of content, methodology, and instructional materials for modern mathematics programs.

ELE 623 Technology in Mathematics Education (3-0)3
Examines modern technologies and their impact on the mathematics curriculum. Focus is on changes that can occur in what is taught and learned (and also what can be assessed) when technologies are used. Students design curricular segments that use technologies and test them with children in classrooms. Includes project-like modules integrating several domains.

ELE 632 Advanced Study in Teaching of Elementary School Science (3-0)3
Combines theory of learning, curriculum development, and research in the teaching of elementary school science with instructional strategies. Include a study on establishing foundations on which to build instructional strategies. Opportunities will be provided for individual and group study of content, methodology, and instructional materials for modern science programs.

ELE 636 Science Teacher Education (3-0)3
Investigates sources of teacher knowledge and explores strategies for improving science teacher performance. Common and innovative approaches are studied and analyzed in terms of theory and research on teaching.

ELE 641 Philosophical Issues in Science Education (3-0)3
This course aims to build an understanding of philosophical and sociological issues relevant to school science curriculum. Different perspectives on the nature of scientific knowledge will be presented through the writings of famous philosophers of science.

ELE 642 Epistemic Issues in Science Education (3-0)3
This course focuses on ways of knowing in science education, the differences and similarities between the characteristic of school science and professional science, the nature of the school science practice and its knowledge. Different epistemic dispositions and theories related to knowing and learning will be discussed, such as constructivism and its variants, and conceptual change.

ELE 643 Science, Technology, Environment and Society in Education (3-0)3
Analyze the relationships/interactions between science, technology, environment, and society. Emphasize various implications/effects of scientific advancement within the environment and society. Evaluate the relationships and ethical implications of science, upon technology, environment, and society.

ELE 651 Foundations and Contemporary Issues in Early Childhood Education (3-0)3
Foundations of educational programs and current research and practices related to the education of young children with an emphasis on sociological, cultural, historical, and philosophical factors. Examination of early childhood program improvements and revisions such as parent involvement, anti-bias curricula, the impact of technology and media, leadership, professionalism and child advocacy.

ELE 652 International Early Childhood Education: Comparing Commonalities and Differences (3-0)3
Study and comparison of the education of young children in selected countries from a comparative perspective. Emphasis is on the historical progress and the curriculum models applied in these countries.

ELE 666 Advanced Curriculum Study in Early Childhood Education (3-0)3
In-depth study of educators and philosophers, who have influenced early childhood curricula. Emphasis on the beliefs of Piaget, Dewey, Vygotsky, Montessori, Bruner, Gardner and how they influence each student's educational belief system.

ELE 669 Program Development for Early Childhood Education (3-0)3
Current trends in planning, implementing, and assessing early childhood programs for children 0-6 years old. Emphasis is on developmentally appropriate practices, child-centered and play-based curriculum and inclusion.

ELE 680 Science Education in Sociological Context (3-0)
Science and its endeavors from a sociological perspective in order to make inferences on school science practice and science teaching. Review the historical, philosophical, and sociological views on science and their implications on science teaching.

DEPARTMENT OF FOREIGN LANGUAGE EDUCATION

PROFESSORS

DALOĞLU, Ayşegül **(*Assistant to the President*)**: B.A., University of Michigan; M.A., Bilkent University; Ph.D., METU.
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GENERAL INFORMATION: The Department of Foreign Language Education offers a B.A. program in English Language Teaching. Taking into consideration the latest developments in the field, students are provided with a solid foundation in the English language, English literature, methodology, educational sciences and linguistics in order to make them fully qualified teachers of English in secondary schools. The Department also offers a wide selection of elective courses in literature and linguistics to students in other Faculties.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

FLE	133	Contextual Grammar I	(3-0)3
FLE	135	Advanced Reading and Writing I	(3-0)3
FLE	137	Listening and Pronunciation	(3-0)3
FLE	129	Introduction to Literature	(3-0)3
EDS	200	Introduction to Education	(3-0)3
TURK	103	Written Communication	(2-0)2
FLE	177	Second Foreign Language I	(3-0)3
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

FLE	134	Contextual Grammar II	(3-0)3
FLE	136	Advanced Reading & Writing II	(3-0)3
FLE	138	Oral Communication Skills	(3-0)3
FLE	140	English Literature I	(3-0)3
FLE	146	Linguistics I	(3-0)3
FLE	178	Second Foreign Language II	(3-0)3
TURK	104	Oral Communication	(2-0)2

SECOND YEAR

Third Semester

FLE	241	English Literature II	(3-0)3
FLE	261	Linguistics II	(3-0)3
FLE	238	Approaches to ELT	(3-0)3
FLE	277	Second Foreign Language III	(3-0)3
EDS	220	Educational Psychology	(3-0)3
CEIT	319	Instructional Technology & Materials Development	(3-0)3

Fourth Semester

FLE	221	Drama Analysis	(3-0)3
FLE	280	Oral Expression & Public Speaking	(3-0)3
FLE	262	ELT Methodology I	(3-0)3
		Departmental Elective I	(3-0)3
FLE	270	Contrastive Turkish-English	(3-0)3
FLE	200	Instructional Principles & Methods	(3-0)3

THIRD YEAR

Fifth Semester

FLE	307	Language Acquisition	(3-0)3
FLE	304	ELT Methodology II	(3-0)3
FLE	311	Adv. Writing & Research Skills	
		Departmental Elective II	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC
FLE	352	Community Service	(1-2) 2
FLE	315	Novel Analysis	(3-0)3
		Non-Departmental Elective I	(3-0)3

Sixth Semester

FLE	308	Teaching English to Young Learners	(3-0)3
FLE	324	Teaching Language Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC
EDS	304	Classroom Management	(3-0)3
FLE	352	Community Service	(1-2) 2
EDS	416	Turkish Educational System & School Management	(3-0)3
		Non-Departmental Elective II	(3-0)3

FOURTH YEAR

Seventh Semester

FLE	405	Materials Adaptation and Development	(3-0)3
FLE	413	English Language Testing & Evaluation	(3-0)3
FLE	425	School Experience	(1-4)3
FLE	423	Translation	(3-0)3
Departmental Elective III			(3-0)3

Eighth Semester

FLE	404	Practice Teaching	(2-6)5
FLE	426	English Lexicon	(3-0)3
EDS	424	Guidance	(3-0)3
		Departmental Elective IV	(3-0)3

MINOR PROGRAMS

The aim of the minor program is to give students of METU the possibility to study a second foreign language. Basic knowledge of French or German is a precondition in entering the minor program. One objective of the minor program is to reinforce and develop knowledge of French or German. The academic objectives of the program are to give the students, according to their inclinations and interests, knowledge about French or German linguistics, French or German culture and literature, French or German for special purposes, translation, and methods of French or German language teaching.

MINOR PROGRAM IN GERMAN

FLE	371	Comparative Grammar: German- Turkish I	(3-0)3
FLE	372	Comparative Grammar: German- Turkish II	(3-0)3
FLE	373	Translation from German	(3-0)3
FLE	374	Readings in German Contributions to Humanities	(3-0)3
FLE	375	History of German Culture	(3-0)3
FLE	376	Development of Communicative Competence in German	(3-0)3
FLE	377	Practice Teaching in German	(3-0)3
FLE	378	German Scientific Texts	(3-0)3
FLE	471	Survey of German Literature	(3-0)3
FLE	472	Introduction to German Linguistics	(3-0)3
FLE	473	Translation into German	(3-0)3
FLE	474	Advanced Literary Texts in German	(3-0)3
FLE	475	Methods of German Language	(3-0)3
FLE	476	Lexical Structure and Word Formation in German	(3-0)3
FLE	478	German in Business and Administration	(3-0)3
FLE	479	Logic and Methodology of Sciences	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

FLE 133 Contextual Grammar I (3-0)3
This course aims to promote understanding the relation between language structures and lexical items as well as raising awareness about the attribution of meaning by means of these structures. Within the framework of a context, advanced language structures are analyzed so as to establish relations between form and text type. Synthesizing these structures, students produce advanced level texts employing these structures. The course also emphasizes interactive activities such as group and pair work.

FLE 135 Advanced Reading and Writing I (3-0)3
This course presents a wide range of authentic reading materials including newspapers, journals, reviews and academic texts in order to comprehend contrasting viewpoints and to predict and identify main ideas and to decode intersentential clues. It also aims to equip students with intensive and extensive reading habits. Critical thinking skills such as synthesizing information or analyzing a problem as well as reacting on the basis of evaluation are fostered. Such sub-skills of reading are employed by the students' in their writings.

Students also analyze and produce different types of writings (e.g. expository paragraph, descriptive paragraph, narrative paragraph, etc.); build up writing skills emphasizing the organization, coherence, and cohesion and such sub-skills as summarizing, outlining, and paraphrasing at paragraph level. The use of spelling and punctuation conventions as well as non-alphabetic symbol use will be practiced as well.

FLE 137 Listening and Pronunciation
(3-0)3

This course aims to develop students' listening and pronunciation skills while gaining confidence in communicating in English. To develop students' receptive listening skills, it employs authentic listening materials (i.e. academic and natural-setting samples) produced by diverse communities of practice to be analyzed as communication-oriented classroom activities. Starting from basic listening and phonetic skills such as discriminating minimal pairs and formulating phonetic transcriptions of problematic sounds focused in class, the course will focus on higher level listening skills and strategies such as note-taking, predicting, extracting specific and detailed information, guessing meaning from context, and getting the gist through content-based activities. Students will be provided with the fundamentals of listening and phonetics namely vowels, consonants, stress in words, rhythm and intonation as well as the usage of phonetic alphabet for learning and production purposes. Throughout the course, students will also be exposed to aural authentic listening materials such as interviews, movies, songs, lectures, TV shows and news broadcasts. This course also aims to equip student teachers with a strong sensitivity towards different accents of English language being spoken around the world. Collaborative learning through group and pair work will be encouraged.

FLE 129 Introduction to Literature
(3-0)3

The course introduces students to the study of literature as a rigorous intellectual discipline introducing ways in which one might approach literature, through the practice of close reading and analysis. It seeks to develop basic strategies for critically reading and interpreting poetry, fiction, and drama, and to introduce the basics of literary analysis and critical methods associated with various literary concerns. The course also seeks to improve the students' ability to understand, appreciate, and apply knowledge of plot, character, point of view, imagery, theme, setting, irony, tone, symbol, metaphor, metonymy, conceit, paradox, hyperbole, language and dramatic elements like hamartia and catharsis when reading fiction, poetry, or drama. Texts are selected from different periods (from classical time to the modernists) and cover three main genres of literature. The course proceeds through class discussions in which the students will demonstrate an understanding of the fundamentals of literary processes and focused writing assignments in which they employ their analytical and interpretative skills.

FLE 177 Second Foreign Language I
(3-0)3

Depending on the facilities of the department, student teachers may chose to learn one of the following languages to fulfill the second foreign language requirement: German, French, Italian.This course is an introduction to the basics of a second foreign language. It aims at providing student teachers with the skills required for basic communication. The aim for student teachers is to understand simple every day dialogues and basic reading texts, express themselves and ask questions in the basic spoken language. To fulfill these aims, dialogues and reading texts are utilized. Student teachers are exposed to the basic structures and vocabulary items of the target language in communicative contexts, but grammar is not the primary focus. Listening is an important component of the course and is integrated especially with speaking. Besides, some insights into the target culture and life style will be given.
*This course is prerequisite for Second Foreign Language II and III.

FLE 134 Contextual Grammar II
(3-0)3

This course is a continuation of Contextual Grammar I. This course leads students to have a critical perspective into the advanced level structures (e.g. word classes, elements of the sentence, types of sentence, sentence fragments etc.) of different types of texts on a contextual level. Building upon analysis and synthesis, students evaluate the most problematic forms of English grammar with guidance in their function and usage using methods such as error analysis or discourse analysis. Besides presenting a descriptive review of the forms and function of advanced English grammar structure, this course encourages students to develop a critical stance toward the use of these structures in various contexts. The course also emphasizes interactive activities such as group and pair work.

FLE 136 Advanced Reading & Writing II
(3-0)3

This course is a continuation of Advanced Reading and Writing I. This course promotes higher level thinking skills. By processing a variety of different

authentic reading texts, students will develop superior-level sub-skills of reading namely, making inferences and deductions, and reading between the lines. Students will relate inferences from the text to real life, and gain insights into the cultural similarities and differences. By means of the awareness gained from the texts, students will analyze, synthesize and evaluate information and therefore, in their compositions, react to readings. Students will also analyze and produce different types of essays (e.g. comparison and contrast, classification, process analysis, cause-and-effect analysis, and argumentative) that are unified, coherent and organized. In addition to the integration of reading with writing, research-based instruction will be adopted, so that students will develop basic research skills including library/internet search, and basic research report writing skills such as citing, paraphrasing and referencing.

FLE 138 Oral Communication Skills (3-0)3

This course offers a variety of different communication-oriented speaking opportunities such as discussions, individual and group presentations and other interactive tasks providing opportunity for students to improve their oral competence by developing effective language use both in formal and informal contexts. It offers extended communicative tasks such as debates, role-plays, individual and group presentations, impromptu speeches and other interactive tasks providing opportunity for students to improve their oral competence by developing effective language use both in formal and informal contexts. As in-class activities, for the promotion of interest and motivation in communication, the course also includes discussion topics, interesting facts, stimulating quotes as well as literary texts which are structurally and intellectually complex and thought-provoking. Integrating different reading and listening texts into communication-oriented tasks, this course aims to develop students' productive skills beyond their receptive skills. By exploring components of communicative competence, this course aims to equip students with the necessary skills to become successful communicators as well as language teachers. Students will develop a good command in supra-segmental features (pitch, stress and intonation) as well as strategic competence in repairing communication breakdowns in communication on the basis of continuous feedback received throughout the course. Common pronunciation mistakes are listed by the instructor and discussed regularly so as to raise the awareness of students as future language teachers. By also utilizing theoretical and practical knowledge acquired in the listening and pronunciation course, students will be expected to deliver informative presentations individually and collaborate with a group to deliver a persuasive group presentation. Students will be acquainted with the use of audiovisual aids (OHP, power point, posters) and techniques which will help them become effective speakers.

FLE 140 English Literature I (3-0)3

This course offers a broad overview of major English works from the Anglo-Saxon period (ca. 600-1100) through the 17th century, and introduces the students to the intensive examination of literary texts in various genres with references to the cultural, philosophical, scientific, and ethical context they were written in. It involves discussion of some of the most influential critical schools of thought which shaped the general features of the texts. By the end of the course the students are expected to perform a reasonable close reading by analyzing the literary and figurative elements in poetry, fiction and drama in the relevant literary periods. The course also provides a kind of background for their professional and intellectual development; and imparts skills of interpretation, analysis, research and writing that are useful in a broad range of professional activities. The course gives them the opportunity to practice and improve different reading skills strategies and to increase their existing vocabulary base. The course proceeds through class discussions in which the students will demonstrate an understanding of the fundamentals of literary processes and focused writing assignments in which they put their analytical and interpretative skills at work and apply the principles of different writing styles.

FLE 146 Linguistics I (3-0)3

An introduction to the basic concepts in linguistics. Components of language as a system: phonology; morphology; semantics and syntax. Linguistic competence and performance; the arbitrariness of the linguistic sign; linguistic creativity; language universals. The anatomy of the brain and language; brain lateralization and handedness; and language processing. Semantics: componential analysis; semantic relations; collocational meaning; thematic relations. Pragmatics and discourse analysis: speech act theory; the Cooperative Principle; politeness and speech acts; formal aspects of discourse; cohesion; discourse and the context of situation.

FLE 178 Second Foreign Language II (3-0)3

This course is a continuation of "Second Foreign Language I". It aims at providing communicative

tasks for student teachers to communicate in the target language. Student teachers will be exposed to commonly occurring grammatical patterns and vocabulary items in written texts such as newspapers, magazines and short stories. Simple writing tasks will also be integrated into the course. Both listening and speaking are important components of this course and more vocabulary items will be presented through longer dialogues and reading texts. More insights into the target culture and life style will be given through the use of authentic materials.
*This course is prerequisite for Second Foreign Language III

FLE 241 English Literature II (3-0)3
This course offers a broad overview of major English works from the end of 17th century up to the present time. As in the Survey of English Literature I, the cultural, philosophical, scientific, and ethical background of the texts is explored in detail with references to some of the most influential critical schools of thought. The course seeks to give the students an appreciation of literary texts in various genres written in the last three hundred years. As this is the continuation of Survey of English Literature I, the students can see how works written in different times can inform each other and the literary works written at present; and they can relate their readings of past literature to 20th century context. As a result of successful completion of this course, the students will be able to:
* Acquire an awareness of the methods of literary analysis and critical methods associated with various literary concerns by analyzing the literary and figurative elements in poetry, fiction and drama in the relevant literary periods.
*Recognize the names and works of creative individuals from each time period;
*Explain the important literary features of each period;
*Recognize concepts from each period and relate these to individuals and their works;
*Analyze specific genres and interpret selected works.
The course proceeds through class discussions and focused writing assignments.

FLE 261 Linguistics II (3-0)3
A continuation of Linguistics I. Phonetics: branches of phonetics; the difference between orthography and speech; articulatory phonetics; consonants and vowels; diphthongs and triphthongs in English. Phonology: phonemes; allophones; distinctive features; minimal pairs; phonetic and phonological transcription; phonological processes; suprasegmental phonology. Morphology: morphemes and allomorphs; bound and free morphemes; word structure; affixes; morphological typology of languages; types of words and word formation processes. Syntax: syntactic constituents and constituent analysis; transformational-generative grammar; phrase structure; clause structure analysis.

FLE 238 Approaches to ELT (3-0)3
This course presents basic issues and processes in ELT course design. It focuses on identifying the difference among approach, method and technique and the significance of these concepts in course design. A critical overview of methods and approaches taking a historical perspective is presented: Grammar Translation Method, Direct Method, Audio-lingual Method, Silent Way, Community Language Learning, Suggestopedia, Communicative Approach, the Natural Approach. Student teachers will discover and synthesize classroom application possibilities of such methods through designing micro-teaching of activities associated with them. A portıon of the course also focuses on current issues and practices in ELT course design, selecting the appropriate approach suitable to learner needs based on current distinctions such as ESL, EFL, EIL, ESP, EAP. It outlines current foreign language teaching trends such as constructivist approach, content-based instruction, task-based instruction, problem-based teaching, multiple intelligences, whole language approach and corpus-based applications of language teaching and designing micro-teaching of activities associated with them. This course aims to raise awareness of issues of culture and classroom second/foreign language learning, of technology use in language classrooms, and of the need for developing communicative and intercultural competencies for the language learner and teacher of the globalized world and designing micro-teaching of activities associated with them.

FLE 277 Second Foreign Languages III (3-0)3
This course is a continuation of Second Foreign Language II. It aims at further developing student teachers' reading and oral skills. Authentic texts of different genres will be studied in order to focus on more complex grammatical structures and advanced level vocabulary items. Student teachers are expected to make short oral presentations, produce role-plays, watch short extracts of movies in the target language and participate in simple discussions on a related topic in class and write letters and e-mails of greeting, complaint, response etc., diary entries and short paragraphs and essays. Further insights into the target culture and life style will be

given through authentic classroom materials and research tasks.

FLE 221 Drama Analysis (3-0)3
This course studies the characteristics of drama as a type of literature, types of drama and major trends in modern drama through close reading and analysis of plays from the Renaissance through the modern period by such playwrights as Marlowe, Shakespeare, Chekhov, Beckett and Ayckbourn. In this course, students will study and identify the elements of drama that distinguish it from other genres, read and identify individual playwrights representative of diverse theatrical expressions, examine social, religious, and philosophical forces that developed each trend, compare the contents and structures of the selected plays and discuss them in relation to each other.

FLE 280 Oral Expression & Public Speaking (3-0)3
This course is an introduction to public speaking and focuses on development of practical skills for effective communication. It emphasizes fundamental stages of speech preparation and delivery including adopting and developing audio and visual aids. Throughout the course, students will deliver extended presentations as an outcome of extensive reading and research. Samples of successful presentations will be analyzed in terms of the appropriateness of content, form, and audiovisual aids. The course also aims to foster students' oral and written language skills in job-related situations such as interviewing, socializing, telephoning, presenting information, holding meetings as well as CV and application writing.

FLE 262 ELT Methodology I (3-0)3
This course is focuses on designing and conducting needs analysis on language learner needs (e.g.: situational, objective, subjective and language needs), writing objectives that reflect these needs and designing course syllabus at the macro level and writing lesson plans at the micro level. An overview of different lesson stages (i.e.: Presentation, Practice and Production) and approaches to lesson planning and course design will be presented. Student teachers will become familiar with various syllabus types and criteria for the selection of appropriate syllabus type according to the needs of the learners, age of the learners and aims of the course; standards-based teaching, proficiency descriptors, English language proficiency standards and guidelines, Common European Framework and the European Language Portfolio ; and identity issues.

FLE 270 Contrastive Turkish-English (3-0)3
An introduction to the contrastive analysis of Turkish and English. Comparing English and Turkish with respect to their phonetic, morphological, syntactic and semantics systems. Phonetics: Consonants and vowels; word stress. Syntax: the structure of the simple clause; phrase structure; embedding. Semantics: tense, aspect and modality in Turkish and English; the perfective and non-perfective aspect; epistemic and deontic modality.

FLE 200 Instructional Principles & Methods (3-0)3
This course presents the basic instructional principles and methods in education. It focuses on the principles of learning and teaching, the significance and necessity of being planned and organized in learning. To this end, this course will cover the basic principles of course design (e.g. yearly plans, lesson plans, and etc.) as well as basic methods and techniques in learning and teaching. In this course students will discover the ways to apply their relevant theoretical knowledge while learning how to utilize their teaching materials effectively. Students will also become conscious of teacher responsibilities and develop strategies to enhance quality in education.

FLE 304 ELT Methodology II (3-0)3
This course is a continuation of ELT Methodology I. Taking a learner-centered teaching model as a guide, it emphasizes application of classroom-based research, teacher directed research and action research for the purposes of diagnosing learners' language related needs and developing remedial teaching activities. Student teachers will design lesson plans based on current trends with a focus on principles of learner monitoring and role of learner assessment in lesson planning and micro-teach these lessons. In order to foster ongoing professional development, student teachers will be informed of the national and international professional organizations (e.g.: TESOL and INGED) and practical journals (e.g.: English Teaching Forum, ELTJ, TESLJ, and TESL Reporter) as a resource to their future teaching. Selected articles from such journals on the previously mentioned issues on language teaching pedagogy and methodology will be discussed.

FLE 307 Language Acquisition (3-0)3
Theories, comparison, and illustration of native and foreign languages; stages of language development and acquisition; learning grammar and other components of language; models of foreign language learning; learner characteristics; using

language and learning stages and processes in the teaching of a foreign language.

FLE 308 Teaching English to Young Learners (3-0)3
The learning strategies of young children and the acquisition of the mother tongue as well as the learning of a foreign language; the classroom methods and techniques to be used when teaching English to young learners; the development of games, songs and visual materials and their use in teaching.

FLE 311 Advanced Writing and Research Skills (3-0)3
The teaching and application of scientific research methods and techniques; having students do small scale research in their own fields and evaluating their work.

FLE 315 Novel Analysis (3-0)3
The years from the Great Exhibition (1851) to the Second Reform Bill (1867) were a period of enormous vitality in the English novel. Major works by Dickens, Thackeray, Charlotte Bronte, Trollope, George Eliot, Gaskell, and others capitalized on the burgeoning of serial publication and circulating libraries; on unprecedented growth of consumer capitalism at home and imperial dominance abroad; on worshipful audiences ranging from distinguished literary critics, to eminent leaders of society and politics, to vast numbers of middle and lower class readers. The result was a novel of confident power and narrative scope. By focusing on this period, we are able to survey many of the major authors of Victorian fiction while attending closely to a specific set of historical developments, class relations, and gender issues. The aim of the course is to instruct the students about the characteristics of novel as a literary genre and to show the classroom techniques for teaching the realist novel and to introduce them to the Victorian novel by close study of major texts from this period.

FLE 324 Teaching Language Skills (3-0)3
This course concentrates on building language awareness and teaching skills through a detailed study of techniques and stages of teaching listening, speaking, pronunciation, reading, writing, grammar and vocabulary to language learners at various ages and language proficiency levels. Student teachers will design individual and/or group micro-teaching activities focusing on the language skills above with adherence to principles of lesson planning and techniques of the specific skills for a variety proficiency levels.

FLE 352 Community Service (1-2)2
In cooperation with national non-governmental organizations, throughout this course student teachers participate in community service to meet certain educational and social needs of local communities in order to develop their critical thinking abilities, their commitment and values, and the skills they need for effective citizenship. Driven by a philosophy of experiential learning, student teachers may take a service or a project option. For the former option, student teachers are to commit to a minimum 15 hours of community service during the term at the following approved non-profit community based agencies:
TEGV: Türk Eğitim Gönüllüleri Vakfı (http://www.tegv.org/v2/default.asp)
ÇYDD: Çağdaş Yaşamı Destekleme Derneği (http://www.cydd.org.tr/)
TGV: Toplum Gönüllüleri Vakfı (http://www.tog.org.tr/)
TEV: Türk Eğitim Vakfı (http://www.tev.org.tr/)
AÇEV: Anne Çocuk Eğitim Vakfı (http://www.acev.org/)
İLKYAR: İlköğretim Okullarına Yardım Vakfı (http://www.ilkyar.org.tr/)
ZİÇEV: Zihinsel Yetersiz Çocukları Yetiştirme ve Koruma Vakfı (http://www.zicev.org.tr/)
ÇEKÜL: Çevre ve Kültür Değerlerini Koruma ve Tanıtma Vakfı (http://www.cekulvakfi.org.tr/)
TEMA: Türkiye Erozyonla Mücadele Ağaçlandırma ve Doğal Varlıkları Koruma Vakfı (http://www.tema.org.tr/)
KIZILAY (http://www.kizilay.org.tr/)
AKUT: Arama Kurtarma Derneği (http://www.akut.org.tr/)
LÖSEV: Lösemili Çocuklar Vakfı (http://www.losev.org.tr/)
For the latter option, with the guidance of a mentor, student teachers are expected to develop and implement small-scale educational problem-based projects in cooperation with primary and secondary level educational institutions in their local surroundings.

FLE 404 Practice Teaching (2-6)5
Consolidating the skills necessary for teaching English as a foreign language at primary and secondary schools through observation and teaching practice in pre-determined secondary schools under staff supervision; critically analyzing the previously acquired teaching related knowlegde and skills through further reading, research and in class activities in order to develop a professional view of the ELT field.

FLE 405 Materials Adaptation and Development (3-0)3
Continuation of FLE 304, enabling students to acquire skills necessary for evaluating language teaching materials in current textbooks, adapting or developing materials for language teaching and language testing.

FLE 413 English Language Testing and Evaluation (3-0)3
Types of tests; test preparation techniques for the purpose of measuring various English language skills; the practice of preparing various types of questions; evaluation and analysis techniques; statistical calculations.

FLE 426 The English Lexicon (3-0)3
An in-depth analysis of the relation between lexical semantics, clause structure and discourse in English, with a focus on aspects of English grammar that are problematic for second language learners. Argument structure: types of verbs and passivisation. Lexical aspect and discourse: types of lexical aspect; aspect in discourse; adverbial modification. The syntax and the semantics of the noun phrase in English: definiteness, quantifiers, subject-verb agreement; definiteness; specificity; genericness.

FLE 423 Translation (3-0)3
This course includes the fundamental theories and approaches in the science of translation. Students translate a variety of different authentic English texts into Turkish and Turkish texts into English. Besides translation activities from diverse areas, within a contrastive analysis framework, students also engage in error analysis tasks in which they critically evaluate the appropriateness of the various translations of the same text paying attention to the idiosyncrasies regarding the unique nature of Turkish and English and its comparison to their own translation by employing different translation skills. Various aspects of translation will be evaluated including style, word selection, the role and importance of translation in language learning and teaching and cultural aspects of translation. The practical aspect of the course will go hand in hand with readings covering theoretical grounds pertinent to current issues in the field of translation. Exposure to and translation of ELT-related materials will also be strongly encouraged.

FLE 425 School Experience (1-4) 3
This course aims to prepare student teachers for full teaching practice. It gives them a structured introduction to teaching, helps them acquire teaching competencies and develop teaching skills. Student teachers have observation and application tasks that they carry out in a primary or secondary school under the supervision of a cooperating teacher. Some observation tasks include: practicing questioning skills, explaining; effective use of textbooks; topic sequencing and lesson planning; classroom management; preparing and using worksheets; effective use of textbooks; effective questioning skills; explaining.

ELECTIVES

FLE 120 History of Ideas I (3-0)3
This course and its sister course, History of Ideas II, were designed to provide the students of this department with an understanding of the basic ideas essential to any understanding of English literature and culture in general. Since this literature and culture are mostly based in Graeco/Latin philosophy and the Western church, this is where course 120 begins, it ends with Galileleo Galilei and the beginnings of a new scientific age.

FLE 131 History of Ideas II (3-0)3
This course and its sister course, History of Ideas I were designed to provide the students of this department with an understanding of the basic ideas essential to any understanding of English literature and culture in general. This course starts with Descartes and Rationalism and continues chronology through to a brief introduction to Postmodernism.

FLE 130 The Short Story (3-0)3
The characteristics of the short story are identified and analysed in this course, and its history and place in literature are discussed. Techniques of analyzing the short story are demonstrated and practiced. The students read and study various short stories by modern British and American writers such as Henry James, D H Lawrence, Doris Lessing, Katherine Mansfield, Edgar Allen Poe, Saki, Oscar Wilde.

FLE 141 English Grammar And Composıtıon I (3-0)3
Understanding the relation between advanced language structures and words (lexical items) and raising awareness about the formation of the meaning by means of these language structures; analyzing advanced language structures within the scope of text type; producing advanced level texts by employing such grammatical structures in context and analysis.

FLE 142 English Grammar And Composition II (3-0)3
A continuation of FLE 141 English Grammar and Composition I.

FLE 143 Reading Skills (3-0)3
Presenting authentic academic texts written in the field from the point of conceptual and structural perspectives; developing reading sub-skills required for higher level thinking skills such as analysis, synthesis, and evaluation; studying academic and professional writing skills; presenting applied studying skills of the academic types such as essay, article and report.

FLE 144 Developing Reading And Speaking Skills (3-0)3
Developing students´ speaking and listening skills with a variety of activities including reading; reading of and listening to authentic English passages, conversations, poems etc. with emphasis on interaction-based activities.

FLE 147 Spoken English (3-0)3
Employing variety of different listening texts that could be used in various discourses regarding from contemporary subjects to academic subjects, focusing on intonation, stress and sound differences; emphasizing the usages of phonetic alphabet in learning as well as production purposes; highlighting th importance of the accurate pronunciation for a language teacher.

FLE 227 Masterpieces of World Literature I (3-0)3
In this course the great legends in world literature from ancient times to the seventeenth century are studied. These legends come from Asia, The Far East, the Classical world and Europe. The course provides essential readings for an understanding of the foundations of literature.

FLE 228 Masterpieces of World Literature II (3-0)3
This course offers choices from a range of courses in literature, in translation or in the original language, from Europe, Asia, Africa, and Latin America, from the late 17th century through to the present day. Through the study of world literature, students will be expected to recognize, understand, and appreciate the diversity of other cultures and societies and the intrinsic value of national literary traditions different from their own. Consequently, they will be required to demonstrate a more global and historical awareness of their place in the world. Students will be required to identify specific characteristics of the various literary modes common to each national literature and literary period, and, thus, recognize the sources, qualities, and achievements of different national literatures and different literary styles and techniques.

FLE 229 Shakespeare I (3-0)3
This course is an intensive study of Shakespeare's dramatic texts selected from various genres: comedy, tragedy, history and romance. The course will center around four plays, one representative example from each sub-genre. The emphasis will be on the study of the historical background of Elizabethan England, the culture in which the selected plays were written and performed, the literary style, dramatic principles and content in Shakespeare's plays such as figurative language, scene development, dialogue, monologue, soliloquy, character development, multiplicity in plot, dramatic irony, thematic elements and their universality.

FLE 230 Shakespeare II (3-0)3
This course introduces students to different reading approaches to Shakespeare's plays. A continuation of FLE 229, four plays (different from the ones studied in other courses) will be studied this time in the light of recent critical practices. Students will explore how various modern critical approaches and literary theories such as semiotics, structuralism, poststructuralism, psychoanalysis, feminism, Marxism and new historicism have been applied to Shakespeare's plays and examine the connections between issues of language, self, gender, and power in Shakespearean dramatic texts and modern critical theory.

FLE 231 Modern Drama I (3-0)3
This course makes a survey of the development of modern drama and studies major trends and theatrical movements of the nineteenth and twentieth centuries such as realism, naturalism, symbolism, expressionism, surrealism, and the absurd through close reading of representative selection of plays by Ibsen, Strindberg, Shaw, Pirandello, Brecht, O'Neill, Ionesco, Pinter, Stoppard and others. In this course, students will examine changes in the social and political role of drama, identify the influences that formed modern drama, read and evaluate samples of plays written in different periods and countries from the perspectives of content and dramatic form, apply critical thinking skills to analyse the connections among them and study how each play responds to the historical and cultural context in which it was written.

FLE 232 Modern Drama II (3-0)3
This course studies plays from post World War II to the present. In this course, students will discover

philosophical and aesthetic developments in contemporary drama and study how these developments are introduced as modes of expression reflecting globalization and contemporary cultural, political and economic forces and changes.

FLE 233 Literature and Society I (3-0)3
Examining literature as social evidence and testimony, this course deals with literary works which provide a variety of commentaries on and insights into the societies which produced them. Literature is taken as both a product of and a commentary on its social environment, which provides as much relevant information indirectly as it does directly and literally; various theoretical models for analysing these sometimes complex interactions are introduced in this course, and students are expected to use these theories in their analyses of the set texts. A selection of important literary texts from different societies is used, including works by some of the following: Monica Ali, Atwood, Malcolm Bradbury, Beecher-Stowe, Chekhov, Coetzee, Dostoevsky, George Eliot, Flaubert, Gaskell, Henry James, Yasar Kemal, Kipling, Thomas Mann, Henry Miller, Toni Morrison, Pamuk, Tolstoy, Twain, Zola.

FLE 234 Literature and Society II (3-0)3
This course looks at the influence that literature has on society as well as the ways in which it reflects or challenges social norms; such themes as 'honour and heroism', 'religion', 'women', 'poverty', 'colonialism', 'individuality', and 'integration and alienation' are studied in relation to famous and influential works of literature. In addition, the material production of literature, history of textual transmission, and sociology of the text are examined and issues such as official and unofficial censorship, popular literature and the Canon, performance and criticism are discussed.

FLE 235 Modern Fiction I (3-0)3
This course focuses on British prose fiction from 1900 to the Second World War. After an introduction to the philosophical, political and economic background and to the arguments of Modernism, some of the main characteristics of Modernist art and of modern fiction in more general terms are studied in relation to works by such writers as James, Conrad, Wells, Bennett, Woolf, Joyce, Mansfield, Forster, Greene. The extent to which modern literary theories are responses to Modernist Fiction is discussed.

FLE 236 Modern Fiction II (3-0)3
A number of works of later 20th century and contemporary British fiction are studied in depth paying attention to issues of contemporaneity and difficulties of evaluating very recent literature, the course to include sustained discussion of the rise and development of postmodernism and the problem of a literary canon. Set texts to include works by some of the following writers: Beckett, Doris Lessing, Spark, Fowles, Golding, Carter, Lodge, Byatt, Rushdie, Barnes, Ackroyd.

FLE 239 From the Epic to the Novel I (3-0)3
In this course a study of classic epics leads to identification and delineation of important epic motifs. These motifs are then traced through significant examples of later epics and romances. Up to and including major works of the Renaissance period. This course will include discussion of the following works: *The Iliad*, *The Odyssey*, *The Aeneid*, *Beowulf*, *Don Quixote*, *Gargantua and Pantagruel*, *Paradise Lost*. Students are expected to read the complete versions of a number of these and to be familiar with the general argument and some extracts of others. These works will be discussed both formally and thematically.

FLE 240 From the Epic to the Novel II (3-0)3
In this course students are required to carry out close study and analysis of novels showing epic or epic-like motifs and themes from the eighteenth century to the present. Such works as *Tristram Shandy*, *Moby Dick*, *Ulysses*, *War and Peace*, and *The Magic Mountain* are studied in this respect.

FLE 245 Turkish Phonetics and Morphology (3-0)3
Linguistic approaches to the study of sound and form units of languages; description the phonetic and morphological units of Turkish making comparisons for teaching a foreign language.

FLE 246 Turkish Syntax and Semantics (3-0)3
The linguistic analysis and description of Turkish sentence structures; arranging materials for teaching Turkish sentence structure with a linguistic approach; the application of modern approaches to semantics to the analysis of the Turkish language; the contribution of semantics to the teaching of Turkish.

FLE 251 Creative Reading (3-0)3
"Creative Reading" is a web-based reading course that is composed of four modules. The presentation of each module has two stages. In the first stage, students read the section entitled "Strategies for Effective Reading" which basically focuses on reading strategies that aim to develop students'

reading skills, providing information on various reading strategies such as contextual clues, figurative/literal language, and tips on how to use them. At this stage students do exercises in the form of completing sentences or answering questions through which they revise the topics introduced. In the second stage, students use the skills they learned in a meaningful and communicative context. At this stage, students read stories and various articles to answer questions with a focus on comprehension of the text and the new vocabulary items. These reading materials are enriched with music, animations and pictures to provide a challenging and communicative learning and practice environment.

FLE 253 Modern Poetry I (3-0)3
This course will explore the shifting meanings of "modern" and "British" within poetic practice, charting a literary history from the late nineteenth to the late twentieth century. The first several weeks of the course will treat some of the currents that gave rise to modernist poetry in Britain, including "movements" such as Imagism and Vorticism, and the new kinds of experience brought about by World War I. The middle part of the course will be centrally concerned with two major figures of "high" modernism, T.S. Eliot and W.B. Yeats. The final part of the course will deal largely with responses to and articulations within the terms set out by modernist poetry: for example, W.H. Auden's "diagnosis" of English culture between the wars; Irish, Scots, Welsh poets' negotiation of minority cultures within British modernity; and Philip Larkin's hostility toward modernism's experimentalism and cosmopolitanism. The student will identify and explain the social, religious, philosophical and economic forces of the period and read and identify modernist poets.

FLE 254 Modern Poetry II (3-0)3
This course is designed to read and discuss a range of important American poems representing the cultural and regional diversity of American Literature. We will focus a good deal of attention on Wallace Stevens, William Carlos Williams, Ezra Pound, H.D. and Robert Duncan. This course will help students understand and appreciate Modern American Poetry through the study of the most important practitioners of poetry locating them in their historical and social context.

FLE 255 Selections from American Literature I (3-0)3
This course surveys the literary, cultural, philosophical, religious, social and economic dimensions of the Pre-colonial, Revolutionary, Romantic, early 19th century periods through a chronological study of major authors and their writing. Included on the reading list are Anne Bradstreet, Edward Taylor, Washington Irwing, James Fenimore Cooper, William Cullen Bryant, Henry Wadsworth Longfellow, Oliver Wendell Holmes, Edgar Allan Poe, Ralph Waldo Emerson, Henry David Thoreau, Nathaniel Hawthorne and Herman Melville.

FLE 256 Selections from American Literature II (3-0)3
This course will focus on historical survey of American Literature from the mid-19th century through the 20th century. This course will include Walt Whitman, Emily Dickinson, Mark Twain, Stephen Crane, Edwin Arlington Robinson, Willa Cather, Sherwood Anderson, William Faulkner, Ernest Hemingway, Gertude Stein, Ezra Pound, Marianne Moore, E..E.Cummings, Wallace Stevens, James Baldwin, Denise Levertov, Adrianne Rich, Saul Bellow, Arthur Miller, Tennessee Williams, Alan Ginsberg, J.D. Salinger, John Barth, Toni Morrison, and Louise Erdrich. Students will identify and explain the social, religious, philosophical, and economic forces behind literary movements.

FLE 257 Psychological Trends in Literature I (3-0)3
This course examines the interrelationships between literature and psychoanalysis. The idea of this course is to introduce students to psychoanalysis and to psychoanalytically informed ways of reading and interpreting texts. Readings will include a selection from the short stories of Edgar Allan Poe, E.T.A. Hoffman, Mary Shelley's *Frankenstein*, Henry James's *The Turn of the Screw*, and R. L. Stevenson's *Dr. Jekyll and Mr. Hyde*. Students will focus on the convergences between these works and various essays written by Sigmund Freud, Carl Gustav Jung, Otto Rank, Sandor Ferenczi, Melanie Klein and Jacques Lacan.

FLE 258 Psychological Trends in Literature II (3-0)3
This course will survey important texts in post-Lacanian psychoanalytic texts and literature that invites a psychoanalytic approach. In this course students will familiarize themselves with some of the key concepts of Helene Cixous, Luce Irigaray, Julia Kristeva, Slavoj Zizek and Judith Butler. They will also examine the texts written by Shoshana Felman, Gayatri Chakrovorty Spivak, Peter Brooks, Louis Althusser and Fredric Jameson and learn how to extrapolate meaning from literary texts such as James Joyce's *Ulysses* and Virginia Woolf's *Mrs Dalloway*.

FLE 259 Moral and Social Aspects in Children's Literature I (3-0)3
This course provides an introduction to different theories and differing views as to the determinants of morality and different aspects of moral development. The major current approaches to moral development are discussed with examples of application in child literature from the Victorian period up to the present.

FLE 260 Moral and Social Aspects in Children's Literature II (3-0)3
In this course children's literature is examined as a source for promoting moral and social development. Through close study of key texts in developmental psychology and children's literature, further theoretical tools are presented and personal skills are developed in the identifying and interpreting of moral aspects of text and narrative.

FLE 263 History of the Theatre I (3-0)3
This course introduces students to the origins of theatre through intensive reading and analysis of plays from ancient Greece and Rome in their theatrical and social contexts and examines the contributions of these plays to contemporary drama. In this course, the origins of Greco-Roman drama and typical structures and subject matters of tragedy and comedy will be studied, these distinguishing characteristics will be identified and analyzed as they are seen in the selected plays, the relationship between the nature and role of drama in society will be discussed and through readings, lectures, and discussions the influence of past styles, conventions and theatrical theory on Western modern drama and dramatic criticism will be explored.

FLE 264 History of the Theatre II (3-0)3
This course is a study of the development of theatre through the Middle Ages with emphasis on English drama of the Medieval period. Selected mystery and morality plays will be read and analyzed to understand the world view which they represent and the society which produced them. In this course, students will become familiar with the main types and themes of Medieval drama and discover the position and function of drama in the Medival period and the relationship of art to society. They will also explore and express the connections between Medieval drama and drama in subsequent periods.

FLE 267 The Short Story in World Literature I (3-0)3
Following a brief study of the nature of this literary form, a comprehensive collection representing the most outstanding short stories written in the past hundred years by English and American writers is examined. This course is designed to develop an appreciation of short story and to provide the students with an understanding of its processes. Students will be exposed to the common elements of short story and its terminology and the historical development of the genre through an analysis of individual short stories; their style and structure. The course also offers brief background notes on the authors, the contextual forces that influenced their orientations; and on the significance of the plays in the context of Western literature. The course will be taught through a combination of readings, and discussions in which the students will demonstrate an understanding of the elements of the short story, its historical development and the major themes of the short story.

FLE 268 The Short Story in World Literature II (3-0)3
This course covers short stories from world literature written in or translated into English (Irish, Russian, Indian, African, Australian, Canadian ...) dating from early 19th century to the post-colonial period written by a diverse range of English-speaking authors and authors from different languages. In addition to examining the literature of these writers, the course is designed to explore the biographical and historical context in which they produced as well as the social and philosophical implications of their messages. This course also aims at a contrastive analysis of generic types: short story vs. novel, short story vs. essays, and short story vs. diary; and how they inform each other; and thus, offers the students the opportunity to consider the relationships between works of literature. The course will be taught through a combination of readings, and discussions in which the students will demonstrate an understanding of the elements of the short story, its historical development and the major themes of the short story.

FLE 271 Comparative English-German Language Structure I (3-0)3
German grammar, German grammar compared to English grammar. Language training in German.

FLE 272 Comparative English-German Language Structure II (3-0)3
Continuation of FLE 271.

FLE 273 Reading Comprehension and Writing in German I (3-0)3
Developing reading and writing skills. Textual practice of grammatical knowledge.

FLE 274 Reading Comprehension and Writing in German II (3-0)3
Continuation of FLE 273; FLE 177, FLE 178, FLE 277.

FLE 275 Modern Language Use I (3-0)3
Language training in German with focus on the standard language. Lexical and structural problems in the process of communication.

FLE 276 Modern Language Use II (3-0)3
Continuation of FLE 275.

FLE 279 Introduction to Comparative Linguistics (3-0)3
The genealogical classification of the languages of the world. The topological classification of the languages of the world. Different explanations of the relationship between languages. The Indo-European language group. The Germanic language group. Universal grammar and language diversity.

FLE 281 General Linguistics I (3-0)3
Features and functions of human communication, components of language and methods of linguistic analysis with emphasis on transformational models. Study of major transformational rules. Not open to students majoring in English Language Teaching.

FLE 282 General Linguistics II (3-0)3
Analysis of phonological components of language. Brief survey of linguistic change and language variation. Language acquisition.
Not open to students majoring in English Language Teaching.

FLE 285 Language and Culture (3-0)3
Beginning with a discussion of language as a social institution, this course treats various aspects of the reciprocal relationship between language and culture, including language and world view, language and nationalism, naming and word magic, linguistic taboos, and national language policy.

FLE 286 Language and Society I (3-0)3
Basic sociolinguistic concepts; language and socialization, language and social setting, pluralingualism and verbal repertoire.

FLE 287 Beginner Italian (3-0)3
greetings, descriptions, Simple Present Tense, Simple Past Tense, Future Tense, and the fundamentals of the Italian language. Analysis of simple grammar structures and elementary conversation skills.
Prerequisite: No prior experience with Italian language.

FLE 288 Elementary Italian (3-0)3
Developing reading and writing skills of the students who have already taken FLE 177, FLE 178 and FLE 277. Italian language -as used in everyday situations. Further studies on Italian grammar taught through dictation, translation and reading exercises.
Prerequisite: FLE 177, FLE 178 and FLE 277

FLE 289 Language and Society II (3-0)3
Basic sociolinguistic concepts; attention, perception, memory; the actual production and processing of language.

FLE 291 Comparative English-French Language Structure I (3-0)3
A beginners' course in French language with focus on grammar. Knowledge of English grammar is presupposed and will be used in explaining the grammatical structure of French.

FLE 292 Comparative English-French Language Structure II (3-0)3
Continuation of FLE 291.

FLE 293 Reading Comprehension and Writing in French I (3-0)3
Developing reading and writing skills and textual practice of grammatical knowledge.

FLE 294 Reading Comprehension and Writing in French II (3-0)3
Continuation of FLE 293.

FLE 295 Post-Colonial and the Third World Literature (3-0)3
This course has a twofold aim. First, it explores literary texts written by authors born into the colonial and imperialist discourse. Second, the course focuses on texts written by authors who live(d) in a colonized country. The course will discuss literary texts against the background of theoretical formulations, historical, linguistic, geographical and cultural contexts with an emphasis on race, sex, gender and identity; and how they are represented and problematized. The students will also discuss different definitions of postcolonialism and related terms such as related terms such as cosmopolitanism, hybridity, diaspora, and nationalism with references to theoretical texts created by Edward Said, Homi Bhabha, Gayatri Spivak, Benedict Anderson and others. Texts will be drawn from a variety of genres (e.g. fiction, poetry, autobiography, drama, travel writing, essays, and film) and from several countries.

FLE 305 The English Renaissance (3-0)3

This course offers an intensive study of works by English Renaissance playwrights exclusive of Marlowe and Shakespeare. The focus will be on the structure, style and dramatic forms of the selected plays and their relation to political history and Renaissance thought. This course aims to help students gain a critical perspective of historical and social forces which contributed to the development of such genres as revenge tragedy and city comedy and to enable them to understand the homogenised concept of "the Renaissance" through varieties of textual, social and ideological construction of human experience in plays by Kyde, Dekker, Jonson, Webster, Middleton, Ford, and others.

FLE 312 19th Century English Literature (3-0)3

19th century English essays, novels, poems and drama are studied as interacting with the debates and discoveries of the long Victorian era. The social, political, scientific and philosophical discussions of the period are introduced through the works of such key figures as John Stuart Mill, Karl Marx and Charles Darwin. Taking these and other issues into consideration, the students are required to read works by Matthew Arnold, the Bronte sisters, Robert and Elizabeth Browning, Thomas Carlyle, Wilkie Collins, Charles Dickens, George Eliot, Thomas Hardy, Ruskin, the Rosettis, Walter Scott, G. B. Shaw, Mary Shelley, Tennyson, W. M. Thackeray, and Oscar Wilde.

FLE 313 Discourse Analysis for Language Teachers (3-0)3

Functional analysis of language; Methods of analyzing spoken and written language; Interaction in the classroom setting.

FLE 314 History of the English (3-0)3

Sentence structure, word formation, semantics, phonology (pronunciation change), spelling, dialectal & socio-linguistic variation. The general approach is chronological, through studies of selected passages from different times.

FLE 316 Seminar in Advanced Composition (3-0)3

Useful hints/tips on thesis writing and paraphrasing and students' professional needs, concentrating on editing and revision strategies, grading and critical evaluation of student essays, and letter/resume writing.

FLE 317 Error Analysis in ELT (3-0)3

Examining the errors frequently made by learners in the English learning process emphasis on classification of common errors, the origins of learners' errors and the ways to help learners correct their errors.

FLE 318 Audio-Visual Aids in ELT (3-0)3

Introducing different kinds of visual aids which improve the language teaching and learning process. Students will be shown why the aid is useful, how to use it, and to which language items the aid is best applied. Recommended for FLE students who are ready to do their practice teaching.

FLE 319 Discourse Analysis for Translation (3-0)3

The use of discourse analysis to understand the characteristics of texts; translating various types of texts from English to Turkish; discussing problematic points in translation and finding ways of dealing with them.

FLE 320 Phonetics for Learners of English (3-0)3

An introduction to the basic concepts of articulatory phonetics; the use of this knowledge in the description and classification of English sounds; helping students to produce and perceive English to become better communicators.

FLE 325 Selections from the English Novel I (3-0)3

The aim of the course is to instruct the students about the characteristics of novel as a literary genre and to show the classroom techniques for teaching the 18th and the 19th Century novels through the close study of major texts from these periods. The 18th century, of course, embraces its proper hundred years, but the period is often more generously stretched to include the Restoration era--the last forty years of the 17th century following the return of Charles II to the throne--and even the first two decades of the 19th century. The Napoleonic Wars comprised a series of global conflicts fought during Napoleon Bonaparte's imperial rule over France (1805–1815). They formed to some extent an extension of the wars sparked by the French Revolution of 1789. Nationalism would shape the course of much of future European history; its growth spelled the beginning of some nations and states and the end of others.

FLE 326 Selections from the English Novel II (3-0)3

In the twentieth century, scientific discoveries, better communications and faster transportation transformed the world in those hundred years more than any time in the past. It was a century that started with steam powered ships as the most sophisticated means of transport, and ended with the space shuttle. As a result of technological, medical,

social, ideological, and political innovation, in the twentieth century the life expectancy and the quality of living changed a lot. Arguably more technological advances occurred in any 10 year period following World War I than the sum total of new technological development in any previous century.. War reached an unprecedented scale and level of sophistication; in the Second World War (1939-1945) alone, approximately 57 million people died, mainly due to massive improvements in the field of weapons. Scientific discoveries such as the theory of relativity and quantum physics radically changed the worldview of many people. The aim of the course is to instruct the students about the characteristics of novel as a literary genre and to show the classroom techniques for teaching the 20th and 21st Century novels through the close study of major texts from these period, from the modernist novel to the postcolonial novel. Major authors may include James, Conrad, Woolf, Joyce, Forster, Lawrence, Orwell, Beckett, Golding, Fowles, Spark, Murdoch, Lessing, Rushdie, Carter, Ishiguro, Barnes.

FLE 327 World Mythology (3-0)3
This course is designed to acquaint students with some of the world's most influential mythology. The students will explore the theory of myth and the use of myth in art, literature and film. During the course, students will study the myths from different cultures: Classical Greek, Roman mythology, Celtic mythology, Scandinavian myhtology, Sumerian mythology, Native American myhthology, Near Eastern mythology, African mythology and Oriental mythology.

FLE 329 Structure and Content in Prose Narrative Literature (3-0)3
While investigating the relationship between "realism" and verisimilitude, this course provides an introduction to the main theories and techniques of narratology and stylistics. For narratology the theories of Todorov, Booth, Bal, Genette and Fludernick are studied, while Rimon Kenan's work is used as the main centralizing text for the class. The main stylisticians referred to are Lodge and Short. Bringing insights from these theorists together, analyses of various novels and short stories are made.

FLE 332 The Restoration and the Enlightenment (3-0)3
In this course the interactions between the literature of the long eighteenth century and its cultural contexts are examined. The theories of Hobbes and Locke, and the work of Newton and the Royal Society in England, and the theories and work of Descartes, Rousseau, Voltaire, Diderot, and Montesquieu in France are discussed; the many social, philosophical and political changes started in this period are introduced through readings of selections from these thinkers' writings (including letters and diaries). The literature of the period is studied with close reading of set texts, and attention is paid to all genres and many text types, to include verse, prose, the novel, satire, diaries, early biographies, the essay and journalism. Especially important among the literary figures studied here are Dryden, Swift, Pope, Addison, Steele, Johnson, and Voltaire. While concentrating on the ideas of the period, the course also examines the extent to which this period paves the way for Romanticism philosophically and artistically.

FLE 333 Introduction to Syntax (3-0)3
Basic notions of generative syntax within the framework of Principles and Parameters and Minimalist program. The course will enable students to work with linguistic data from a variety of languages, including but not restricted to English, make generalizations over the data, from hypotheses that can explain the generalizations, and test the hypotheses on more data in order to reach a (tentative) conclusion.

FLE 353 Phonology (3-0)3
The aim of the course is to raise an awareness of the sound systems of different languages and provide students with theoretical knowledge of phonology and practical skills in phonological analysis. It is a comprehensive survey of suprasegmentals, phonological processes, speech errors, dialect and language variations and phonological development with a special emphasis on English and Turkish

FLE 361 Computer Assisted Language Learning (3-0)3
The course aims to educate students on computer assisted language learning. The course focuses on Historical background of computer assisted language learning, theoretical and practical applications in ELT, teacher training in computer assisted language learning and ELT, and conducting research in the field.

FLE 379 Introduction to Cognitive Linguistics (3-0)3
Models for the acquisition, processing, and application of human knowledge as the object of cognitive sciences. Cognitive linguistics as the investigation of the acquisition, processing, and application of language knowledge. Grammar as a model of human language knowledge. Relations to artificial intelligence.

FLE 396 Development of Communicative Competence in French (3-0)3
A course in the communicative grammar of French including speech acts, communicational routines and discourse analysis.

FLE 398 Translation from Italian into Turkish (3-0)3
This course will focus on Italian grammar and translation into Turkish. While addressing aspects of modern and contemporary Italian literature, history and culture, the course will also teach students to communicate in written and spoken Italian. The lectures are in English, but the students will read texts originally written in Italian and in Turkish and eventually translate them in the class-room. Films in Italian will be assigned as home-work. At the end of the semester the students are expected to submit a research project which covers some aspect of Italian language, literature, or thought translated into Turkish.

FLE 406 Poetry Analysis (3-0)3
This class is an introduction to English and American poetry. We will study poems from the Renaissance to the present day. Poets to be read include Shakespeare, Donne, Marvell, Coleridge, Wordworth, Keats, Bradstreet, Emerson, Whitman, Dickinson, Yeats, Eliot, Frost, Williams and Stevens.

FLE 407 The Novel: Analysis II (3-0)3
The aim of the course is to further instruct the students about the characteristics of the novel as a literary genre and to show the classroom techniques for teaching 19th, 20th and 21st Century novels through the close study of major texts from these periods. Major authors may include Bronte, Dickens, Eliot, Conrad, Joyce, Woolf, Forster, Lawrence, Orwell, Amis, Lessing, Rushdie.

FLE 411 20th Century English Novel (3-0)3
The literature of the 20th century has an overwhelming preoccupation with the self, the nature of consciousness, and the processes of perception. Literature is often subjective, and personal and internal. Authors are concerned with the fragmentation of both experience and thought. Many employ stream-of-consciousness: the fluid, associational, often illogical, sequence of the ideas, feelings and impressions of a single mind as seen in the works of Virginia Woolf and James Joyce. This course will include: presentation of the characteristics of novel as a literary genre, approaches to analyzing the novel analysis considering of the work of major novelists and classroom techniques for teaching the novel and practical applications.

FLE 433 Advanced Syntax (3-0)3
The course is a continuation of FLE 333 Introduction to Syntax, in which students are introduced to the ideas underlying the generative tradition and where they attain basic knowledge of generative syntax, including the notions of phrase structure (head, complement, specifier), structural relations between elements in a syntactic structure, constituency, lexical and functional categories/projections, subcategorization (selection), Theta theory, head movement. The topics covered in FLE 433 include more advanced concepts in syntactic theory, such as Binding theory, Case theory, passivization, local and long distance (A and A') movement, and related notions such as syntactic locality, successive cyclicity, islandhood, quantifier raising. The course will advance students' proficiency in syntactic analysis, with an emphasis on individual research, as well as provide them with the basics of syntax-semantics interface.

FLE 496 Lexical Structure and Word Formation in French (3-0)3
A course in the morpho-syntactic structure of French, including morpho-phonemic structure, derivation and composition of words, semantic structure, and loan influence.

DESCRIPTION OF COURSES IN THE MINOR PROGRAM IN GERMAN LANGUAGE

FLE 371 Comparative Grammar: German -Turkish I (3-0)3
Comparison of the categories of finite verb, subject and predicate, verb tenses modality, gender of verb, declination of nouns, article, pronoun, adverb, relative clauses, adjectival, nominal phrases, and related grammatical topics in the two languages under consideration.

FLE 372 Comparative Grammar: German -Turkish II (3-0)3
Comparison of the categories of subject, direct and indirect object, case, subject-and object-sentences, modal auxiliary verbs, sentence connectives, questions, indirect questions, temporal clauses, conditional clauses, infinitives, and related grammatical topics in the two languages under consideration.

FLE 373 Translation from German (3-0)3
Translations from German into Turkish and/or English. Special problems in translating literary, philosophical, scientific, and commercial texts, lexical and structural problems in the translation process.

FLE 374 Readings in German Contributions to Humanities (3-0)3
Reading texts of high intellectual level from representative writers of philosophy, humanities, and social sciences in different centuries.

FLE 375 History of German Culture (3-0)3
German Civilization in the Middle Ages, in the Renaissance, Baroque, Enlightenment, Classical and Romantic epochs., during the Second German Empire, between 1919-1945, after World War II, between 1965-1990 and after reunification.

FLE 376 Development of Communicative Competence in German (3-0)3
Communicative grammar of German including speech acts, communicational routines, and discourse analysis.

FLE 377 Practice Teaching in German (3-0)3
Audits and practice teaching sessions in German classes of schools of secondary education.

FLE 378 German Scientific Texts (3-0)3
Developing reading and writing skills in German for special purposes in different scientific fields and in theory of science.

FLE 471 A Survey of German Literature (3-0)3
German literature in the Middle Ages, Renaissance, Baroque, Enlightenment, Classical, Romantic epochs, Realism, Naturalism, Expressionism, Impressionism, and the 20th century.

FLE 472 Introduction to German Linguistics (3-0)3
German and Germanic. The German dialects. The standardization of German. The influence of foreign languages. Language reform. 'New-High-German'. Language and nationalism. German as a scientific language. Language development and urbanization. Contemporary normative linguistics. Language problems of foreigners.

FLE 473 Translation into German (3-0)3
Translations into German from Turkish and/or English. Special problems in translating literary, philosophical, scientific, and commercial texts. Lexical and structural problems in the translation process.

FLE 474 Advanced Literary Texts in German (3-0)3
Reading literary texts of high level from representative writers in different centuries. FLE 471 is recommended.

FLE 475 Methods of German Language Teaching (3-0)3
Theories of language acquisition and language teaching methods. Bilingualism. German as a second foreign language. A comparative sociology of English and German as foreign and second languages. Curriculum planning. Computer-aided language learning. Teacher training: theory and application.

FLE 476 Lexical Structure and Word Formation in German (3-0)3
The morpho-syntactic structure of German including morpho-phonemic structure, derivation and composition of words, semantic structure, and loan influence.

FLE 478 German in Business and Administration (3-0)3
Developing reading and writing skills in German for special purposes in the fields of business and administration.

FLE 479 Logic and Methodology of Sciences (3-0)3
Developing reading and writing skills in German for special purposes in the field of logic, theory of grammar, and cognitive sciences.

GRADUATE PROGRAMS IN ENGLISH LANGUAGE TEACHING

AIMS AND OBJECTIVES OF ELT GRADUATE PROGRAMS: The M.A. and Ph.D. programs in ELT (English Language Teaching) introduce major theoretical and methodological issues in language learning/acquisition and teaching and provide students with a firm foundation in the theoretical and applied aspects of the field. Both programs strive to provide a critical perspective on current issues in teaching and learning languages by putting a great deal of emphasis on fieldwork skills in relation to qualitative/quantitative and mixed-methods research as well as theoretical/applied linguistic, cross-linguistic/cultural analysis within the field of language teaching.

CAREER OPPORTUNITIES: The graduates of the English Language Teaching M.A. Program can work as instructors at national and international educational institutions. The graduates of the PhD program in ELT can work as academicians, researchers, advisors at national and international higher education institutions working on diverse fields within the language sciences. The graduates may also work as teacher educators of pre-service and in-service teachers in the field of English Language Teaching.

GRADUATE CURRICULUM

M.A. PROGRAM IN ENGLISH LANGUAGE TEACHING

Required Courses

ELT	506	Second Language Acquisition	(3-0)3
ELT	554	Quantitative Research Methods in Language Research	(3-0)3
ELT	555	Qualitative Research: Theory and Methods	(3-0)3

+4 electives

ELT	590	Seminar in English Language Teaching	NC
ELT	599	Master's Thesis	NC
ELT	801-850	Special Studies	NC

Elective Courses

ELT	507	Curriculum Development for English for Specific Purposes	(3-0)3
ELT	508	Research Methods in Applied Linguistics	(3-0)3
ELT	509	Literature in the Teaching of English	(3-0)3
ELT	513	Linguistics for English Language Teaching	(3-0)3
ELT	517	Materials Evaluation and Development in ELT	(3-0)3
ELT	518	English Language Testing	(3-0)3
ELT	520	English-Turkish Contrastive Analysis	(3-0)3
ELT	521	Cultural Aspects of Language Teaching	(3-0)3
ELT	522	Lexical Semantics	(3-0)3
ELT	525	Approaches Methods and Techniques in ELT I	(3-0)3
ELT	526	Approaches Methods and Techniques in ELT II	(3-0)3
ELT	528	Instructional Technology in ELT	(3-0)3
ELT	529	Brain-based Learning and Language Teaching	(3-0)3
ELT	530	Modern Theory of Grammar	(3-0)3
ELT	531	Cognitive Linguistics	(3-0)3
ELT	541	Language Acquisition	(3-0)3
ELT	542	Bilingualism and Bilingual Education	(3-0)3
ELT	561	Linguistics and Formal Languages	(3-0)3

Ph.D. PROGRAM IN ENGLISH LANGUAGE TEACHING

Required Courses

**ELT*	*506*	*Second Language Acquisition*	*(3-0)3*
**ELT*	*554*	*Quantitative Research Methods in Language Research*	*(3-0)3*
**ELT*	*555*	*Qualitative Research: Theory and Methods*	*(3-0)3*
ELT	613	Concepts and Theoretical Considerations in ELT	(3-0)3
ELT	602	Approaches to English Language Teacher Education	(3-0)3
+5 electives			
ELT	699	Ph.D. Dissertation	NC
ELT	901-950	Special Studies	NC

Elective Courses

ELT	601	Current Issues in English Language Teaching	(3-0)3
ELT	602	Approaches to English Language Teacher Education	(3-0)3
ELT	603	English Language Teaching Curriculum	(3-0)3
ELT	604	Seminar in Applied Linguistics	(3-0)3
ELT	605	Sociolinguistics	(3-0)3
ELT	606	Program Evaluation in English Language Teaching	(3-0)3
ELT	607	Instructional Design in English Language Teaching	(3-0)3
ELT	608	Pragmatics and Discourse Analysis	(3-0)3
ELT	609	Classroom Research	(3-0)3
ELT	610	Statistical Methods in English Language Teaching	(3-0)3
ELT	611	Psycholinguistics	(3-0)3

**These courses (which are also required courses in the M.A in ELT program) are required in the PhD program if the student has not taken an equivalent course at a previous graduate program attended. Note that equivalence is subject to the approval of the ELT graduate programs coordinator. Newly admitted PhD students need to take ELT 506, ELT 554 and ELT 555 before taking any 600-level courses, if not otherwise instructed.*

DESCRIPTION OF GRADUATE COURSES
M.A. PROGRAM IN ENGLISH LANGUAGE TEACHING

ELT 506 Second Language Acquisition (3-0)3

Surveying current research in language acquisition with special emphasis on similarities and differences between child and adult language, between native and foreign language acquisition

ELT 507 Curriculum Development for English for Specific Purposes (3-0)3

Curriculum development and course design as applied to ESP; language functions, notions and speech acts; principles of functional /notional or communicative syllabus strategies and techniques; designing structural interviews and questionnaires; discourse analysis and teacher training for ESP.

ELT 508 Research Methods in Applied Linguistics (3-0)3

The course aims to provide a comprehensive introduction to the research methods and techniques used in the field of applied linguistics and to help students develop skills necessary to design and implement research in the field. The first section of the course provides a brief review of the main concepts in the area while the second part focuses on quantitative methodology and scrutinises experimental, quasi-experimental and non-

experimental research designs as well as the data collection and analyses procedures appropriate for this brand of research. The third part of the course is devoted to qualitative research designs and examines case studies, ethnographies, action research, grounded theory and phenomenology. It also walks the students through the basics of gathering and interpreting qualitative data. The course ends by discussing topics such as mixed research designs, writing the research and practicalities in applied linguistics research.

ELT 509 Literature in the Teaching of English (3-0)3
Significant contributions of literature to the process and purpose of learning English as a foreign language; poetry, prose and drama in the EFL classroom; approaches to selecting texts for different levels of learners.

ELT 513 Linguistics for English Language Teaching (3-0)3
Contributions of linguistics to the field of foreign language teaching; current approaches to the linguistic analysis of English.

ELT 517 Materials Evaluation and Development in ELT (3-0)3
Reviewing methods of evaluating language teaching materials and adaptation techniques and applying evaluation and adaptation criteria to materials currently employed; determining appropriate discovery procedures for developing effective language teaching materials through applied research.

ELT 518 English Language Testing (3-0)3
Major aspects of English language testing: item analysis and interpretation of test scores; subjective and objective tests; procedures in preparing different kinds of test items appropriate for testing different language skills; practice in item writing and statistical methods.

ELT 520 English-Turkish Contrastive Analysis (3-0)3
Introducing current approaches to contrastive analysis; comparing and contrasting English and Turkish in the areas of phonetics and phonology, syntax and semantics with special emphasis on problem areas in language teaching and learning.

ELT 521 Cultural Aspects of Language Teaching (3-0)3
Providing language teachers with a basis for introducing a cultural component into their teaching; significance of culture in teaching English as a foreign language; perspectives on how language and culture interact, and on the significant distinction between understanding and participating in a foreign culture.

ELT 522 Lexical Semantics (3-0)3
History of lexical semantics, arguments and theta-roles; lexical conceptual structures; verb classes and alternations; lexical aspects; events; unaccusativity; ergativity; linking from lexicon to syntax.

ELT 525 Approaches, Methods and Techniques in ELT I (3-0)3
Examining major approaches to, methods and techniques of English language teaching; studying linguistic and psychological theories behind them; practical applications of techniques for teaching various language skills, specifically listening and speaking.

ELT 526 Approaches, Methods and Techniques in ELT II (3-0)3
A continuation of ELT 525, practical work on English language teaching by focusing on the techniques in teaching grammar, vocabulary, reading and writing; discussion and evaluation of applications of approaches, methods and techniques.

ELT 528 Instructional Technology in English Language Teaching (3-0)3
Current developments in the use of instructional technology in language teaching; use of computers, interactive video, television and video in language teaching; approaches to the design, evaluation, development and application of English language teaching courseware by using instructional technology.

ELT 529 Brain-based Learning and Language Teaching (3-0)3
Introducing a new paradigm, known as brain-compatible or brain-based learning, providing language teachers with research from the discipline of neuroscience, biology and psychology to design brain-compatible materials and a brain-based curriculum that encompass the role of emotions, patterns, meaningfulness, enriched environments, body rhythms, attention span of the brain and rest, attitudes, stress and relaxation, learner states, trauma, multiple ways of brain-compatible assessment, music, movement, memory, retrieval of information, perception, meaning construction, cognition, nonconscious learning, motivation, creativity, nutrition and brain-gym in the language classroom.

ELT 530 Modern Theory of Grammar (3-0)3

This course will examine the theory of generative grammar in its minimalist version. The empirical adequacy of generative grammar as a system of mental representations is one of the main topics of investigation in the course.

ELT 531 Cognitive Linguistics (3-0)3

The course will examine models for acquisition, processing and application of knowledge as the object of cognitive linguistics, and investigate the cognitive aspects of the different branches linguistics.

ELT 541 Language Acquisition (3-0)3

The nature of child language; universal grammar; theories and research methods in the acquisition of phonology, morphology, syntax, and semantics; an overview of second language acquisition.

ELT542 Bilingualism and Bilingual Education (3-0)3

The course aims to cover a wide range of topics at the individual and at the societal level: the linguistic, psycholinguistic, sociolinguistic and educational aspects of bilingualism. The course starts with how bilingualism is defined and measured, the development of bilingualism, linguistic behaviours of bilinguals, the psycholinguistic and neurolinguistic bases of bilingualism which are essential to understand bilinguals and bilingual education. The second part of the course will draw attention to societal bilingualism and its effects discussing the topics such as language contact, language maintenance, language and identity, and issues of education and language planning for bilinguals and society as a whole.

ELT 554 Quantitative Research Methods in Language Research (3-0)3

Focusing on the foundations of quanitative inquiry, this course aims to introduce graduate students to the design and implementation of quantitative research projects. Course participants will explore various quanitative research traditions such as designing and executing experiments, preparing and analyzing surveys and data elictitation tasks that give way to quantitative analysis.

ELT 555 Qualitative Research: Theory and Methods (3-0)3

Focusing on the epistemological foundations of qualitative inquiry, this course aims to introduce graduate students to the design and implementation of qualitative research projects. Course participants will explore various qualitative research traditions such as Interviewing, Case Study, Action Research, Ethnography, Narrative Inquiry, Phenomenological Studies, and Grounded Theory.

ELT 561 Linguistics and Formal Languages (3-0)3

The course aims at investigating language as a knowledge-based process. It elaborates the relationship between formal language theory and natural language and relates language theory to its computational machinery.

ELT 590 Seminar in English Language Teaching NC

Preparation towards M.A. thesis proposal through prescribed readings; written or oral presentation of the work developed.

ELT 599 Master's Thesis NC

ELT 801-850 Special Studies NC

Ph.D. PROGRAM IN ENGLISH LANGUAGE TEACHING

ELT 601 Current Issues in English Language Teaching (3-0)3

Concerns of the language teaching profession worldwide as currently being discussed and debated in professional literature. The political and intellectual roots of ELT, social, economic and cultural influences on ELT, the debate over communicative language teaching, and the relation of current theory and research to actual classroom practice.

ELT 602 Approaches to English Language Teacher Education (3-0)3

Overview of major issues in teacher education through promoting research on the design and implementation of teacher education and training programs; action research, and models of teacher supervision; training the trainers.

ELT 603 English Language Teaching Curriculum (3-0)3

Current approaches to ELT curriculum design and development. The procedures involved in designing

and developing syllabuses for teaching English as a foreign language. Practical work on aspects of syllabus design with special emphasis on primary and secondary education EFL curricula.

ELT 604 Seminar in Applied Linguistics (3-0)3
Current understanding of applied linguistics; use of linguistic theories in understanding language of actual use; linguistic accounts of real world problems.

ELT 605 Sociolinguistics (3-0)3
A survey of sociolinguistic theories and research findings which illuminate the learning and use of English as a foreign language, with particular emphasis on practical applications.

ELT 606 Program Evaluation in English Language Teaching (3-0)3
Concepts of measurement and evaluation; preparation and use of measurement tools in evaluation and decision-making; models of program evaluation; processes of evaluation; standards for the evaluation of effectiveness of instruction, courses, syllabuses, materials; applying these to hypothetical/real cases with a view of accountability in English language education.

ELT 607 Instructional Design in English Language Teaching (3-0)3
Current theory and practice in the field of instructional design and practice in creating effective designs for instruction in English language teaching by selecting and using current techniques according to the specific needs of the learners. Research work, applications and paper presentations.

ELT 608 Pragmatics and Discourse Analysis (3-0)3
Current theories, issues, concepts and research techniques specific to pragmatics and discourse analysis with a view of language as an interactive process.

ELT 609 Classroom Research (3-0)3
A comprehensive overview of recent classroom-centered research and its implications for teaching and learning of languages; classroom research methods; teacher talk; learner behavior; teacher and student interaction; learning outcomes; directions in research and teaching.

ELT 610 Statistical Methods in English Language Teaching (3-0)3
Basic statistical concepts and tools such as types of variables and data in ELT studies; ways of measuring differential outcomes of empirical/comparative language studies through applying these to projects and interpreting the results for their implications to ELT. Statistical packages on computer.

ELT 611 Psycholinguistics (3-0)3
Current issues and theories in psycholinguistics focusing mainly on language and cognition, language acquisition, language processing, biological foundations of language, language disorders, and bilingualism.

ELT 613 Concepts and Theoretical Considerations in ELT (3-0)3
This course is designed to provide a thorough account of concepts, theories and research related to English Language Teaching (ELT). It aims to explore theoretical considerations and empirical findings dealing with English language learning and teaching with reference to both the global world and the immediate local context. Issues in English Language Teaching arising from linguistic, socio-political, cultural and cognitive perspectives will also be discussed. This course not only aims to offer a review of main aspects of ELT but also to help students design and conduct a research study exploring one aspect of ELT.

ELT 699 Ph.D. Dissertation NC

ELT 901-950 Special Topics NC

GRADUATE PROGRAMS IN ENGLISH LITERATURE

AIMS AND OBJECTIVES OF ELIT GRADUATE PROGRAMS: The MA and PhD programs in ELIT aim to educate researchers in the field of English Literature. Our courses focus on both canonical and non-canonical texts of English Literature from the Middle Ages onward, locating them within relevant historical, cultural, philosophical and psychological contexts. Students are expected to develop a critical approach to literature; they study ancient and modern literary criticism and learn how to use literary theory in textual analysis.

CAREER OPPORTUNITIES: Our graduates from ELIT can work as instructors of English in prep-schools of various universities and in private language schools. They can work as cultural researchers and consultants in public and international relations departments of national and international companies and institutions. They can work as academics in Humanities and Social Sciences departments of various universities.

M.A. PROGRAM IN ENGLISH LITERATURE

Required Courses

ELIT	590	Seminars in English Literature	NC
ELIT	599	Master's Thesis	NC
ELIT	801-850	Special Studies	NC

Elective Courses

ELIT	503	Milton	(3-0)3
ELIT	504	Spencer	(3-0)3
ELIT	505	20th Century British Novel I	(3-0)3
ELIT	506	20th Century British Novel II	(3-0)3
ELIT	507	20th Century British Drama	(3-0)3
ELIT	508	Shakespearean Drama	(3-0)3
ELIT	509	Approaches to Literary Criticism	(3-0)3
ELIT	510	The Rise and Development of the English Novel	(3-0)3
ELIT	511	The Romantic Period	(3-0)3
ELIT	512	Postcolonial Theory and Literature	(3-0)3
ELIT	513	20th Century British Poetry	(3-0)3
ELIT	514	Chaucer	(3-0)3
ELIT	515	The Victorian Novel	(3-0)3
ELIT	516	Literature in the Middle Ages	(3-0)3
ELIT	517	Literature in the Renaissance	(3-0)3
ELIT	518	Literature in the 17th Century	(3-0)3
ELIT	519	Literature in the Restoration and the 18th Century	(3-0)3
ELIT	520	The Victorians	(3-0)3
ELIT	521	Literature in the 20th Century	(3-0)3
ELIT	522	Backgrounds of Modern Criticism	(3-0)3
ELIT	523	Highlights of American Literature	(3-0)3
ELIT	529	Psychological Aspects of Literature	(3-0)3

Ph.D. PROGRAM IN ENGLISH LITERATURE

Required Courses

ELIT	699	Ph.D. Dissertation	NC
ELIT	901-950	Special Studies	NC

Elective Courses

ELIT	604	Interactions Between English and Other European Literatures	(3-0)3
ELIT	606	Psychology and Literature	(3-0)3
ELIT	607	Non-Western Contemporary Literatures	(3-0)3
ELIT	609	Research Methodology in Literary Studies	(3-0)3
ELIT	610	Literary Genres and Inter-Generic Relations	(3-0)3
ELIT	611	Contemporary Literary Theory	(3-0)3
ELIT	618	Women and Writing	(3-0)3
ELIT	619	Literature and Science	(3-0)3
ELIT	620	Selected Works from Turkish and English Literatures	(3-0)3
ELIT	621	Fiction: Selected Works	(3-0)3
ELIT	622	Drama: Selected Works	(3-0)3
ELIT	623	Poetry: Selected Works	(3-0)3

M.A. PROGRAM IN ENGLISH LITERATURE

ELIT 503 Milton (3-0)3
A critical study of selected works of John Milton including Paradise Lost, Paradise Regained, L'Allegro, IL Penseroso, and Comus.

ELIT 504 Spencer (3-0)3
Spencer's works, especially The Faerie Queene, will be discussed in a critical and theoretical perspective.

ELIT 505 20th Century British Novel I (3-0)3
Significant novels of Conrad, Woolf, Joyce, Lawrence and Forster will be examined critically.

ELIT 506 20th Century British Novel II (3-0)3
Works of significant novelists from the thirties through the Post-War period to the present day will be studied.

ELIT 507 20th Century British Drama (3-0)3
In-depth study of trends and works in modern British drama, including plays by Osborne, Bond, Pinter, Arden, and other significant dramatists.

ELIT 508 Shakespearean Drama (3-0)3
In-depth study of selected major Shakespearean plays.

ELIT 509 Approaches to Literary Criticism (3-0)3
After a brief review of approaches to literature before the twentieth century, this course concentrates upon developments in literary criticism in the twentieth century. The approach used is conceptual rather than historical; the concepts of literature in the major contemporary movements of literary criticism and the assumptions concerning the study of literature underlying these movements are studied in representative texts. Examples of applications of the approaches discussed to literary texts are also included in the course.

ELIT 510 The Rise and Development of the English Novel (3-0)3
After an introduction to the background of the English novel and its beginning in the eighteenth century, novels by Defoe, Richardson, Fielding, Sterne and other significant writers are studied in depth.

ELIT 511 The Romantic Period (3-0)3
Significant characteristics of the Romantic period and Romanticism will be discussed and selected works of prose and poetry will be studied. Among the authors to be considered are Burns, Coleridge, Wordsworth, Lamb, Hazlitt, Blake, Scott, De Quincey, Byron, Shelley, Keats.

ELIT 512 Postcolonial Theory and Literature (3-0)3
This course aims to serve as an intensive study of major authors in postcolonial theory and literature. Through lecture, discussion, research, and writing, students will practice applying postcolonial theory to works of literature. The course aims to establish some of the important concepts in the study of postcolonial literature, discuss colonialism, call attention to major research tools, and exemplify the interplay between the colonialist and the colonized. The course will focus on the conceptual work that postcolonial thinking allows in relation to historical periodizing logic, on the relation of postcolonial to comparable designations such as third world, transnational, global and neoliberal. We will ponder the usefulness of notions of mimicry, hybridity, orientalism, resistance, and migrancy in understanding postcolonial subjectivity. The intersections of these categories with the broader conceptual categories of race, class, gender, sexuality, and nation will be a critical area of inquiry.

ELIT 513 20th Century British Poetry (3-0)3
Significant characteristics of modern English poetry will be studied with emphasis on selected works of major poets.

ELIT 514 Chaucer (3-0)3
Chaucer's role in the development of English literature and a study of his major works including The Canterbury Tales and Troilus and Criseyde.

ELIT 515 The Victorian Novel (3-0)3
Representative examples of the Victorian novel are studied and criticized as a means of achieving a complete understanding of selected authors' attitudes towards the basic human and social issues of the Victorian Period.

ELIT 516 Literature in the Middle Ages (3-0)3
Representative texts are used to study the courtly love and romance traditions, verse romances and Medieval drama.

ELIT 517 Literature in the Renaissance (3-0)3
Characteristics of the Renaissance spirit as reflected in English literature are studied in selected works of drama, poetry and prose. (To include texts by Sidney, Spencer, Marlowe, Decker, Middleton, Shakespeare).

ELIT 518 Literature in the 17th Century (3-0)3
Representative works and genres are studied in the context of social and intellectual trends of the period. (To include works by Milton, Donne, Marvell, Johnson, Behn, etc.)

ELIT 519 Literature in the Restoration and the 18th Century (3-0)3
Representative works and genres are studied in the context of the social and intellectual trends of the period. (To include works by Pope, Dryden, Swift, Johnson, Fielding, Defoe, etc.)

ELIT 520 The Victorians (3-0)3
Representative examples of the poetry and prose of the Victorian Age are studied as a means of understanding and evaluating the social, moral and scientific issue of this period. (To include works by Arnold, Huxley, Ruskin, Dickens, G. Eliot, Oscar Wilde, Tennyson, Browning, Butler, etc.)

ELIT 521 Literature in the 20th Century (3-0)3
Major non-fictional works, such as biographies, autobiographies, essays, letters and travel writings are studied as a means of investigating social, cultural and intellectual issues of the period.

ELIT 522 Backgrounds of Modern Criticism (3-0)3
This course concentrates on the development of Literary Theory from the Classical Age of Greece to the Modern Period. The approach used is historical as well as conceptual. Major texts necessary for an understanding of modern criticism are read and discussed. The focus is on the theoretical aspect. Practical criticism is not a part of this course.

ELIT 523 Highlights of American Literature (3-0)3
Texts by major literary figures of the 19th and 20th century are studied with a critical approach to give the students a taste of American Literature and culture with its specifically American themes and concerns.

ELIT 529 Psychological Aspects of Literature (3-0)3
After basic concepts, theories and trends of psychology are introduced, representative literary works are studied in the light of these trends.

ELIT 590 Seminar in English Literature NC
Preparation towards M.A. thesis proposal through prescribed readings; written or oral presentation of the work developed.

ELIT 599 Master's Thesis NC

ELIT 801-850 Special Studies (4-2)NC

ELIT 604 Interactions Between English and Other European Literatures (3-0)3
Interactions between English literature and Spanish, Italian, French, German and Russian Literatures from the Middle Ages to 20th century. This interaction is be studied in the light of social, political economic changes and philosophical and literary trends.

ELIT 606 Psychology and Literature (3-0)3
Analysis of the literary text as a key to the mechanisms of the psyche, the relationship between the text and author and reader. The texts are also studied as a part of a more general problem of dealing with the constitution of the self and its relationship with the other.

ELIT 607 Non-Western Contemporary Literatures (3-0)3
An introduction to contemporary Non-Western literatures with an emphasis on multicultural and multiethnic writers. The texts include the works of writers who write in English to reach a wider audience, as well as those translated into English. Emphasis on different authors in different semesters.

ELIT 609 Research Methodology in Literary Studies (3-0)3
Development of a disciplined and consistent approach to literary research, with emphasis on problems of locating, analyzing and interpreting data.

ELIT 610 Literary Genres and Inter-Generic Relations (3-0)3
Major narrative literary genres and inter-generic relations. Non-literary causes behind genres, and common formal literary devices among genres and their transformations.

ELIT 611 Contemporary Literary Theory (3-0)3
Recent literary theoretical concerns and their bearing upon writing, reading and criticism of literature. It examines, among others, the theoretical positions of new psychoanalytic, Marxist, feminist, deconstructionist, phenomenological and new historicist criticism.

ELIT 618 Women and Writing (3-0)3
The relationship between women and the idea of "author" and "authority". How women writers try to find a space for writing in their own terms and the strategies they develop to be recognized in the male-dominated world of writing and publishing. The work of prominent feminist theorists as well as a wide selection of creative writers are examined.

ELIT 619 Literature and Science (3-0)3
The impact of scientific discoveries and theories on literature studied with an interdisciplinary approach.

ELIT 620 Selected Works from Turkish and English Literature (3-0)3
A study of Turkish and British works evincing similar generic and content features. Emphasis on different genres in different semesters.

ELIT 621 Fiction: Selected Works (3-0)3
A study of fiction as a literary genre through representative works from different periods.

ELIT 622 Drama: Selected Works (3-0)3
A study of drama as a literary genre through representative works from different periods.

ELIT 623 Poetry: Selected Works (3-0)3
A study of verse forms and types through representative works from different periods.

ELIT 699 Ph.D. Dissertation NC

ELIT 901-950 Special Topics NC

DEPARTMENT OF PHYSICAL EDUCATION AND SPORTS

PROFESSOR

KOÇAK, M. Settar ***(Department Chair)***: B.S., M.S., METU; Ph.D., University of New Mexico.

ASSOCIATE PROFESSORS

İNCE, M. Levent: B.S., M.S., Ph.D., METU.
KİRAZCI, Sadettin ***(Vice Chair)***: B.S., M.S., METU; Ph.D., University of Wales, Bangor.

ASSISTANT PROFESSOR

ALTUNSÖZ HÜRMERİÇ, Irmak: B.S., M.S., METU; Ph.D., The Ohio State University

INSTRUCTOR

TÜZÜN, Macide: B.S., M.S., Ege University; Ph.D., Gazi University.

GENERAL INFORMATION: The Department of Physical Education and Sports offers an undergraduate program for those who choose teaching and coaching as a profession. However, admission to this program was temporarily discontinued in 1997-1998. The Department offers elective courses to the students of other departments to broaden their cultural background and to increase their understanding of sports sciences in general. One other function of the department is to encourage and initiate research and applications related to physical education and sports practices in Turkey.

With the beginning of Ph.D. program in 2002, the department's main focus shifted to the graduate program in the fields of exercise physiology, training theory and methodology, motor learning, motor development, sports management, sports psychology, teaching/curriculum-planning in physical education and adapted physical activity. The aims of the graduate program are to equip students with the skills and knowledge to conduct research and to interpret the results to be of value to further development in field. Considering that a great majority of the graduate students are either junior lecturers or are interested in academic careers, the department's emphasis is not only on research but also on development of teaching skills.

RESEARCH INTERESTS AND FACILITIES: The graduate level research activities undertaken by the Department can be summarized under the following topics:

1. The evaluation of physiological characteristics of elite athletes.
2. Relationship among physical activity, fitness and health.
3. The use of feedback and the various practice scheduling methods to enhance learning.
4. The relationships among growth, maturation, motor performance and the individuals' context.
5. Analysis of management theories and management of athletic programs.
6. Teaching and coaching effectiveness on Physical Education and Sports.
7. The effects of various practices and applications on physical activity levels of individuals with special needs.
8. The examining training theories and methodologies in different sport branches.

Department has Anatomy & First Aid Laboratory, Human Performance Laboratory and Movement Education Laboratory to conduct the relevant tests for research and teaching activities.

GRADUATE PROGRAM AT THE DEPARTMENT OF PHYSICAL EDUCATION AND SPORTS
GRADUATE CURRICULUM

M.S. PROGRAM IN PHYSICAL EDUCATION AND SPORTS

Required Courses

EDS	502	Research Methods in Education	(3-0)3
EDS	504	Educational Statistics	(3-0)3
PES	545	Prothesis Seminar	NC
PES	599	Master's Thesis	NC
PES	8xx	Special Studies	NC

Elective Courses

PES	537	Statistical Analysis in Physical Education and Sports	(3-0)3
PES	540	Philosophical Foundations of Leisure, Play and Recreation	(3-0)3
PES	590	Readings in Physical Education, Sports and Recreation	(3-0)3

Elective Courses Offered in Physiology of Exercise Area

PES	518	Sports Induced Inflammation	(3-0)3
PES	533	Physiology of Exercise	(3-0)3
PES	534	Advanced Topics in Physiology of Exercise	(3-0)3
PES	535	Nutrition in Sports	(3-0)3
PES	536	Biochemistry of Exercise	(3-0)3
PES	538	Advanced Topics in Training Theory	(3-0)3
PES	539	Stress Testing and Exercise Prescription	(3-0)3

Elective Courses Offered in Teaching and Curriculum Planning in Physical Education Area

PES	524	Comparative Systems in Physical Education and Sports	(3-0)3
PES	526	Instructional Designs in Physical Education	(3-0)3
PES	530	Curriculum Development in Physical Education	(3-0)3
PES	531	Pedagogical Aspect of Sports Coaching	(3-0)3

Elective Courses Offered in Sports Management Area

PES	519	Sport Marketing	(3-0)3
PES	520	Recreation in Perspective	(3-0)3
PES	521	Administration & Management in Athletics and Recreational Sports	(3-0)3
PES	522	Trends and Issues in Physical Education, Sports & Recreation	(3-0)3

Elective Courses Offered in Sports Psychology and Motor Learning Area

PES	541	Psychological Foundation of Physical Education and Sports	(3-0)3
PES	542	Psychological Effects of Sports and Physical Activity	(3-0)3
PES	543	Growth & Motor Development	(3-0)3
PES	550	Motor Control	(3-0)3
PES	560	Motor Learning	(3-0)3

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. PROGRAM IN PHYSICAL EDUCATION AND SPORTS

Required Courses

EDS	508	Educational Statistics II	(2-2)3
PES	600	Research Seminar in Physical Education	(3-0)3
PES	699	Ph.D. Dissertation	NC
PES	9xx	Special Studies	NC

Elective Courses

PES	610	Analysis of Instruction in Physical Education	(3-0)3
PES	620	Process of Skill Acquisition	(3-0)3
PES	624	Independent Study in Motor Behavior	(2-2)3
PES	630	Advanced Nutrition in Sport	(3-0)3
PES	640	Exercise Physiology Specialization	(3-0)3
PES	642	Exercise throughout Life Cycle	(3-0)3
PES	646	Designing Training Programs in Competitive Sports	(3-0)3
PES	650	Sports Injuries, Preventive Measures & Rehabilitation	(3-0)3
PES	660	Program and Event Management	(3-0)3
PES	664	Public Relations & Fund Raising in Sport Setting	(3-0)3

Total minimum credit: 24
Number of courses with credit (min): 8

Upon successful completion of course work, students are required to take a comprehensive examination. If successful in the examination, students will register for PES 699 Ph.D. Dissertation course for the duration of the time they are preparing their dissertation.

DESCRIPTION OF GRADUATE COURSES

PES 518 Sports Induced Inflammation (3-0)3

Aim is to study sports-induced inflammation, and under what circumstances it is initiated. To indicate the differences between the macro traumatic and micro traumatic inflammatory processes. To evaluate promotive causes, directions & outcome of inflammation and whether these can be beneficially modified. The fibratic healing process will be evaluated. The role of exercise in controlling the onset of inflammatory response will be discussed.

PES 519 Sport Marketing (3-0)3

Develop an understanding of theories and principles required in marketing in various sport setting. Students will gain insights into who the sport consumer is, why people consume sports and when market segmentation is essential to successful marketing.

PES 520 Recreation in Perspective (3-0)3

An overview of recreation from past to present, concepts of recreation and different programs.

Organizational methods of school, community and industrial recreational sports programs.

PES 521 Administration and Management in Athletics and Recreational Sports (3-0)3
The study of administrative structures in sports organizations, leadership and management techniques. Also the current development in physical education and sports.

PES 522 Trends and Issues in Physical Education, Sports and Recreation (3-0)3
The study of current trends and issues in schools, university physical education and sports departments, governmental sports institutions and society.

PES 524 Comparative Systems in Physical Education and Sports (3-0)3
The study of organization, administration and application of physical education and sports in different societies and countries.

PES 526 Instructional Designs in Physical Education (3-0)3
The study of the methods and skills that are necessary to teach physical activities, which includes an examination of techniques and tools useful for effective instruction: analyzing learning environments, analyzing learners, developing a scope and sequence, writing objectives, determining evaluation, designing learner activities.

PES 530 Curriculum Development in Physical Education (3-0)3
Analysis of physical education and discussion of current issues with specific reference to Turkey.

PES 531 Pedagogical Aspect of Sports Coaching (3-0)3
Coaching is a complex process that enables learning and development of athletes toward the goal of specific training. This course aims to develop an understanding of pedagogical issues in sports coaching. Pedagogical processes in different coaching context including recreational, developmental and performance settings, will be examined in detail.

PES 533 Physiology of Exercise (3-0)3
Structures and functioning of the human body as applied to physical activity. Energy liberation and transfer, muscle contraction; neuro-muscular function; physical work capacity; energy cost of various activities; factors affecting performance.

PES 534 Advanced Topics in Physiology of Exercise (3-0)3
Physiological adaptations of human organism to exercise and environmental stress, aerobic and anaerobic capacity. Techniques of diagnostic and functional exercise testing.

PES 535 Nutrition in Sports (3-0)3
Food requirements for sportsmen. Aspects of nutrition for sportsmen before and during competition. How to control weight in sports. Ergogenic aids and muscular performance.

PES 536 Biochemistry of Exercise (3-0)3
An insight to the structure and properties of complex biomolecules such as carbohydrates, lipids and proteins, hormones and enzymes, also the mechanism of generation and storage of metabolic energy during exercise.

PES 537 Statistical Analysis in Physical Education and Sports (3-0)3
Hypothesis testing, simple and multiple regression analysis of variance, designs of experiments, sampling theory and non-parametric techniques.

PES 538 Advanced Topics in Training Theory (3-0)3
Basic concepts in enhancing performance of different characteristics. Planning & programming training schedules for various activities and sports.

PES 539 Stress Testing and Exercise Prescription (3-0)3
Principles of exercise prescription based on current practices in physical education and physiology with emphasis on prevention & rehabilitation.

PES 540 Philosophical Foundations of Leisure, Play and Recreation (3-0)3
Study of the function of philosophy and its importance to the individual and profession; individual and group analysis of philosophies of outstanding leaders in light of their respective contemporary culture; and the refinement and clear communication of individual student philosophies.

PES 541 Psychological Foundations of Physical Education and Sports (3-0)3
A study of man's psychological involvement and behavior in physical activity and sports.

PES 542 Psychological Effects of Sport and Physical Activity (3-0)3
Consequences of involvement in physical activity and sport on selected psychological states such as anxiety, depression, hostility and self-esteem.

PES 543 Growth & Motor Development (3-0)3
A study of growth and motor development of children from infancy through adolescence Emphasis is on observing, analyzing characteristics of movement behavior and motor performance of children with application to developmentally appropriate movement experiences.

PES 545 Prosthesis Seminar NC
Scanning field literature, preparing and conducting seminars, submitting a research proposal, under a supervisor's guidance.

PES 550 Motor Control (3-0)3
Theories around motor control will be examined and discussed as to their usefulness to understand changes in movement execution as a result of task demands and environmental changes. One of the emphases will be explaining how basic principles and theories are derived from experimental approaches within the disciplines of physiology, neuroscience, biomechanics, and psychology.

PES 560 Motor Learning (3-0)3
An investigation of motor learning as an important component of the foundation needed to understand human behavior as it relates to teaching, learning and performing motor skills. The course explains the process by which humans acquire and refine physical skills, as well as the stages of skill learning and development.

PES 590 Readings in Physical Education Sports and Recreation (3-0)3
Analysis and study of current literature in the physical education sports and recreation areas.

PES 599 Master's Thesis NC
Program of research leading to M.S. degree, arranged between the student and a faculty member. Students register this course while the research program or write-up of thesis is in progress.

PES 600 Research Seminar in Physical Education (3-0)3
Development of doctoral dissertations, projects and presentations. The course will assist students in literature review, design, methods and other matters of concern in preparation of a dissertation, project and presentation.

PES 610 Analysis of Instruction in Physical Education (3-0)3
This course is designed to equip students with the knowledge and skills to systematically describe, analyze, and evaluate teachers and coaches in reliable and valid manner. The focus will be on both qualitative and quantitative data collection procedures in PE context.

PES 620 Process of Skill Acquisition (3-0)3
The course prepares students to be able to design and implement optimal learning environments for both the acquisition and performance of motor skills. Process of skill acquisition is explored by analyzing the early perceptual motor development in children and the problems of motor learning and retention for individuals of all ages.
Prerequisite: Consent of the instructor

PES 624 Independent Study in Motor Behavior (2-2)3
Independent study into the current research, literature, and issues in the area of motor behavior. The course is designed to help students to choose the topic(s) that they are interested and to help them to conduct in-depth literature review and run experiments in the area of motor behavior.
Prerequisite: Consent of the instructor

PES 630 Advanced Nutrition in Sport (3-0)3
This lesson aims to give the ability to create diet to enhance performance and capacity in sports. Detailed information and data related to food commodities and nutritional substances, increasing strength and resistance in sports, will be given as complementary to nutrition in sports.

PES 640 Exercise Physiology Specialization (3-0)3
Exercise physiology emphasis area, which is broadly based upon life sciences: physiology, biochemistry, biomechanics, nutrition and human anatomy. The premier interest is to understand how various cells, tissues, organs, and organ systems respond to challenges posed by exercise and physical training. Exercise physiology focuses on optimal performance such as that attained by sedentary, elite and highly trained athletes.

PES 642 Exercise throughout Life Cycle (3-0)3
Exercise is a concept of lifetime and the habit of exercise should be gained in childhood. This habit should then further carried to older ages. It is well known that exercise is one of the most important items in reducing illnesses. This course will teach methods on how exercise can become part of daily

life. It will give information and draw attention to the importance of exercise throughout life cycle.

PES 646 Designing Training Programs in Competitive Sports (3-0)3

Design of a training program is a significant part of theory and methodology in sports. The main interest of this course is to apply basic principles and methodology of preparation of different types of training plans including training lessons, micro- and macro-cycles, annual, Olympic and long term plans in various individual and team sports.

PES 650 Sports Injuries, Preventive Measures and Rehabilitation (3-0)3

Students will be able to identify the sports specific types of injuries and apply preventive precautions during the acute period. Students will have been thought to prevent sport injuries by alternating stretching types, correct load of training, choosing sport specific exercise patterns etc.

PES 660 Program & Event Management (3-0)3

This course is designed to develop and understanding of theories and principles required in managing a program and event in various sport settings, including the management process. Focus on the knowledge and application of necessary skills to develop, propose and conduct sport-related program, events, games, and contests.

PES 664 Public Relations & Fund Raising in Sport Setting (3-0)3

This course is designed to prepare and update prospective sport managers and leaders with regard to fund raising approaches and strategies. Upon completing the course, a student will have a sound grasp of the principles and practice of fund raising and will be able to work effectively in a variety of sport institutions and related non-profit organizations both as a staff member and as an independent consultant.

PES 699 Ph.D. Dissertation NC

Program of research leading to Ph.D. degree, arranged between the student and a faculty member. Students register this course while the research program or write-up of thesis is in progress.

PES 800-899 Special Studies NC

Students choose and study under the guidance of a faculty member, normally as M.S. thesis advisor.

PES 900-999 Special Studies NC

Students choose and study under the guidance of a faculty member, normally as Ph.D. thesis advisor.

DEPARTMENT OF SECONDARY SCIENCE AND MATHEMATICS EDUCATION

PROFESSORS

BERBEROĞLU, Giray: B.S., M.S., METU; Ph.D., Hacettepe University.
BULUT, Safure: B.S., M.S., Ph.D., METU.
GEBAN, Ömer ***(Department Chair):*** B.S., M.S., Ph.D., METU.
UBUZ, Behiye: B.S., M.S., METU; Ph.D. University of Nottingham.

ASSOCIATE PROFESSORS

BOZ, Yezdan: B.S., METU; Ed.D., University of Warwick.
ERBAŞ, A. Kürşat: B.S., M.S., METU; Ph.D. University of Georgia.
ERYILMAZ, Ali: B.S., M.S., METU; Ed.S, Ph.D., Florida Institute of Technology.
UZUNTİRYAKİ, Esen: B.S., M.S., Ph.D., METU.
ÇETİNKAYA, Bülent: B.S., METU; M.S., Celal Bayar University; Ph.D., Syracuse University.

ASSISTANT PROFESSOR

ÖZDEMİR, Ömer Faruk ***(Vice Chair)***: B.S., Selçuk University; Ph.D. Ohio State University.

INSTRUCTORS

SANCAR, Mehmet: B.S., M.S., Ph.D., METU.
YILDIRIM, Ufuk ***(Vice Chair)***: B.S., METU; Ed.D. University of Warwick.

GENERAL INFORMATION: The Department offers three types of programs: a) five-year programs; b) Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) programs with thesis.

The five-year programs prepare graduates as fully qualified teachers of science in secondary schools. The graduate programs with thesis are aimed at those students who would like to pursue an academic career, or to become administrators or specialists in the area of science / mathematics education.

The department aims particularly to equip students with the up-to-date knowledge and practical skills required for secondary school science and mathematics teachers. An important objective of the department is to provide its graduates with relevant contemporary information, training, and prerequisite skills to enable them to guide their students to cope with the challenges of the 21st century. Science education and computer laboratories are available to enrich the theoretical background of prospective teachers.

FIVE-YEAR PROGRAMS: The admission to the five-year programs is through the Interuniversity Student Placement System. The department currently runs integrated programs in chemistry and physics education. Graduates are qualified to teach in secondary schools. The curricula of the programs require students to take courses from the Department of Secondary Science and Mathematics Education, Educational Sciences and relevant departments of the Faculty of Arts and Sciences.

GRADUATE PROGRAMS WITH THESIS: The graduate programs with thesis are designed to prepare graduate students as academicians, science and mathematics supervisors, curriculum consultants, test and evaluation specialists in science and mathematics education. The Department offers M.S. and Ph. D. courses in Physics Education, Chemistry Education, Biology Education, and Mathematics Education.

MAJOR GRADUATE LEVEL RESEARCH ACTIVITIES

- Affective and cognitive variables in science and mathematics education.
- Students' learning difficulties and misconceptions in science and mathematics.
- Conceptual change in science and mathematics education.
- Different learning/teaching techniques, methods, and strategies in science and mathematics.

– Use of educational technology in science and mathematics.
– Development of instructional materials for science and mathematics.
– Instructional design and implementation in science and mathematics education.
– Assessment and development of pedagogical content knowledge of science and mathematics teachers.

MAJOR PROJECTS UNDERTAKEN

– Curriculum Development in Mathematics, and Science Education
– Teaching-Learning Materials for Effective Science and Mathematics Teaching.
– In-service Training for Science and Mathematics Teachers
– Modeling in science and mathematics.
– Microcomputer based science laboratories in science education.
– Science and mathematics teachers' competencies.
– Teacher self-regulation in science and mathematics education.

LABORATORIES AND EQUIPMENT: The Science Education Laboratory of the Department is equipped with necessary materials to carry out the most up-to-date research in effective science teaching. The Faculty has computer laboratories in which students can carry out projects related to instructional technologies.

CAREER OPPORTUNITIES: The graduates of the Department are employed by secondary science and mathematics education departments of other universities as well as the Ministry of Education and private schools as teachers, academicians, supervisors, inspectors, curriculum consultants, and test and evaluation specialists in science and mathematics.

FIVE-YEAR PROGRAMS

CHEMISTRY EDUCATION PROGRAM

FIRST YEAR

First Semester

CHEM	105	General Chemistry I	(4-4)6
ENG	101	Development of Reading and Writing Skills I	(4-0)4
MATH	117	Calculus I	(4-2)5
PHYS	111	Physics I (Mechanics)	(4-2)5

Second Semester

CHEM	106	General Chemistry II	(4-4)6
ENG	102	Development of Reading and Writing Skills II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC
MATH	118	Calculus II	(4-2)5
PHYS	112	Physics II (El. And Magn.)	(4-2)5

SECOND YEAR

Third Semester

CHEM	200	Colloquium in Chemistry I	(1-0)0
CHEM	221	Analytical Chemistry I	(4-0)4
CHEM	223	Analytical Chemistry	(0-6)3
CHEM	233	Introduction to Organic Chemistry	(2-0)2
CHEM	257	Mathematics for Chemists	(4-0)4
EDS	200	Introduction to Education	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

CHEM	234	Organic Chemistry I	(4-0)4
CHEM	236	Organic Chemistry Lab. I	(0-4)2
CHEM	252	Physical Chemistry I	(4-0)4
CHEM	254	Physical Chemistry Lab. I	(0-4)2
EDS	220	Educational Psychology	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

CHEM	301	Organic Chemistry II	(4-0)4
CHEM	303	Organic Chemistry Lab. II	(0-6)3
CHEM	353	Physical Chemistry II	(4-0)4
CHEM	355	Physical Chemistry Lab. II	(0-4)2
SSME	301	Curriculum Development & Instruction in Science/Mathematics Education	(3-0)3
TURK	305	Oral Communication	(2-0)2

Sixth Semester

CHEM	322	Analytical Chemistry II	(4-0)4
CHEM	324	Analytical Chem. Lab. II	(0-6)3
ENG	311	Advanced Communication Skills	(3-0)3
SSME	302	Measurement and Evaluation in Science/Mathematics Education	(3-0)3
SSME	309	Theories and Approaches in Teaching and Learning of Science/Mathematics	(3-0)3
TURK	306	Written Expression	(2-0)

FOURTH YEAR

Seventh Semester

CHEM	361	Inorganic Chemistry I	(4-0)4
CHEM	400	Colloquium in Chemistry II	(1-0)0
SSME	400	Computer Applications in Science/Mathematics Education	(2-2)3
SSME	511	Methods of Science/ Mathematics Teaching I	(2-2)3
Elective I			(3-0)3
Elective II			(3-0)3

Eighth Semester

CHEM	362	Inorganic Chemistry II	(4-0)4
SSME	403	Laboratory Experiments in Science Education	(3-0)3
SSME	512	Methods of Science/Mathematics Teaching II	(2-2)3
SSME	518	Instructional Technology and Material Development	(2-2)3
Elective III			(3-0)3

FIFTH YEAR

Ninth Semester

EDS	416	Turkish Educational System and School Management	(3-0)3
EDS	424	Guidance	(3-0)3
SSME	534	School Experience in Science/ Mathematics Education	(1-4)3
Restricted Elective I*			(3-0)3
Elective IV			(3-0)3

Tenth Semester

EDS	304	Classroom Management	(2-2)3
SSME	544	Practice Teaching in Science/ Mathematics Education	(2-6)5
SSME	555	Research Projects in Science/ Mathematics Education	(2-2)3
Restricted Elective II*			(3-0)3

*Restricted electives: Courses offered by the Chemistry Department are defined as restricted elective.

PHYSICS EDUCATION PROGRAM

FIRST YEAR

First Semester

PHYS	109	Physics I (Mechanics)	(4-2)5
CHEM	101	General Chemistry I	(4-2)5
MATH	117	Calculus I	(4-2)5
ENG	101	English for Academic Purposes I	(4-0)4

Second Semester

PHYS	110	Physics II (Electricity and Magnetism)	(4-2)5
CHEM	102	General Chemistry II	(4-2)5
MATH	118	Calculus II	(4-2)5
ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

SECOND YEAR

Third Semester

PHYS	203	Introductory Electronics	(3-2)4
PHYS	209	Math. Methods in Phys. I	(4-0)4
PHYS	221	Optics and Waves	(4-0)4
MATH	260	Linear Algebra	(3-0)3
EDS	200	Introduction to Education	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

PHYS	202	Modern Physics	(4-0)4
PHYS	210	Math. Methods in Phys. II	(4-0)4
PHYS	222	Optics and Waves Lab.	(1-4)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
EDS	220	Educational Psychology	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

PHYS	307	Applied Modern Physics Lab	(1-4)3
PHYS	311	Classical Mechanics	(4-2)5
SSME	301	Curriculum Development & Instruction in Science/Mathematics Education	(3-0)3
SSME	309	Theories and Approaches in Teaching and Learning of Science/Mathematics	(3-0)3
TURK	305	Oral Communication	(2-0)2
Restricted Elective I*			(3-0)3

Sixth Semester

PHYS	300	Quantum Physics	(3-0)3
ENG	311	Advanced Communication Skills	(3-0)3
SSME	302	Measurement & Evaluation in Science/Mathematics Education	(3-0)3
SSME	400	Computer Applications in Science/Mathematics Education	(2-2)3
TURK	306	Written Expression	(2-0)2
Elective I			(3-0)3

FOURTH YEAR

Seventh Semester

PHYS	431	Quantum Mechanics I	(4-0)4
SSME	443	High School Physics Curriculum Review I	(3-0)3
SSME	511	Methods of Science/Mathematics Teaching I	(2-2)3
SSME	518	Instructional Technology and Material Development	(2-2)3
Elective II			(3-0)3

Eighth Semester

PHYS	334	Electromagnetic Theory	(4-2)5
EDS	304	Classroom Management	(3-0)3
SSME	403	Laboratory Experiments in Science Education	(3-0)3
SSME	512	Methods of Science/Mathematics Teaching II	(2-2)3
Elective III			(3-0)3

FIFTH YEAR

Ninth Semester

EDS	416	Turkish Educational System and School Management	(3-0)3
SSME	534	School Experience in Mathematics Education	(1-4)3
Restricted Elective II*			(3-0)3
Elective IV			(3-0)3

Tenth Semester

EDS	424	Guidance	(3-0)3
SSME	544	Practice Teaching in Science/Mathematics Education	(2-6)5
SSME	555	Research Projects in Science/Mathematics Education	(2-2)3
Restricted Elective III*			(3-0)3

*Restricted electives: Courses offered by the Physics Department (courses with PHYS and ASTR codes) are defined as restricted elective.

DESCRIPTION OF COURSES

SSME 301 Curriculum Development & Instruction in Science/Mathematics Education (3-0)3

Following topics will be covered in this course: Basic definitions, concepts, and processes of curriculum development in science or mathematics education. Philosophical and social aspects of different curriculum patterns. Basis of curriculum and basic curriculum patterns as applied to science or mathematics education. Taxonomies of educational objectives. Principles of instruction, planning and the importance of planning in educational practices, course curriculum. Development of yearly, unit, and daily plans for secondary science or mathematics. Strategies in content selection and organization. Teaching methods and strategies in science or mathematics education. Basic characteristics and selection of instructional materials. New approaches in teaching and learning science or mathematics such as lifelong learning, constructivism, and content specific instructional strategies. The responsibilities of teachers on improving the quality of science or mathematics education.
Prerequisite: EDS 200 and EDS 220

SSME 302 Measurement & Evaluation in Science/Mathematics Education (3-0)3

This course covers the following topics: Role and importance of measurement and evaluation in education, particularly in relation to science or mathematics education. Basic definitions, concepts, and processes of assessment in science or mathematics education. Assessment for formative, summative, placement, and diagnostic purposes. Norm- and criterion-referenced assessment. Development of test specifications. Basic attributes of tests: validity, reliability, and usability. Common assessment strategies used in science or mathematics education. Constructing classroom tests. Constructing objective test items of the following forms: Multiple-choice, true/false, short answer, matching, and essay item types. Alternative assessment strategies: observation, interviews, performance assessment, peer evaluation, attitude scales, and self evaluation. Techniques for constructing test items, marking and reporting. Elementary statistics for test/item analysis. Construction of diagnostic tests and other measuring tools in testing cognitive and affective development.
Prerequisite: SSME 301

SSME 309 Theories and Approaches in Teaching and Learning of Science/Mathematics (3-0)3

This course designed to provide students with the opportunity to develop their critical understanding of teaching and learning in theory and practice related to science and mathematics education. This course focuses upon behaviorist, constructivist, and social learning theories with a particular emphasis upon instructional implications in science and mathematics education. Specific instructional strategies emerging from these theories are covered. This course also includes new approaches and strategies in science and mathematics education such as multiple representations, models and modeling, learning styles, and self regulated learning strategies.
Prerequisite: EDS 200 and EDS 220

SSME 400 Computer Applications in Science / Mathematics Education (2-2)3

Instructional use of personal computers in the classroom. Basics of hardware and software. Word processors, spreadsheets and database packages. Design, evaluation, and selection of courseware. Recent research findings in computer based education.

Prerequisite: SSME 301

SSME 403 Laboratory Experiments in Science Education (2-2)3

Laboratory Experiments in Science Education. Improvement of skills in setting up experiments in Physics, Chemistry and Biology for secondary schools. Theory of the experiments. Data gathering and evaluation. Interpretations of possible unexpected results. Daily life applications of scientific principles relevant to experiments.

Prerequisite: SSME 511

SSME 443 High School Physics Curriculum Review I (3-0)3

Analysis of all topics in Turkish ninth and tenth grade physics curricula in detail; review of the physics concepts emphasizing the common misconceptions and learning difficulties related to these concepts in literature; the strategies in order to handle the misconceptions; examination of ÖSS and ÖYS questions and measuring tools to assess the misconceptions, achievement, skills and attitude; familiarizing students to the corresponding Turkish terms of the physics concepts in English.

Prerequisite: SSME 301

SSME 501 Curriculum Development & Instruction in Science/ Mathematics Education (3-0)3

Following topics will be covered in this course: Basic definitions, concepts, and processes of curriculum development in science or mathematics education. Philosophical and social aspects of different curriculum patterns. Basis of curriculum and basic curriculum patterns as applied to science or mathematics education. Taxonomies of educational objectives. Principles of instruction, planning and the importance of planning in educational practices, course curriculum. Development of yearly, unit, and daily plans for secondary science or mathematics. Strategies in content selection and organization. Teaching methods and strategies in science or mathematics education. Basic characteristics and selection of instructional materials. New approaches in teaching and learning science or mathematics such as lifelong learning, constructivism, and content specific instructional strategies. The responsibilities of teachers on improving the quality of science or mathematics education.

SSME 502 Measurement & Evaluation in Science/Mathematics Education (3-0)3

This course covers the following topics: Role and importance of measurement and evaluation in education, particularly in relation to science or mathematics education. Basic definitions, concepts, and processes of assessment in science or mathematics education. Assessment for formative, summative, placement, and diagnostic purposes. Norm- and criterion-referenced assessment. Development of test specifications. Basic attributes of tests: validity, reliability, and usability. Common assessment strategies used in science or mathematics education. Constructing classroom tests. Constructing objective test items of the following forms: Multiple-choice, true/false, short answer, matching, and essay item types. Alternative assessment strategies: observation, interviews, performance assessment, peer evaluation, attitude scales, and self evaluation. Techniques for constructing test items, marking and reporting. Elementary statistics for test/item analysis. Construction of diagnostic tests and other measuring tools in testing cognitive and affective development.

SSME 509 Theories and Approaches in Teaching and Learning of Science/Mathematics (3-0)3

This course designed to provide students with the opportunity to develop their critical understanding of teaching and learning in theory and practice related to science and mathematics education. This course focuses upon behaviorist, constructivist, and social learning theories with a particular emphasis upon instructional implications in science and mathematics education. Specific instructional strategies emerging from these theories are covered. This course also includes new approaches and strategies in science and mathematics education such as multiple representations, models and modeling, learning styles, and self regulated learning strategies.

SSME 511 Methods of Science / Mathematics Teaching I (2-2)3

Instructional theories in teaching-learning process. Theoretical aspects of teaching-learning process as supported by research findings, in reference to science / mathematics education. Subject oriented teaching methods and strategies in science or mathematics education, teaching and learning processes in the subject area at secondary school level. General teaching methods as applied to

science or mathematics teaching, critical examination of textbooks and establishing their relations to teaching methods and strategies in science or mathematics education. Micro-teaching practice and evaluation of instruction.
Prerequisite: SSME 302 and SSME 309

SSME 512 Methods of Science/ Mathematics Teaching II (2-2)3
Teaching methods in the subject area, teaching and learning processes, application of general teaching methods in science or mathematics education, critical examination of subject field textbooks and establishing their relations to special teaching methods and strategies in the subject area, micro-teaching applications, evaluation of instruction. Study of various topics related to teaching methodology in research studies to help students develop a more critical perspective, to increase awareness of the variety of approaches to studying teaching and to provoke thought about appropriateness of teaching method(s) in teaching the subjects.
Prerequisite: SSME 511.

SSME 518 Instructional Technology and Material Development (2-2)3
Characteristics of various instructional technologies, the place and use of technologies in instructional process, development of teaching materials through instructional technologies (worksheets, transparencies, slides, videotapes, computer-based course material, etc.) and quality assessment of various teaching materials with respect to their feasibility and efficiency for the applications in science/mathematics education.
Prerequisite: SSME 400.

SSME 534 School Experience in Science/Mathematics Education (1–4)3
Classroom observations under the close supervision of a cooperating school teacher, including acquaintance with the school, students and the teaching profession from various perspectives at an early stage of the teacher training program in science and mathematics education. The main theme and activities of this course includes: school organization, its management and its problems; daily activities in the school; departmental activities in mathematics and science fields; a day of a student; a day of a teacher; school-parent collaboration; observation of major and minor subject area courses in terms of how teacher organize the lesson, use various teaching methods and activities, manage the classroom and evaluate student work; evaluating and preparing educational materials equipment and written resources to be used in teaching.
Prerequisite: SSME 511.

SSME 544 Practice Teaching in Secondary Education (2-6)5
Practice teaching in a classroom environment for acquiring required skills in becoming an effective science or mathematics teacher (one day or two half days a week; minimum 12 weeks); teaching of a course(s) in a planned way to improve teaching skills in the real classroom setting. Seminars related to practice teaching for two hours (evaluation of practice teaching and sharing experiences with other student teachers). Needs in classrooms, designing instructional activities for students with special needs.
Prerequisites: SSME 403, SSME 512, SSME 534 and SSME 518.

SSME 555 Research Projects in Science / Mathematics Education (2-2) 3
This course is based on the assertion that students learn research by doing it, rather than simply being told. Therefore, this course is designed to provide students with the opportunity to conduct a scientific research on a topic of their preference related to science/mathematics education. This course focuses upon reviewing literature, collecting and analyzing data, making interpretations, and communicating their research in its entirety with others.
Prerequisite: SSME 511 and SSME 518.

ELECTIVE COURSES

SSME 402 Technology Supported Mathematics Teaching (2-2)3
The potential and the place of technology in particular information technology and cognitive tools, in teaching and learning mathematics. The impacts of calculator and computers on curriculum and new standards for the professional development of mathematics teachers. Use of such technologies in teaching/learning algebra, geometry, pre-calculus, statistics, probability and problem solving.

SSME 404 Laboratory Experiments in Physics/ Chemistry/ Biology Teaching (2-2)3
Laboratory experiments in SSME. Improvement of skills in setting up experiments in Physics, Chemistry, Biology for Secondary Schools. Theory

of the experiments, data gathering and evaluation. Interpretation of possible unexpected results daily life applications of scientific principles relevant to experiments. Design new experiments in accordance with the national curriculum. The impacts of calculators and computers on curriculum and new standards for the professional development of Physics, Chemistry and Biology teachers.

SSME 412 Learning and Cognition in Teaching Science (3-0)3

Provides students with a broad-based understanding of the major theories and concepts of human learning and cognition as they pertain to the science education. Specifically, students in this course will examine current learning theories and applications of these theories to instructional practices at the secondary and high school.

SSME 422 Teaching Science Concepts Through Hands-on Activities (2-2)3

Focuses on planning and managing appropriate hands-on science experiments for grades six through eleven. Opportunity for exploring, developing, experimenting, and evaluating hands-on instructional materials.

SSME 424 Introduction to Statistics for Teachers (2-2)3

Nature of statistical methods, elementary distribution and sampling theory, estimation and testing hypothesis, linear regression and analysis of variance. Use of computer packages in the statistical analysis of data in education.

SSME 430 Special Problems in Math. / Science Education (2-2)3

Research project carried out under the supervision of a staff member on Science Education aiming at giving the student the necessary skill and experience in carrying out a scientific research. Students are expected to complete a written report on their topics, and give a seminar.

SSME 440 Teaching of Geometry Concepts (2-2)3

The role of geometry in Turkish school mathematics curricula. Psychological development of geometrical concepts. Methods of teaching geometry with special emphasis on active learning.

SSME 443 High School Physics Curriculum Review I (3-0)3

Analysis of all topics in Turkish ninth and tenth grade physics curricula in detail; review of the physics concepts emphasizing the common misconceptions and learning difficulties related to these concepts in literature; the strategies in order to handle the misconceptions; examination of ÖSS and ÖYS questions and measuring tools to assess the misconceptions, achievement, skills and attitude; familiarizing students to the corresponding Turkish terms of the physics concepts in English.

SSME 444 High School Physics Curriculum Review II (3-0)3

Analysis of all topics in Turkish 11^{th} and 12^{th} grade physics curricula in detail; review of the physics concepts emphasizing the common misconceptions and learning difficulties related to these concepts in the literature; the strategies in order to handle the misconceptions; examination of ÖSS and ÖYS questions and measuring tools to assess the misconceptions, achievement, skills and attitude; familiarizing students to the corresponding Turkish of the physics concepts in English.

SSME 445 High School Chemistry Curriculum Review (3-0)3

Reviewing the topics in high school chemistry curriculum in detail; exploring common misconceptions related to chemistry concepts reported in the literature; discussing assessment techniques to identify misconceptions; discussing conceptual change strategies on how to eliminate the misconceptions; examining the questions in University Entrance Examination considering the misconceptions; introducing Turkish terms for the corresponding chemistry concepts.

SSME 456 Laboratory Applications in Mathematics Teaching (2-2)3

Planning, development, and managing hands-on mathematics activities relevant to secondary school mathematics curriculum. Effective use of technological tools to analyze mathematical phenomena; application of teaching methods and assessment tools in mathematics education considering cognitive, affective and psychomotor aspects of human learning. Connections between real-world and mathematics realm.

SSME 485 Research Methods for Prospective Teachers (3-0)3

Research skills and related competences involved in planning conducting and reporting of applied research studies of the type needed for prospective teachers.

SSME 486 Problem Solving in Mathematics (3-0)3

Theories of mathematical problem solving; pedagogical techniques for school mathematics problem solving; curriculum organization to incorporate problem solving in school mathematics

programs; extensive experience and practice in solving mathematical problems.

SSME 492 Teaching of Probability and Statistics (2-2)3

Misconceptions on probability and statistics; methods of teaching concepts of probability and statistics; problem solving techniques to solve the problems related to them; their utility in daily life and other areas; pedagogical techniques for improving attitudes toward them, self-concept and beliefs related to their nature and their teachings; their historical development; their integration into school mathematics curriculum; basic inferential statistics to use them in action research.

SSME 495 Affective Variables for Mathematics / Science Teachers (3-0)3

Theories of affective variables related to attitudes toward mathematics/science, mathematics/ science anxiety, mathematics/ science self-concept, beliefs about the natures of mathematics/science and their teachings, self-regulation; reciprocal relationships among those variables and achievement; factors affecting these variables; pedagogical techniques for improving affective outcomes; evaluation of affective variables.

GRADUATE PROGRAMS WITH THESIS AT THE DEPARTMENT OF SECONDARY SCIENCE AND MATHEMATICS EDUCATION

GRADUATE CURRICULUM

M.S. in Secondary Science and Mathematics Education

SSME	500	M.S. Thesis	NC
SSME	503	Educational Statistics	(3-0)3
SSME	520	Research Methods in Education	(3-0)3
SSME	552	Seminar	NC

5 Elective Courses*

Total minimum credit: 21
No of Courses with credit: 7

Ph.D. in Secondary Science and Mathematics Education

If admitted by M.S. degree:

SSME	600	Ph.D. Thesis	NC

7 Elective Courses*

Total minimum credit: 21
No of Courses with credit: 7

If admitted by B.S. degree:

SSME	503	Educational Statistics	(3-0)3
SSME	520	Research Methods in Education	(3-0)3
SSME	552	Seminar	NC
SSME	600	Ph.D. Thesis	NC

12 Elective Courses*

Total minimum credit: 42
No of Courses with credit: 14

*** These electives are approved by the Department**

GRADUATE COURSES

SSME	500	M.S. Thesis	NC
SSME	503	Educational Statistics	(3-0)3
SSME	519	Courseware Design for Computer Mediated Learning in Network Environment	(1-4)3
SSME	520	Research Methods in Education	(3-0)3
SSME	530	Fundamentals of Curriculum Development	(3-0)3
SSME	536	Computer Assisted Instruction in Science and Mathematics	(3-0)3
SSME	539	Laboratory Projects in Science and Mathematics Education	(3-0)3
SSME	540	Test Construction in Science and Mathematics Education	(3-0)3
SSME	550	Projects in Computer Assisted Mathematics Education	(3-0)3
SSME	552	Seminar	NC
SSME	600	Ph.D. Thesis	NC
SSME	618	Psychology of Mathematics Education	(3-0)3
SSME	621	Critiques and Analysis of Research in Science and Mathematics Education	(3-0)3
SSME	648	Man, Environment and Science Education	(3-0)3
SSME	649	Historical Development of Basic Concepts of Science	(3-0)3
SSME	650	Cognitive Development in Mathematics and Science Education	(3-0)3
SSME	652	Theories of Learning as Applied to Science and Mathematics Education	(3-0)3
SSME	654	Theories of Instruction in Science and Mathematics Education	(3-0)3
SSME	655	Affective Variables in Mathematics and Science Education	(3-0)3
SSME	657	Computer-Assisted Instructional Models	(3-0)3
SSME	662	Planning and Evaluation of Computer Education Programs	(3-0)3
SSME	670	Applications of Item Response Theory Models in Achievement and Attitude Testing	(3-0)3
SSME	7XX	Special Topics in Science Education	(3-0)3
SSME	8XX	Special Studies	(4-2)NC
SSME	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

SSME 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between student and a faculty member. Students register for this course in every semester starting from beginning of their second or third semesters while the research program or write-up of thesis is in progress.

SSME 503 Educational Statistics (3-0)3
Inferential statistics, including sampling, test for significance, ANOVA techniques and regression analysis.

SSME 519 Courseware Design for Computer Mediated Learning in Network Environment (1-4)3
Computer Mediated Learning via Internet. Design and use of hyper text/ Media in instructional settings. Studying and understanding learning theory and the design of technology.
Prerequisite: SCE 300 or equivalent.

SSME 520 Research Methods in Education (3-0)3
Basic research designs constructed for hypothesis testing, their relevancies, their weaknesses .

SSME 530 Fundamentals of Curriculum Development (3-0)3
Philosophical and social aspects of different curriculum patterns.

SSME 536 Computer Assisted Instruction in Science and Mathematics (3-0)3
Application of computers into teaching-learning process in science and mathematics by school and home units.

SSME 539 Laboratory Projects in Science and Mathematics Education (3-0)3
Individual and group science and mathematics projects organized by way of process units are put into practice in the laboratory.

SSME 540 Test Construction in Science and Mathematics Education (3-0)3
Construction of diagnostic and achievement tests and other measuring tools in testing cognitive development.

SSME 550 Projects in Computer Assisted Mathematics Education (3-0)3
Development of a learning package with educational software, printed materials, instruction for teachers including the philosophy and background of the concepts.

SSME 552 Seminar NC
Investigation and group discussion of research topics relevant to major issues of maths/science education; oral and written presentation of a review of available literature on a certain topic.

SSME 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between student and a faculty member. Students register for this course in all semesters starting from the beginning of their second or third semesters while the research program or write-up of thesis is in progress.

SSME 618 Psychology of Mathematics Education (3-0)3
Discussions of researches in mathematics education: Basic issues for research in mathematics education; Mathematical idea analysis; Research on mathematics teacher development; Understanding of various topics in mathematics; Classroom research; Cultural aspects of the teaching and learning; Theories in mathematics education.

SSME 621 Critiques and Analyses of Research in Science and Mathematics Education (3-0)3
Emphasis on conceptualizing advanced educational research problems, analyzing data and interpreting data, and developing the methodology for dissertation proposals. Investigating and critically analyzing relevant research in science and mathematics education.

SSME 648 Man, Environment and Science Education (3-0)3
Various aspects of human impacts upon the environmental problems. Balance between man and his environment. Description of specifics of an ecosystem and translation into teaching-learning process in high school and university science curriculum.

SSME 649 Historical Development of Basic Concepts of Science (3-0)3
The development of basic concepts and principles dominant to physics, chemistry and biology. Historical development reference to science education.

SSME 650 Cognitive Development in Mathematics and Science Education (3-0)3
Behavioral patterns consisting of critical thinking, in reference to Piaget's patterns of cognitive

development. Science and mathematics education curricula in universities.

SSME 652 Theories of Learning as Applied to Science and Mathematics Education (3-0)3

Basic learning theories interacted with basic curriculum. Instructional patterns in Science and Mathematics Education.

SSME 654 Theories of Instruction in Science and Mathematics Education (3-0)3

Study of past and present theories of instruction. Synthesizing a broad range of existing and emerging perspectives in understanding individual, interactional and contextual phenomena of instruction in science and mathematics.

SSME 655 Affective Variables in Mathematics and Science Education (3-0)3

Theories of the affective variables including motivation, attitude, anxiety, self-concepts about the subject itself, beliefs about nature, teaching and learning of mathematics/science, self-regulation; investigation of research studies on affective variables in mathematics /scienceeducation; evaluation techniques of these variables; modelling of affective variables.

SSME 657 Computer-Assisted Instructional Models (3-0)3

Design of instructional systems, and test of these systems via-computers. Discussions about efficiency and feasibility. Applications in Science Education.

SSME 662 Planning and Evaluation of Computer Education Programs (3-0)3

Identifying purposes, selecting software and hardware, planning a computer education curriculum, training teachers, evaluating the outcomes of computer education programs.

SSME 670 Application of Item Response Theory Models in Achievement and Attitude Testing (3-0)3

Statistical concepts for test theory, classical test theory scaling techniques, process of test construction. Item Response Theory (IRT), application of IRT to solve problems in achievement and attitude testing, model data fit analysis in IRT, package programs used in scaling, such as BILOG RASCAL, ASCAL, MULTILO6

SSME 7XX Special Topics in Science Education (3-0)3

Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include current trends in Physics Education, Chemistry Education, Biology Education, Math Education, recent developments in Instructional Technology.

SSME 8XX Special Studies (4-2)NC

M.S. students choose and study a topic under the guidance of a faculty member normally his/her advisor

SSME 9XX Advanced Studies (4-0)NC

Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member normally his/her supervisor.

MASTER OF SCIENCE PROGRAMS WITHOUT THESIS AT THE DEPARTMENT OF SECONDARY SCIENCE AND MATHEMATICS EDUCATION

The graduates of the program will obtain a M.S. degree without thesis in Secondary Science and Mathematics Education with a major in biology, chemistry, mathematics or physics education, and will be qualified to teach in secondary schools. Applications to each of the four major areas of the program need to have a B.S. degree in one of the corresponding disciplines listed below.

Mathematics Education
Electrical Engineering
Electrical and Electronic Engineering
Electronic Engineering
Electronic and Communication Engineering
Mathematics
Mathematics Engineering
Mathematics-Informatics
Mechanical Engineering
Civil Engineering

Physics Education
Electrical Engineering
Electrical and Electronic Engineering
Electronic Engineering
Electronic and Communication Engineering
Physics
Physics Engineering
Mechanical Engineering
Civil Engineering

Chemistry Education
Biochemistry
Food Engineering
Chemistry
Chemical Engineering

Biology Education:

Horticulture
Plant Protection
Biochemistry
Biology
Food Sciences and Technology
Food Engineering
Molecular Biology and Genetics
Medical Biological Sciences
Animal Biology

GRADUATE CURRICULUM WITHOUT THESIS

First Semester

EDS	507	Development and Learning	(3-0)3
SSME	511	Methods of Science/Mathematics Teaching I	(2-2)3
SSME	501	Curriculum Development & Instruction in Science/Mathematics Education	(3-0)3
SSME	509	Theories and Approaches in Teaching and Learning of Science/Mathematics	(3-0)3
EDS	524	Introduction to Education	(3-0)3

Second Semester

EDS	510	Classroom Management	(2-2)3
SSME	512	Methods of Science / Mathematics Teaching II	(2-2)3
SSME	518	Instructional Technology and Material Development	(2-2)3
SSME	502	Measurement & Evaluation in Science/Mathematics Education	(3-0)3
SSME	534	School Experience in Science/ Mathematics Education	(1–4)3
Elective			(3-0)3

Third Semester

EDS	522	Guidance	(3-0)3
SSME	544	Practice Teaching in Secondary Education	(2-6)5
SSME	555	Research Projects in Science/ Mathematics Education	(2-2)3
EDS	551	Turkish Educational System and School System	(3-0)3
Elective			(3-0)3

For the course descriptions, see Five-Year Programs of Secondary Science and Mathematics Education Department.

INTERNATIONAL JOINT PROGRAM ON LIBERAL STUDIES WITH A CONCENTRATION IN ENGLISH LANGUAGE TEACHING

Program Coordinator: ÇOPUR, Deniz, (METU/ Department of Foreign Language Education)
B.A., M.A., Ph.D., METU.

PROGRAM DESCRIPTION:

Global socioeconomic conditions in the new millennium require the need for going beyond conventional teacher education models and highlight multidimensional, interdisciplinary educational programs for teacher education. Based on this philosophy, Middle East Technical University (METU), Department of Foreign Language Education in collaboration with State University of New York (SUNY)–New Paltz is offering a dual diploma undergraduate program in Teaching English as a Foreign Language (TEFL) and Liberal Studies.

The program in TEFL-Liberal Studies provides students with a solid foundation in the field of English language teaching and helps them to develop strategies, firmly grounded in research, theory and practice, to teach English in any part of the world, or to do research on the teaching, learning or assessment of English as a foreign language. This formulation is enriched by 'Liberal Studies' perspective that students will gain throughout their education.

The four-year program includes full-time enrolment for 6 semesters at METU and 2 semesters and 2 summer sessions at SUNY-New Paltz: first, second and fourth years at METU, and the third year and two summer sessions at SUNY, New Paltz. Compulsory courses in the program provide students with the fundamentals of English language teaching profession while a wide spectrum of elective courses in psychology, sociology, philosophy, linguistics and literature equip them with new perspectives and new horizons.

Upon successful completion of all the requirements at both institutions, students of this dual diploma program are awarded Bachelor of Arts degree in English Language Teaching at METU and Bachelor of Arts degree in Liberal Studies at SUNY-New Paltz.

During their education, students will have

- a chance to study in one of the most respectable institutions both in Turkey and the US,
- an understanding of cross-cultural characteristics of today's world by being a student in Turkey and in the US, and
- compulsory courses which aims to familiarize students with the fundamentals of their academic development as well as a wide range of elective courses which broaden their vision and facilitate their specialization.

For more information about the program, please visit www.suny.metu.edu.tr

UNDERGRADUATE CURRICULUM

FIRST YEAR (METU)

First Semester				Second Semester			
TEFL	171	Expository Writing I	(3-0)3	TEFL	172	Expository Writing II	(3-0)3
TEFL	173	Critical Reading &Thinking I	(3-0)3	TEFL	174	Critical Reading &Thinking II	(3-0)3
TEFL	175	Oral Communication I	(3-0)3	TEFL	176	Oral Communication II	(3-0)3
TEFL	177	Introduction to Literature	(3-0)3	TEFL	182	Introduction to English Language Teaching: Approaches and Methods	(3-0)3
EDS	200	Introduction to Education	(3-0)3				
TURK	103	Turkish I	(2-0)2	TEFL	273	Introduction to Linguistics I	(3-0)3
IS	100	Introduction to Information Technologies & Applications	(NC)	TURK	104	Turkish II	(2-0)2
ENG	105	TOEFL IBT I	(NC)	ENG	106	TOEFL IBT II	(NC)

SECOND YEAR (METU)

Third Semester				Fourth Semester			
TEFL	274	Introduction to Linguistics II	(3-0)3	TEFL	271	Language Acquisition	(3-0)3
TEFL	275	Survey of English Literature	(3-0)3	TEFL	278	ELT Methodology II	(3-0)3
TEFL	277	ELT Methodology I	(3-0)3	TEFL	280	The Novel I	(3-0)3
TEFL	279	Lexical Competence	(3-0)3	TEFL	282	Advanced English Structure	(3-0)3
TEFL	281	Research Methods	(3-0)3	TEFL	286	English-Turkish Translation	(3-0)3
HIST	2201	Principles of Kemal Atatürk	(NC)	HIST	2202	Principles of Kemal Atatürk	(NC)

SUMMER SCHOOL I (New Paltz University)

EDS	367	Human Development	(3-0)3
Elective (Arts)			(3-0)3

THIRD YEAR (New Paltz University)

Fifth Semester				Sixth Semester			
SED	356	Teaching and Learning in the Digital Environment	(3-0)3	EDS	340	Sociological and Philosophical Foundations of Education	(3-0)3
SED	393	Syntax, Phonology & Lexicon I	(3-0)3	SED	353	Field Work Level I	(NC)
Math		(Restricted Elective)	(3-0)3	SED	393	Syntax, Phonology & Lexicon II	(3-0)3
Natural Sciences			(3-0)3	SED	393	Sed. Ed. Selected Topics	(3-0)3
Major			(3-0)3	SED	453	Introduction to Curriculum and Assessment	(3-0)3
Major			(3-0)3	Major			(3-0)3
				Major			(3-0)3

SUMMER SCHOOL II (New Paltz University)

Major	(3-0)3
Major	(3-0)3

FOURTH YEAR (METU)

Seventh Semester

TEFL	487	ELT Materials Development and Adaptation	(3-0)3
TEFL	489	Teaching English to Young Learners	(3-0)3
TEFL	491	Drama	(3-0)3
EDS	304	Classroom Management	(3-0)3
EDS	424	Guidance	(3-0)3

Eighth Semester

TEFL	490	Practice Teaching	(2-6)5
TEFL	492	Poetry	(3-0)3
TEFL	494	The Novel II	(3-0)3
TEFL	496	Turkish- English Translation	(3-0)3
EDS	416	Turkish Educational System and School Management	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

TEFL 171 Expository Writing I (3-0)3
Paragraph writing; organization of paragraphs; developing skills of summarizing, outlining, paraphrasing, and answering examination questions at paragraph level, developing students' linguistic competence in English, increasing awareness of how meaning is created through structure and how structure and vocabulary are related.

TEFL 172 Expository Writing II (3-0)3
Developing expository essay writing skills, focusing on example essays, comparison-contrast essays and cause-effect essays, improving students' use of linguistic structures at the discourse level, focusing on relation between form and text type; producing texts that increase sensitivity to grammar in context.

TEFL 173 Critical Reading &Thinking I (3-0)3
Enabling students to read unfamiliar, authentic texts accurately and efficiently, focusing on awareness of the relations between vocabulary, structure and meaning.

TEFL 174 Critical Reading & Thinking II (3-0)3
A continuation of Critical Reading and Thinking I, aiming to develop critical reading and thinking skills with emphasis on reading texts which are structurally and intellectually complex and thought-provoking.

TEFL 175 Oral Communication I (3-0)3
Developing students' speaking and listening skills with a variety of activities; listening to authentic English passages, conversations, poems, etc. on tape with emphasis on interaction-based activities that involve students in active communication.

TEFL 176 Oral Communication II (3-0)3
A continuation of Oral Communication I, aiming at further practice in listening and spoken skills, focusing on formal presentation skills.

TEFL 177 Introduction to Literature (3-0)3
Studying basic concepts of literary analysis and critical appreciation through selected texts from various genres and periods.

TEFL 182 Introduction to English Language Teaching: Approaches and Methods (3-0)3
Examining approaches and methods such as Grammar Translation, Direct, Audio-Lingual Methods, Communicative Approach, the Natural Approach and techniques in English language teaching from a historical viewpoint; presentation of examples.

TEFL 271 Language Acquisition (3-0)3
Theories, comparison, and illustration of native and foreign languages; stages of language development and acquisition; learning grammar and other components of language; models of foreign language learning; learner characteristics; using language and learning stages and processes in the teaching of a foreign language.

TEFL 273 Introduction to Linguistics I (3-0)3
Creating an awareness of language as a dynamic system; introducing basic concepts in linguistic analysis, i.e. components of language as a system; understanding the relevance of linguistics in the teaching profession and literary studies.

TEFL 274 Introduction to Linguistics II (3-0)3
Understanding the process of language acquisition, the connection between language acquisition

theories and language teaching methods, and the functioning of language in society.

TEFL 275 Survey of English Literature (3-0)3
Studying literary texts representing different periods and genres of English literature is the main objective of this course. The students will be introduced to the study of literature as an intellectual discipline by showing the ways of approaching literature, through close reading and analysis. It aims at developing basic strategies for critical reading and interpreting poetry, fiction, and drama. Reading texts are selected from different literary periods and it aims to develop familiarity with notable literary texts of English Literature.

TEFL 277 ELT Methodology I (3-0)3
Developing students' awareness concerning the relationship between linguistics, psychology and educational psychology; enabling students to make presentations with major approaches, methods and techniques of teaching English.

TEFL 278 ELT Methodology II (3-0)3
A continuation of ELT Methodology I, enabling students to acquire skills necessary for teaching different language skills with special emphasis on learning and teaching strategies, lesson planning and class management.

TEFL 279 Lexical Competence (3-0)3
This course aims to raise students' understanding of the relation between lexical items and structural forms as well as expanding their vocabulary knowledge by focusing on the components of word formation including prefixes and suffixes. Students also learn idioms, collocations, slang, euphemisms, neologisms, proverbs and phrasal verbs to help them to better explore, review, play with and enhance their spoken and written expression. Throughout the course, students will engage in interactive content-based tasks such as problem-solving activities, error analysis, and journals writing to increase their vocabulary span.

TEFL 280 The Novel I (3-0)3
Studying the characteristics of the novel as a literary genre; approaches to analyzing the novel; analysis of sample British novels that represent various literary periods.

TEFL 281 Research Methods (3-0)3
The teaching and application of scientific research methods and techniques; having students do small scale research in their own fields and evaluating their work.

TEFL 282 Advanced English Structure (3-0)3
Reviewing syntactic and semantic trouble spots in English grammar at advanced level, with emphasis on techniques of teaching grammar.

TEFL 286 English-Turkish Translation (3-0)3
This course develops basic knowledge, skills and techniques required for translating as well as continued growth of linguistic resources such as vocabulary, structures and style within an English-Turkish foreign language cultural and social context.

TEFL 487 ELT Materials Development and Adaptation (3-0)3
Enabling students to acquire skills necessary for evaluating language teaching materials in current textbooks, adapting or developing materials for language teaching and language testing.

TEFL 489 Teaching English to Young Learners (3-0)3
The learning strategies of young children and the acquisition of the mother tongue as well as the learning of a foreign language; the classroom methods and techniques to be used when teaching English to young learners; the development of games, songs and visual materials and their use in teaching.

TEFL 490 Practice Teaching (2-6)5
Consolidating the skills necessary for teaching English as a foreign language at primary and secondary schools through observation and teaching practice in pre-determined secondary schools under staff supervision; critically analyzing the previously acquired teaching related knowledge and skills through further reading, research and in class activities in order to develop a professional view of the ELT field.

TEFL 491 Drama (3-0)3
Studying the characteristics of drama as a genre; types of drama; analysis of drama; analysis of examples from European or American drama representing different trends.

TEFL 492 Poetry (3-0)3
This course aims at developing familiarity with important poems of English Literature by focusing on widely appreciated poems by British poets through critical methods associated with poetry analysis.

TEFL 494 The Novel II (3-0)3
This course aims at studying and analyzing significant British novels of the 20th century. Modernist and Postmodernist texts of prominent 20th century writers are discussed critically by considering social, political and cultural changes of the period.

TEFL 496 Turkish-English Translation (3-0)3
This course develops basic knowledge, skills and techniques required for translating as well as continued growth of linguistic resources such as vocabulary, structures and style within a Turkish-English foreign language cultural and social context. The course enables students to acquire skills necessary for dealing with a broad range of (Turkish to English) translation problems through analysis, discussion and practice with a variety of texts.

Electives
For their major, students will select 6 courses from the following list in consultation with their advisor at New Paltz.

I. Language and Literature
41200 Great Books
41231 American Women Writers
41308 Short Story
41310 Studies in Drama
41331 American Literature Survey I
41332 American Literature Survey II
41436 19th Century American Literature
41439 20th Century American Novel
71201 Logic
90357 Argumentation
90359 Communication among Cultures
90413 Sociolinguistics

II. Society and Culture
33100 American Economic Development
33351 History of Economic Thought
48301 Geography of US and Canada
48273 Physical Geography
58221 Survey of US History to 1865
58222 Survey of US History since 1865
58302 American Immigration
58328 American Social and Cultural History: 1877 to Present
58329 Post-War America: 1945 to Present
71120 Introduction to Philosophy Classics
71211 Ancient Greek Philosophy
71270 Religions of the World
71304 Ethics
71344 Philosophy of the Arts
90101 Media and Society
90432 TV in American Culture
91420 American Musical Theatre

FACULTY OF ENGINEERING

Dean : AKYÜZ, Uğurhan; Prof. Dr.;
B.S., M.S., Ph.D., METU
Associate Dean : EYÜBOĞLU, Murat; Prof. Dr.;
B.S., M.S., METU, Ph.D., Sheffield University
Associate Dean : İMAMOĞLU, İpek; Assoc. Prof. Dr.;
B.S.,METU, M.S., University of Newcastle upon Tyne, Ph.D., University of Wisconsin-Milwaukee

MISSION STATEMENT

The Faculty of Engineering of METU educates engineers and researchers with universal qualifications, who can fulfill the needs and expectations of, and play a leadership role in the advancement of industry and society. The Faculty of Engineering advances engineering science and technology through research, and contributes to the application of the created knowledge and technology to benefit mankind.

OBJECTIVES

- To educate engineers capable of applying their knowledge effectively to solving engineering problems and to design, who are open to change and committed to lifelong learning, equipped with communication skills and understanding of professional issues and humanitarian values.
- To educate master's level engineers with a level of knowledge sufficiently advanced to carry out research and communicate the results thereof.
- To educate doctorate level engineers capable of carrying out original research and defending and disseminating the results thereof.
- To employ a sufficient number of faculty members to carry out high quality education and research, who can be role models to students through their personality and scholarly conduct.
- To increase high level, funded research, preferably interdisciplinary, and guided by goals that contribute to the advance of technology.
- To disseminate results of research and existing knowledge through such means as national and international publications, meetings, consultancy and continuing education.

PROGRAMS OF STUDY

The Faculty of Engineering has the following fourteen departments:
Aerospace Engineering,
Chemical Engineering,
Civil Engineering,
Computer Engineering,
Electrical and Electronics Engineering,
Engineering Sciences,
Environmental Engineering,
Food Engineering,
Geological Engineering,
Industrial Engineering,
Mechanical Engineering,
Metallurgical and Materials Engineering,
Mining Engineering,
Petroleum and Natural Gas Engineering,

offering 13 undergraduate programs (the Department of Engineering Sciences has no undergraduate program) as well as numerous graduate programs at both master's and doctoral level. The Faculty of Engineering, being aware of its distinguished standing in the country, gives utmost priority to research activities and to relations with the industry. There are also cooperative links with universities in the U.S.A., U.K., Europe, and Australia via several educational and R&D protocols.

ENGINEERING FACULTY CORE CURRICULUM

The *Faculty Core Curriculum* intends to set up criteria regarding the maximum and minimum allowable credits necessary for graduation and to establish a well-balanced composition of topics from the following four main categories:

- Mathematics and basic sciences
- Engineering sciences
- Social sciences, humanities, economics and communication
- Professional sciences and applications of a particular engineering field

MATHEMATICS and BASIC SCIENCES: (min. 9 courses; min. 32 credits)

MATHEMATICS: (min. 4 courses; min. 14 credits)
2 courses in Calculus
Differential Equations
1 course in the following areas: Linear Algebra, Complex Variables, Introduction to Numerical Methods, Statistics & Probability, Advanced Calculus, Mathematical Analysis.

BASIC SCIENCES: (min. 3 courses; min. 11 credits)
2 courses in General Physics
1 course in General Chemistry or General Biology
Areas for additional courses: General Physics, Optics, Classical Mechanics, Modern Physics, Quantum Physics, Astronomy, General Chemistry, Analytical, Physical, Organic or Quantum Chemistry, Earth Sciences, General Biology, Molecular Biology, Microbiology, Biochemistry, Environmental Sciences.

ENGINEERING SCIENCES: (min. 4 courses in 3 of the following 6 areas with at least 1 course outside the discipline; min. 12 credits)
Engineering Mechanics (Continuum/Sub-continuum)
Thermodynamics
Electrical Sciences
Materials Science
Transport Phenomena
Computer Science

ENGINEERING GRAPHICS: (min. 1 course; min. 3 credits)

COMPUTER LITERACY & PROGRAMMING: (min. 1 course; min. 3 credits)

SOCIAL SCIENCES, HUMANITIES, ECONOMICS & COMMUNICATIONS: (min. 6 courses; min. 18 credits)
2 courses in basic reading and writing in English
1 course in oral communication in English
1 course in communication skills
2 courses in the following areas: Linguistics, Foreign Language Studies, History, Psychology, Sociology, Philosophy, Literature, Fine Arts, Political Science, Economics.

ENGINEERING ETHICS: (min.course content equivalent to 1 credit)
FREE ELECTIVES: (min. 1 courses; min. 3 credits)
Any area

TECHNICAL ELECTIVES: (min. 4 courses; min. 12 credits)

DESIGN: (min. 2 design courses based on previous course work in the relevant discipline; min. 4 credits)

TOTAL CREDITS: 128-140

MINOR PROGRAMS IN ENGINEERING

Currently there are 23 minor programs offered by various departments of the Faculty of Engineering as listed below:

Minor Program	**Department**
Aerodynamics	Aerospace Eng.
Aeropropulsion	Aerospace Eng.
Aerostructure	Aerospace Eng.
Flight Vehicle Control	Aerospace Eng.
Chemical Reaction Engineering	Chemical Eng.
Geotechnics	Civil Eng.
Structural Analysis and Design	Civil Eng.
Information Systems	Computer Eng.
Environmental Chemistry	Environmental Eng.
Environmental Microbiology	Environmental Eng.
Telecommunication	Electrical and Electronics Eng.
Food Sciences	Food Eng.
Earth Sciences	Geological Eng.
Mechatronics	Dean’s Office
Geographic Information Systems and Remote Sensing	Dean's Office
Operational Research	Industrial Eng.
Production Planning and Control	Industrial Eng.
Quality Planning and Control	Industrial Eng.
Production	Mechanical Eng.
Engineering Metals and Alloys	Metallurgical and Materials Eng.
Ceramic Materials	Metallurgical and Materials Eng.
Mineral Technology	Mining Eng.
Rock Mechanics	Mining Eng.

The details of individual minor programs are given under the program descriptions of related departments except *Geographic Information Systems and Remote Sensing* and *Mechatronics* minor programs which appear under the Faculty of Engineering. The equivalency of courses taken in student's major program to the courses in a minor program is determined by the department offering that minor. However, students must take courses of at least 12-credits and at least 4-courses in addition to their regularly enrolled major programs in order a minor certificate to be granted.

DOUBLE MAJOR PROGRAMS IN ENGINEERING

Students seeking a double major in engineering must satisfy the requirements of both majors as stated by both departments involved as well as the requirements of the Faculty Core Curriculum. The equivalency of courses which will be considered common in both programs is determined by the departments involved.

MINOR PROGRAM IN GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING

The program is designed to provide systematic approach to students who are interested in the field of activity which integrates all the means used to acquire and manage spatial data required as part of scientific, administrative, legal and technical operations involved in the process of production and management of spatial information. Considering the interdisciplinary nature of the subject the program offers equal opportunity to interested students from different departments.

Compulsory courses:

GEOE 431	Introduction to Remote Sensing	(3-0)3
CENG 302	Introduction to Database Management Systems	(3-0)3

One of the following courses:

CE	413	Introduction to Geographic Information Systems	(2-2)3
or			
CP	338	Introduction to Geographic Information Systems in Planning Practice	(3-0)3

Three of the following courses:

GEOE	408	Geomorphology	(2-2)3
GEOE	409	Photogeology	(2-2)3
GEOE	443	Aerial Thematic Mapping	(2-2)3
GEOE	445	Aerial Photography	(3-0)3
GEOE	447	Digital Terrain Analysis	(2-2)3
CENG	466	Fundamentals of Image Processing	(3-0)3
CP	444	Application Development in Geographic Information Systems	(3-0)3

MINOR PROGRAM IN MECHATRONICS

Faculty of Engineering offers a Minor Program on Mechatronics for undergraduate students of the Faculty of Engineering. Mechatronics is a methodology and design philosophy which blends areas of technology involving analysis and design of the behaviour of systems of sensors, measurements, drives, actuators as well as their microprocessor based controls. A mechatronic system is multidisciplinary, embedding several fundamental disciplines; electrical and electronics, computer science and information technology and mechanical engineering with fundamental engineering design methodology. The main purpose of this program is to provide the successful and motivated students within broad knowledge of mechatronics that will enable them to practice their profession in an interdisciplinary manner.

Compulsory Courses:

ME	220	Introduction to Mechatronics	(1-0)1
EE	281	Electrical Circuits	(2-2)3
EE	282	Introduction to Digital Electronics	(3-0)3
ES	223	Statics and Strength of Materials	(4-0)4
ME	208	Dynamics	(3-0)3
ME	212	Principles of Production Engineering	(3-0)3
METE	227	Basic Concepts in Material Science	(3-0)3
EE	301	Signals and Systems I	(3-0)3
EE	302	Feedback Systems	(3-0)3
EE	348	Introduction to Logic Design	(3-0)3
ME	461	Mechatronic Components and Instrumentation	(1-4)3
ME	462	Mechatronic Design	(2-2)3
ME	414	System Dynamics	(3-0)3
EE	447	Introduction to Microprocessors	(3-2)4

Two of the Following Courses:

ME	301	Theory of Machines I	(3-0)3
ME	302	Theory of Machines II	(3-0)3
ME	307	Machine Elements I	(3-0)3
ME	308	Machine Elements II	(3-0)3

Three of the Following Courses:

1- ME 442 Design of Control Systems (3-0)3
2- EE 402 Discrete Time Systems (3-0)3
or
ME 534 Computer Control of Machines* (3-0)3
3- EE 430 Digital Signal Processing (3-0)3
4- CENG 424 Logic for Computer Science (3-0)3
or
CENG 462 Artificial Intelligence (3-0)3
or
EE 586 Artificial Intelligence* (3-0)3
or
EE 559 Intelligent Control* (3-0)3
5- CENG 466 Fundamentals Image Processing Techniques (3-0)3
or
CENG 483 Introduction to Computer Vision (3-0)3
or
EE 584 Machine Vision* (3-0)3
or
EE 634 Digital Image Processing * (3-0)3
6- ME 440 Numerically Controlled Machine Tools (3-0)3
or
ME 448 Fund. of Micro Electromechanical Systems and Microsystems (3-0)3
or
ME 493 Introduction to Smart Structures and Materials (3-0)3
or
ME 551 Design of High Precision CNC Machinery* (3-0)3
7- CENG 443 Intro. to Object Oriented Prog. Lang. and Systems (3-0)3
8- CENG 786 Robot Motion Planning and Control* (3-0)3
or
CENG 787 Robot Locomotion: Models and Algorithms* (3-0)3
or
EE 780 Statistical Techniques in Mobile Robotics* (3-0)3
9- CENG 436 Data Communications and Computer Networking (3-0)3
or
EE 444 Introduction to Computer Networks (3-0)3

A maximum of one course from among those indicated by " * " can be selected from this list.

ACCREDITATION HISTORY

Formal external evaluations were requested from ABET (Accreditation Board for Engineering and Technology, Inc.) in 1992. As a result of these evaluations, Chemical and Mining Engineering programs (since 1994), Civil, Electrical & Electronics, Mechanical, Metallurgical & Materials Engineering programs (since 1996), and Aerospace, Computer, Environmental, Food, Geological, Industrial and Petroleum & Natural Gas Engineering programs (since 2002), were judged to be *"substantially equivalent to similarly named accredited programs in the USA"* by ABET which was the only kind of positive accreditation statement provided by ABET for programs outside the USA at the time.

Latest evaluations were towards *full accreditation* and currently all 13 undergraduate programs are accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org, effective October 1, 2007.

DEPARTMENT OF AEROSPACE ENGINEERING

PROFESSORS

AKMANDOR, İ. Sinan: B.S., Boğaziçi University; M.S., Sc.D., M.I.T.
ALEMDAROĞLU, Nafiz: B.S., METU; D.E.A., Doctorat d'Ingenieur, E.N.S.M.A., Poitiers France.
ÇELENLİGİL, M. Cevdet: B.S., METU; M.A., Ph.D., Princeton University.
KAYRAN, Altan: B.S., METU; Ph.D., University of Delaware.
ÖZGEN, Serkan : B.S., M.S., METU; P.G. Dipl., V.K.I.;Ph.D., Université Libre de Bruxelles.
ÖZYÖRÜK, Yusuf***:*** B.S., İ.T.Ü.; M.S., Ph.D., Pennsylvania State University.
TEKİNALP, Ozan ***(Department Chair)***: B.S., İ.T.Ü.; M.S., Ph.D.,University of Michigan.
TUNCER, İsmail H.: B.S., METU; M.S., Purdue University; Ph.D. Georgia Institute of Technology.
YAMAN, Yavuz***:*** B.S., M.S., METU; Ph.D., University of Southampton.
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ASSOCIATE PROFESSORS

ÇÖKER, Demirkan : B.S., METU; M.S. in Applied Mathematics, Wright State Univ.;
M.S. in Aerospace Eng., Univ. of Dayton; Ph.D.in Aeronautics, California Institute of Technology.
EYİ, Sinan: B.S., K.T.Ü.; M.S., Ph.D., University of Illinois at Urbana-Champaign.
KURTULUŞ, Dilek Funda ***(Vice Chair)***: B.S., M.S., Ph.D. METU; Ph.D., E.N.S.M.A., Poitiers France.
ŞAHİN, Melin: B.S., M.S., METU; Ph.D., University of Southampton.
UZOL, Oğuz : B.S., M.S., METU; Ph.D., Pennsylvania State University.
YAVRUCUK, İlkay: B.S., METU; M.S., Ph.D., Georgia Intitute of Technology.

ASSISTANT PROFESSORS

GÜRSES, Ercan: B.S., METU in Civil Eng., M.S., Ph.D. University of Stuttgart
KUTAY, Ali Türker ***(Vice Chair)***: B.S., M.S. METU; Ph. D. in Aerospace Eng., Georgia Institute of Technology.

GENERAL INFORMATION : The mission of the Department of Aerospace Engineering is to educate students and to do research in aerospace sciences, including analysis, design, manufacturing and testing of air and space vehicles, in order to contribute to the economic progress and welfare of the society.

MISSION STATEMENT : Department of Aerospace Engineering aims to graduate students who can meet the demands of the National Aerospace Industry, who are equipped with fundamental engineering knowledge and abilities who can comprehend and analyze aerospace systems as a whole, who have leadership qualities, ethical values and consciousness of environmental issues, who can renew themselves and who can continuously learn and question. The department collaborates with distinguished universities and technology centers of the world on education and research, thus increasing and updating its knowledge and does research to develop and produce technology.

UNDERGRADUATE PROGRAM : Successful students are awarded the degree of Bachelor of Science (B.S.) in Aerospace Engineering at the end of the program. The Aerospace Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

The program is designed to equip the students with basic physical and mathematical sciences in the first year; with basic aeronautical engineering courses in the second year and applied courses in the remaining two years. The program comprises various summer training programs and laboratory work at every level of the education.

Program Educational Objectives:

METU Aerospace Engineering graduates,

- equipped with advanced knowledge in their fields, fulfill aerospace engineer requirements in Turkey,
- are preferred by national and international pioneering institutes and research centers in the fields of aerospace and advanced technologies,
- specialize in areas of their choice by pursuing graduate studies and those who prefer seek academic and research positions in reputable universities.

Aerospace Engineering Student Outcomes:

Our graduates are expected to have the following knowledge, skills, and behaviors:

- ability to apply basic knowledge in mathematics, science, and engineering in solving aerospace engineering problems,
- ability to analyze and design aerospace systems and subsystems,
- ability to reach knowledge required to solve given problems and utilize that knowledge in solving them,
- ability to follow advancements in their fields and improve themselves professionally,
- ability to communicate and participate effectively in multi-disciplinary teams.

CAREER OPPORTUNITIES: TUSAŞ Aerospace Industries (TAI), TUSAŞ Engine Industries (TEI); TÜBİTAK-SAGE; ROKETSAN; ASELSAN; HAVELSAN; Turkish Airlines; Turkish Air League; Turkish Air Force; PTT, TÜRKSAT, Research Institutes of TÜBİTAK Ministry of Defense, Universities; Various private sector companies.

GRADUATE PROGRAMS

To train Aerospace Engineers at M.S. or Ph.D. levels in order to create the potential in research and development for the needs of the industry and Aerospace Engineering Sciences.

Individually designed graduate programs are offered at M.S. and Ph.D. levels according to the formation requirements of each student in the following fields: Aerodynamics, Structures and Materials, Propulsion, and Flight Dynamics and Control. The current research interests of the staff members are described below.

Aerodynamics: Some of the current research interests of faculty members are: Computational fluid dynamics (CFD); Development of Euler and Navier-Stokes CFD solvers for application to various missile and aircraft configurations, prediction of vortical flow fields of helicopter rotor blades, numerical prediction of ice-accretion and loss of performance, performance evaluation of various turbulence models, high-lift aerodynamics and performance of multi element airfoils, jets in cross flow, numerical investigation of unsteady turbomachinery flows, numerical investigation of flapping airfoil combinations. Hypersonic and rarefied gas dynamics. Computational aeroacoustics; Prediction of tonal noise radiating from turbofans. Turbulence measurements using hot-wire and split-film anemometry techniques. Conceptual and detailed design aircraft and helicopter; Model manufacturing and wind tunnel testing of new conventional and unconventional flight vehicles. Flow visualization in subsonic and supersonic wind tunnels. Calculations of lift, drag, pitching moment coefficients and various stability coefficients using empirical, 3-D panel and advanced CFD techniques. 6 DOF flight simulation of various missile and aircraft configurations.

Structures, Structural Dynamics and Materials: Structural dynamics and vibrations, theoretical and applied mechanics, thin walled structures: beams, plates and shells, mechanics of composite materials, sandwich structures, composite manufacturing, experimental and computational mechanics, fracture mechanics, fatigue of materials, damage tolerant design, behavior of materials under dynamic loading involving high strain rates, impact loading structures, adhesive joints in composite structural elements, periodic structures, active noise and vibration control of aerospace structures by using smart structures, application of piezoceramics and/ or shape memory alloys, structural health monitoring and damage detection, multidisciplinary design and optimization of aerospace structures, aeroelasticity, aeroservoelasticity, biomechanics, morphing aerospace structures.

Propulsion, Heat Transfer, Aerothermodynamics: Propulsive ducts, ice formation on wings and propellers, 3D-TVD and ENO Solutions of turbine and compressor blades, quasi 3-D inverse flow solution and design of rotating cascades, 2 phase liquid-gas internal flow analysis, spinning solid rocket propulsion assessment, overall performance estimation and experimental investigation of small ramjet, turbojet and turboprop engines; 3-D Spray Combustion Simulation. Design and test of combustion chambers; lean and rich combustion, flame propagation and stability characteristics. Analysis of ducted and non-ducted propellers, production system integration and design, cogeneration and combined cycle performance analysis. Turbomachinery flows, rotor-stator interaction, experimental techniques including optical diagnostics, gas turbine modeling, simulation and control, turbulence.

Avionics, Flight Mechanics and Control: Modeling of aerospace flight vehicles, development of simulation tools, automatic flight control algorithms, guidance techniques, NN Based INS filtering methods, combined optimization of design and control variables, development of a flight control system for a VTOL-UAV.

RESEARCH INTERESTS AND FACILITIES: Aerospace Engineering Department has grown very fast within the last 20 years following its naissance in 1981. The department was first established as a collaborative product of Mechanical, Civil, Electrical, Metallurgical Engineering and Engineering Science

Departments of the Faculty of Engineering. In this respect, the research facilities and laboratories of these Departments are jointly used with Aerospace Engineering and the respective Departments. Detailed information about the facilities of these departments can be looked up from appropriate sections of this catalog. However, Aerospace Engineering Department is developing its own research facilities and putting them at the disposition of the other departments. Some important research facilities of Aerospace Engineering Department are;

AERODYNAMICS LABORATORY:

1. Small Subsonic Research Wind Tunnel: This is a home built, Eiffel type, variable speed (0-30 m/s) subsonic wind tunnel, having a test section of 0.3 m x 0.3 m and is used basically for demonstration and research purposes. The tunnel speed can be controlled and regulated through a personal computer. Basic research in turbulence and flow field measurements using pressure probes and hot-wire anemometry techniques are conducted in this tunnel. A complete data-acquisition system is also incorporated with this facility for automated probe traversing and data collection.

2. Supersonic Wind Tunnel: This is a blow-down supersonic wind tunnel, complete with its compressor, air drier and exhaust silencer. The test section is 20 mm x 30 mm, and is of variable nozzle type which permits to attain speeds in the range $1.3 < M < 3.4$, velocity being continuously adjustable during operation. The running time of the tunnel is 30 to 60 seconds, depending upon the Mach number. The nominal operating stagnation pressure of the system is 14 bars supplied by a compressor rated at 7.5 kW. The tunnel incorporates a complete Schlieren system for flow visualization. This tunnel is used mainly for demonstration purposes in high-speed compressible gas dynamics.

3. Air Flow Bench: This is a mobile bench providing the basic airflow for a wide range of demonstration experiments, laboratory and project work. Various test facilities, such as Bernoulli's equation, drag force, round turbulent jet, boundary layer, flow around a bend, jet attachment and flow visualization are also incorporated. The working section of the apparatus is 100 mm x 50 mm. Besides the department has a 3 channel Constant-temperature anemometer system, with various single, cross (double) and triple hot-wire probes and triple-quadruple split film probes used basically for measurements in recirculation flows. Data acquisition hardware and software systems are also available for research and application purposes.

4. Water Tank: This is a water tank with 80cmx80cm cross section having 2m length. Impulsive starting flows, flow around aerodynamic bodies at low Reynolds numbers and flow visualization with dye are incorporated in the setup. Data acquisition hardware and software systems are also available for research and application purposes.

5. Low-speed Wind Tunnel: This is a continuous-flow blower configuration wind tunnel that consists of a 0.6 m diameter double-intake radial blower driven by a frequency controlled 18.5 kW AC electric

motor, a 2.6 m long rectangular to square transitional diffuser with a 7 deg diffusion angle, a 1.85 m long 1.1x1.1 m^2 cross-section settling chamber, a 0.915 m long contraction with an area ratio of 3.36 followed by a 0.5 m long square-to-rectangular transition duct. The maximum achievable velocity is 18 m/s. There are two types of Plexiglas test sections: one for wing models and the other is for linear turbine cascade models. Miscellaneous measurement techniques can be implemented on the test sections such as pressure measurements, hot wire measurements etc. Also state of the art Time-resolved Particle Image Velocimetry (Tr-PIV) system can be incorporated to various steps.

6. Low-speed Wind Tunnel: This is an open circuit suck down wind tunnel that consists of 1.2 m diameter axial fan with a speed of 1500 rpm driven by a 200L electric motor. A rectangular cube test section with cross section area of 1x1 m^2 and the length of 2 m, the material used for test section production is Plexiglas. A 1 m contraction section placed before the test section. This wind tunnel has a maximum velocity of 28 m/s and a turbulence intensity of 1.2% at the inlet of the test section. A wind screen can be assembled upstream of the test section to improve the flow quality depending on the problem in hand. Various measurement techniques such as pressure measurements, hot wire measurements and PIV measurements can be achieved on the model tested.

HIGH PERFORMANCE COMPUTING LABORATORY: The department has a distributed and parallel computing laboratory dedicated to both research and course work. The laboratory cluster consists of Linux workstations multi-core Intel and AMD processors. The cluster computers are connected together by a Gigabit Ethernet switch. CONDOR is used for workload and resource management. It has an extensive software library for Aerospace Engineering applications, graphics/plotting, and parallel computing. Computational research in areas such as Computational Fluid Dynamics, Computational Mechanics and Aeroacoustics is currently performed.

SIMULATION CONTROL AND AVIONICS LABORATORY: The main focus of the laboratory is flight mechanics simulation as well as the automatic flight control of aerospace vehicles. For this purpose many simulation codes, novel control algorithms as well as sensor integration and filtering methods has been developed. There are number of remotely piloted vehicles, where the instrumentation and development of flight control systems has been carried out. Among them, two relatively large fixed wind UAVs with 3m wing span, helicopters, and quadrotors may be named. The laboratory has integrated IMU's, GPS receivers, as well as other sensors to these small vehicles with novel flight controllers, implemented on PC104s as well as DSPs and other micro controllers. Some of the other facilities of the lab are listed below:

1. A single axis air bearing table where control moment gyroscopes and reactions wheels are being tested.
2. Experimental setups for smart structures research
3. A set up to demonstrate gyroscope principles

PROPULSION LABORATORY (AEPL):

1. Propeller Rig: Maximum rotational speed is 2250 RPM and is driven by a speed controlled 18.4 kW DC electric motor. The rig can be used as a whirl stand for ducted and non-ducted propellers up to 130 cm in diameter.

2. J79 Compressor Blade Row: Maximum rotational speed is 3000 RPM and is driven by a simovert controlled 200 kW electric motor. The blade row is coupled in series with a radial fan which can discharge air up to 10 kg/sec. On the GE- J79 compressor, only the first stage is left. 3D flow measurements and analysis, secondary flow and stall research is carried out. (Jointly developed by T.U.A.F. 1st Overhaul and Maintenance Center and METU-AEPL)

3. Impulse and Reaction Turbines Test Units: Bench top units are used to test miniature turbines reaching 50 000 RPM and 30 000 RPM respectively at no-load configuration

4. Nozzle Performance Test Unit: Bench-top unit is used to test miniature nozzles for their optimum performance and theoretical pressure ratios. Velocities around 500 m/sec are searched.

5. Combustion and Flame Propagation Test Facility: Accurate combustion research of various fuel/air ratio can be carried out. Combustion products are analyzed through an electronic gas analyzer. Determination of the flame speed, flame zones and the stability, characteristic can be undertaken. A flow calorimeter is used for teaching and research.

6. Ramjet/ Pulse Jet Propulsion Test Facility: Thrust, drag and specific fuel consumption of various ramjets and pulse jets at low air flow speeds (M < 0.29) can be measured. Fuel of such engines is either butane-propane gas mixture or gasoline.

7. Turbocharger Based Turbojet/ Turboprop Engine: Design, development and research of such engine is being undertaken jointly with TEI (TUSAŞ Engine Industry) and METU- AEPL.

8. Turboshaft Gas Turbine Test Cell: A full-scale test cell for performance testing, health-monitoring and bio-fuel studies on turboshaft engines. Currently a Rolls-Royce C-18 helicopter engine is installed on the system.

9. Small Turbojet Test Setup: A small scale test setup for measuring the performance characteristics of a small turbojet engine. Thrust, rpm, fuel consumption, EGT data can be acquired. Currently, a 100 N thrust small Simjet engine is installed.

10. Small Radial Compressor Test Rig: This facility is used for testing and determining the performance characteristics of small radial compressors that are generally used in small jet engines.

STRUCTURES LABORATORY:

1. Universal Testing Machine: It is of 100 kN capacity for torsion, compression and fatigue testing.

2. Vibration Test Unit: Universal testing bench for vibrating beam- and plate- like structures. This unit can also be used for modal testing of various light weight aircraft structures such as aileron, flap, rudder, small scale UAV wings of up to wing span of 4m.

3. Experimental Modal Analysis and Testing Equipment: A complete data-acquisition system with six channel input module. The module has a real time FFT analysis capability with modal analysis software. This test setup also comprises a waveform generator up to 15 MHz, four exciters (a 200N modal shaker, two miniature modal shakers and an impact hammer) and various types of sensors (single axis and tri-axial deltratron accelerometers, a laser displacement sensor and various strain gauges)

4. Strain Measurement Equipment.

5. Smart Structures Analysis Unit: Smart structures having piezoceramics. High voltage power amplifiers. Controllers for smart structures. Data acquisition and signal processing units. Charge and isotron signal conditioner of three-channel input.

6. Noise Measurement Unit: A hand-held analyser with built-in free-field pre-polarised microphone of operating range of 6Hz to 30 kHz. The unit has sound level meter and frequency analyses software with sound recording option.

7. Test set-up for Measuring Wave Velocities in Elastic Bars: The test up consists of bars made of different materials with installed strain gages, bridge amplifier, a power supply and an oscilloscope. Wave velocities are measured by the oscilloscope after impacting the bars with a hammer. Young's modulus of elastic bars are determined experimentally from the measured wave velocities.

8. Computing Facility: High performance desktop and laptop with computers with AutoCAD, CATIA, ANSYS, MSC NASTRAN/ PATRAN for structural and mechanical design and analysis with finite element modelling and analyses capabilities, Fluent and MSC Flight Loads for Aeroelastic modelling and related analyses, NI LabVIEW and MATLAB for virtual instrumentation and mathematical modelling and control system design.

COMPOSITE AIRFRAME MANUFACTURING LABORATORY:

The laboratory is established for the purpose of prototype manufacturing of composite micro to tactical range category of unmanned air vehicles.

The laboratory is mainly used for research projects and for senior year design course projects to give hands-on experience to the students. The main capabilities available in this laboratory are:

1. Infrastructure for vacuum bagging and vacuum infusion techniques for composite manufacturing .

2. Temperature controlled curing oven with maximum temperature of 200ºC, having dimensions of 3m x 3m x 3m with ports for vacuum bagging manufacturing.

3. Male and female mold making and composite manufacturing workshop with separate positive pressure fanned room for trimming and painting operations.

4. Storage room for composite fabric, resin systems, chemicals and vacuum bagging/infusion system components

5. Numerically controlled automatic foam cutting machine for manufacturing base models of substructures of aerospace vehicles

6. Small scale carpenter shop for mold manufacturing, and manufacturing of internal reinforcements of aerospace structures and back-up structure of the molds

7. Design Bureau equipped with related hardware and software such as PC and workstations, CATIA V5, Fluent, MD Nastran/Patran, Marc Mentat, Dytran, Adams, Aeroelasticity I, Flightloads, Matlab, Absoft Pro Fortran and IMSL libraries, direct access to ESDU database etc.

8. Electro-mechanical system integration room with soldering-desoldering unit, power supplies, oscilloscope etc.

9. Storage room for airplane electro-mechanical components such as engines, fixed and folding propellers, different kind of batteries, battery charging devices, remote radio control units, speed control units, receivers, servos, servo heads and arms, connecting rods, cables etc.

10. Portable computer controlled testing facility for piston and turbo-prop engines for performance, thrust, temperature, fuel consumption and rpm measurements.

11. Portable computer controlled testing facility for micro sized turbo jet engines for performance as thrust, temperature, rpm and fuel consumption.

12. Facilities for developing, testing and evaluation of ground control station for mini and tactical Unmanned Aircraft Systems.

13. Facilities for developing, testing and evaluation of autopilot systems for mini and tactical Unmanned Aircraft Systems.

14. Facilities for testing of Video Transmission units and cameras.

OTHER FACILITIES SHARED BY THE AEROSPACE ENGINEERING DEPARTMENT:

Ankara Wind Tunnel of TÜBİTAK-SAGE: This is the oldest industrial scale wind tunnel of Turkey, with a test section of 3.05 x 2.5 m² and 6m in length, and is equipped with an overhead six component external electro-mechanical balance system. The tunnel is of closed circuit type with a maximum velocity of 100 m/s in its closed test section. Graduate students of Aerospace Engineering Department can perform academic and industry supported research activities in this wind tunnel.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
MATH	119	Calculus with Analytic Geometry	(4-2)5	MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	105	General Physics I	(3-2)4	PHYS	106	General Physics II	(3-2)4
CHEM	107	General Chemistry	(3-2)4	CENG	200	Int. to Computers and Fortran Programming	(2-2)3
ME	105	Computer Aided Engineering Graphics	(2-2)3	AEE	172	Introduction to Aircraft Performance	(3-0)3
AEE	101	Introduction to Aerospace Engineering	(0-2)NC	ENG	102	English for Academic Purposes II	(4-0)4
ENG	101	English for Academic Purposes I	(4-0)4				
IS	100	Introduction to Information Technologies and Applications	NC				

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
METE	230	Fundamentals of Materials Science and Engineering	(3-0)3
AEE	231	Thermodynamics	(4-0)4
AEE	261	Statics	(3-0)3
ES	202	Mathematics for Engineers	(3-0)3
Non-technical Elective			(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC
AEE	200	Summer Practice I	NC

Fourth Semester

AEE	244	Fluid Mechanics	(4-0)4
AEE	262	Dynamics	(3-0)3
AEE	264	Mechanics of Materials	(4-0)4
ES	361	Computing Methods in Engineering	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
EE	209	Fund. Of electrical and Electronics Engineering	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

AEE	305	Numerical Methods	(3-0)3
AEE	331	Heat Transfer	(3-0)3
AEE	341	Aerodynamics I	(3-2)4
AEE	361	Applied Elasticity	(3-0)3
AEE	383	Systems Dynamics	(3-0)3
TURK	303	Turkish I	NC
AEE	300	Summer Practice II	NC

Sixth Semester

AEE	334	Propulsion Systems I	(3-2)4
AEE	342	Aerodynamics II	(3-2)4
AEE	362	Aerospace Structures	(4-0)4
AEE	372	Flight Mechanics	(3-0)3
ME	212	Principles of Production Engineering	(3-0)3
Non-technical Elective			(3-0)3
TURK	304	Turkish II	N

FOURTH YEAR

Seventh Semester

AEE	451	Aeronautical Engineering Design	(2-2)3
AEE	435	Propulsion Systems II	(3-0)3
AEE	463	Mechanical Vibrations	(3-0)3
Technical Elective* (AE Course)			(3-0)3
Free Elective			(3-0)3
AEE	400	Summer Practice III	NC

Eighth Semester

Technical Elective*	(3-0)3
Technical Elective** (One of the following AE 438, AEE 452, AE462, AE446)(2-2)3	
Technical Elective (AE Course)	(3-0)3
Technical Elective (AE Course)	(3-0)3
Non-technical Elective	(3-0)3

All elective courses are minimum 3 credits.
Technical Elective* = Non-departmental Technical Elective
Technical Elective**= Restricted Design Technical Elective

DOUBLE MAJOR PROGRAM IN AEROSPACE ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the department.

MINOR PROGRAM IN AEROPROPULSION

The aim of this minor program is to provide students, who are interested in aeronautics, basic information about the methods of approach and facts on aeronautical propulsion systems.

Compulsory courses

AEE	172	Introduction to Aircraft Performance	(3-0)3
AEE	231	Thermodynamics	(4-0)4
AEE	334	Propulsion Systems I	(3-2)4
AEE	372	Flight Mechanics	(3-0)3
AEE	435	Propulsion Systems II	(3-0)3
AEE	438	Aircraft Engine Design	(2-2)3

MINOR PROGRAM IN AERODYNAMICS

The aim of this minor program in aerodynamics is to give the basic information on aerodynamics of aeronautical systems to students who are interested in aeronautics.

Compulsory courses

AEE	172	Introduction to Aircraft Performance	(3-0)3
AEE	244	Fluid Mechanics	(4-0)4
AEE	341	Aerodynamics I	(3-2)4
AEE	342	Aerodynamics II	(3-2)4
AEE	372	Flight Mechanics	(3-0)3
AEE	451	Aeronautical Engineering Design	(2-2)3

MINOR PROGRAM IN AEROSTRUCTURE

Structural engineers, who are interested in aerospace structures, will find a high technology field of activity if they learn the essential aspects of aerospace engineering related to this field. The aim of this minor program is to give students the opportunity to know basics of this interdisciplinary field.

Compulsory courses

AEE	172	Introduction to Aircraft Performance	(3-0)3
AEE	264	Mechanics of Materials	(4-0)4
AEE	361	Applied Elasticity	(3-0)3
AEE	362	Aerospace Structures	(4-0)4
AEE	372	Flight Mechanics	(3-0)3
One of the following			
AEE	462	Aerospace Structures Design	(2-2)3
AEE	469	Mechanics of Composite Materials	(3-2)4

MINOR PROGRAM IN FLIGHT VEHICLE CONTROL

This minor program is designed for students of other departments who may have specializations in various fields but are not acquainted with aerospace systems. This program aims at providing the fundamental background on important aspects of aerospace flight vehicles and their control, so that they may easily be employed in aerospace industries.

Compulsory courses

AEE	172	Introduction to Aircraft Performance	(3-0)3
AEE	341	Aerodynamics I	(3-2)4
AEE	384	Automatic Flight Control Systems I	(3-0)3
AEE	372	Flight Mechanics	(3-0)3
AEE	483	Automatic Control Systems II	(2-2)3
One of the following			
AEE	484	Inertial Navigation Systems	(3-0)3
AEE	486	Spacecraft Dynamics	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

AEE 101 Introduction to Aerospace Engineering (0-2)NC

Aerospace Engineering Department of METU: METU; Faculty of Engineering; Department of Aerospace Engineering; Purpose, Staff, Facilities, Courses, Rules and Regulations.

Turkish Aviation Industry: Short Summary of Aviation History; Historical View of Turkish Aviation Industry, Existing Industry, opportunities in Aerospace Industry; Aerospace Engineer: What is an Engineer?; What are expected from an Aerospace Engineer?

Visits to industry: Companies and factories related to Aerospace Engineering located mostly in the vicinity of Ankara.

AEE 172 Introduction to Aircraft Performance (3-0)3

Elements and functions of aircraft basic configuration. Forces and moments acting on aircraft; aerodynamic coefficients. International standard atmosphere. Peformance: Equations of motion; horizontal flight; climb performance; take-off performance; gliding, descent and landing performance; range and endurance; flight envelope; V-n diagram. Longitudinal static stability; aerodynamic center; criterion for longitudinal static stability; static margin; unstable aircraft.

AEE 200 Summer Practice I NC

Students are required to participate in a one-week summer practice at Türk Hava Kurumu (THK) model aircraft school which includes building a small model airplane.

AEE 231 Thermodynamics (4-0)4

Basic concepts, properties of pure substances, first law of thermodynamics for closed systems and control volumes, entropy, second law of thermodynamics, second law analysis, introductory cycle analysis, gas mixtures.

AEE 244 Fluid Mechanics (4-0)4

Introductory remarks, definitions, physical properties of fluids, definitions of density, pressure and viscosity. Fluid statics, pressure variation in a fluid, forces acting on flat and curved surfaces, buoyancy. Fluid kinematics, motion of a fluid element, rotation, deformation. Eulerian and Lagrangian flow descriptions, pathlines, streaklines, timelines and streamlines. Eulerian and Lagrangian flow descriptions, conservation laws, system-control volume approaches, Reynolds Transport theorem. Governing integral equations of fluid flow, conservation of mass, conservation of linear momentum and angular momentum, conservation of energy, Bernoulli's equation and its applications. Differential analysis of fluid flow, Navier-Stokes equations, Couette flow, Poiseuille flow. Turbulent flows in pipes.

AEE 261 Statics (3-0)3

Fundamental concepts and principles of mechanics. Introductory vector analysis. Statics of particles. Statics and equilibrium of rigid bodies in 2-D and 3-D. Equivalent system of forces and couples. Centroids and centers of gravity. Analysis of simple structures; trusses, frames and machines. Analysis of simple beams. Friction. Moments of Inertia. Method of virtual work.

AEE 262 Dynamics (3-0)3

A vectorial approach to dynamics of particles and rigid bodies. Kinematics of particles, kinetics of particles. Kinematics of rigid bodies and kinetics of rigid bodies. Newton's second law and the laws of linear and angular momentum. Conservation Laws. The principle of impulse and momentum. Impact of particles and rigid bodies.

Prerequisite:AEE 261 or consent of the department.

AEE 264 Mechanics of Materials (4-0)4

Introduction to the concept of stress and strain Normal and shear stresses due to axial loading, bending and transverse loading. Torsion of circular cross-sections. Stress concentrations. Analysis of linearly elastic problems Transformations of stress and strain in plane-stress and plane-strain problems. Design of beams for strength. Deflection of beams.

Prerequisite:AEE 261 or consent of the department.

AEE 300 Summer Practice II NC
Students are required to perform a minimum of 4-week (20 working days) summer practice, preferably in an aircraft or aircraft engine manufacturing factory, or civilian or military aircraft/helicopter maintenance facility. Students are expected to take part in machine shop related activities such as machining parts or overhauling engines and parts, or contributing to the research work of the company. Each student is required to submit a technical report to reflect the activities he has carried out during this period.

AEE 305 Numerical Methods (3-0)3
Numerical solution of Ordinary Differential Equations (ODE), initial value problems, Euler's method, Runge-Kutta methods, stability analysis, Solution of system of ODE's and high order ODE's. Boundary value problems. Numerical solution of integral equations, Finite Volume Method. Numerical solution of Partial Differential equations (PDE), Finite Difference Method, convergence and stability analysis. Model equations, numerical solutions of parabolic PDEs, elliptic PDEs and hyperbolic PDEs.
Prerequisite: ES 305 or consent of the department.

AEE 331 Heat Transfer (3-0)3
Basic concepts. One-dimensional steady-state conduction, extended surfaces, two-dimensional steady-state conduction, shape factors, transient conduction. Forced convection, Reynolds analogy, convection for external and internal flows. Free convection, boiling and condensation, heat exchangers. Radiation heat transfer between surfaces.

AEE 334 Propulsion Systems I (3-2)4
Introduction to propulsion systems. Aerothermodynamics of propulsion systems (Carnot, Brayton, Otto cycles; Mixtures; Combustion; Equilibrium and Dissociation). Reciprocating engines. Rocket engines. Ideal engine cycle analysis.
Prerequisite:AEE 231 or consent of the department.

AEE 341 Aerodynamics I (3-2)4
Potential flow theory, complex potential, flow around a cylinder, lift, conformal mapping, Joukowsky airfoil, aerodynamic coefficients, panel method. Thin airfoil theory, Kutta condition, Kelvin's Circulation Theorem, symmetrical and cambered airfoils, flapped airfoil. Finite wing; lifting line theory, general wing loading. Slender wing theory, pressure distribution, aerodynamic coefficients.
Prerequisite:AEE 244 or consent of the department.

AEE 342 Aerodynamics II (3-2)4
Compressible flow of air, governing equations for compressible inviscid flow, normal and oblique shock waves, Prandtl Meyer expansion wave, Linearized theory. Viscous flow of air, Navier-Stokes equations, Boundary layer simplifications, 2D boundary layers, similarity solutions, Blassius solution, integral methods, effects of pressure gradient, laminar and turbulent flow, transition and turbulence, law of the wall. Separation and stall, boundary layers on airfoils.
Prerequisite:AEE 341 or consent of the department.

AEE 361 Applied Elasticity (3-0)3
Generalized theory of pure bending. General theory for shear stresses. Shear center. Statically indeterminate beams. Torsion of non-circular beams. Concepts of stress and strain in 3-D. Generalized Hooke's Law. Plane stress and plane strain problems.Stress concentrations, thermal stresses. Axisymmetric problems. Aerospace Applications
Prerequisite:AEE 264 or consent of the department.

AEE 362 Aerospace Structures (4-0)4
Introduction to Aerospace Structures. Failure theories. Energy Methods in Structural Analysis.Thin Walled Stiffened Open Section Beams.Thin Walled Stiffened Closed Section Beams.Bending of Unsymmetrical Sections. Structural Analysis of Aircraft Sub-Structures.Elastic Stability.
Prerequisite:AEE 361 or consent of the department.

AEE 372 Flight Mechanics (3-0)3
Axes and Notation. Longitudinal static stability and control, Maneuverability. Effects of high systems, propulsion system and structural flexibility. Lateral, directional static stability and control. General equations of unsteady motion. Stability derivatives. Stability of uncontrolled motion.

AEE 383 Systems Dynamics (3-0)3
System concepts; Laplace transformation and properties; transfer functions, block diagrams; lumped parameter modelling of physical systems; state space formulation, linearization of nonlinear systems; stability of linear time invariant systems, Routh test; time domain analysis of dynamic systems, response; feedback control system examples, P, PD, PID control; Bode plot and stability margins.
Prerequisite:MATH 219 or consent of the department.

AEE 384 Automatic Control Systems I (3-0)3
Feedback control systems; performance specifications in time domain; root locus plotting techniques, time domain design of feedback systems via root locus, lead and lag compensators, rate feedback, PID control; Bode plot, Nyquist plot, frequency domain analysis of control systems, performance specifications in frequency domain; design of compensators in frequency domain; introduction to modern control.
Prerequisite:AEE 383 or consent of the department.

AEE 400 Summer Practice III NC
Students are required to perform a minimum of 4-week (20 working days) summer practice at a factory of engineering firm to get acquainted with managerial work. Students are required to write a technical report reflecting their personal contributions concerning the managerial and engineering practices of the company.

AEE 402 Aircraft Instruments and Measurement (3-0)3
Description of physical data. Deterministic and random data. Static and dynamic characteristics of measuring instruments. Error analysis. Gyroscopic transducers. Flight instruments. Radio navigation, instrument landing systems and communications.

AEE 410 Aerospace Engineering Laboratory (2-2)3
Introduction. Experimental errors. Statistical analysis of experimental data. Data acquisition and processing. Report writing and presentations. Wind tunnels. Pressure, flow and shear stress measurements. Flow visualization. Force, torque, strain measurement. Hardware-in-the-loop simulation of dynamic and controller systems. Laboratory experiments.
Prerequisite:Consent of the department.

AEE 422 Aerospace Systems Engineering (3-0)3
Review of evolution of systems engineering discipline. Introduction to the concept of system life cycle. System design, development and qualification through systems engineering process, system modeling methods, development of functional, physical and operational architectures, system integration and interface management. Integration of systems engineering processes. Use of computer aided tools for systems product and process modeling. Examples of aerospace applications of systems engineering discipline.

AEE 435 Propulsions Systems II (3-0)3
Aerothermodynamic performance of aircraft engines. Non-ideal cycle analysis of turbojet, turbofan and turboprop engines. Loading characteristics of axial and radial compressors and turbines. Performance of non-rotating components: inlets, nozzles and combustion chambers. Off-design performance calculations of engines.
Prerequisite:AEE 334 or consent of the department.

AEE 438 Aircraft Engine Design (2-2)3
Calculation of required and available specifi thrust and impulse at various flight phases of the mission for a turbojet, turbofan and turboprop engines. Calculation of performance characteristics of aircraft engine components, such as inlet, fan, compressor, combustor, turbine, afterburner and nozzle. Component matching and calculations of total temperature and pressure ratios of each components at different rotational speeds and mass flow rates.
Prerequisite:AEE 435 or consent of the department.

AEE 442 Introduction to Rocket Technology (3-0)3
This course provides introductory information for rocket/missile design, development, integration, operational characteristics and problems of full-scale missiles affected by the dynamics of environment. Determination, analysis and processing of missile trajectory including different flight conditions are discussed.

AEE 443 Computational Aerodynamics (3-0)3
Simplifications to the Navier-Stokes equations for steady, attached flows. Integral formulation of potential flow equations for subsonic flows. Potential flow solutions with panel methods. Gradient based design optimization, inverse airfoil design using a panel method. Full potential flow equation, characteristic lines, analysis of transonic potential flows past airfoils based on the Transonic Small Disturbance (TSD) equation, upwind differencing in supersonic flow regions, Numerical solution of the TSD equation using Finite Difference methods. Numerical solution of the Full Potential flow Equation (FPE), coordinate transformations, discretization of FPE equation in curvilinear coordinate systems..
Prerequisites:AEE 305 and AEE 341 or consent of the department.

AEE 445 Hypersonic Flow (3-0)3
General characterization of hypersonic flow, inviscid hypersonic flow, high temperature effects.
Prerequisite:AEE 342 or consent of the Department.

AEE 446 Introduction to Helicopter Aerodynamics and Helicopter Design (2-2)3

Introduction: Helicopters in general, critical parts of helicopters, types of helicopters. Rotor in vertical flight (momentum theory). Rotor in vertical flight (blade element theory). Mechanisms of rotor.
Forward Flight: Momentum theory, blade element theory. Performance and Trim-Stability: Helicopter design, design road map, blade section design, blade tip shapes, rear fuselage upsweep, fuselage drag estimates. Design assignment: conceptual level projects assigned to groups of max. of three students expected to be completed within eight weeks.
Prerequisite:AEE 341 or consent of the department.

AEE 451 Aerospace Engineering Design (2-2)3

Conceptual design of fixed wing aircraft. Aircraft sizing. Airfoil and geometry selection. Thrust to weight ratio and wing loading. Configuration layout. Propulsion and fuel systems integration. Landing gear and subsystems. Aerodynamics. Weights and balance. Stability, control and handling qualities. Performance and flight mechanics. Cost.
Prerequisite:AEE 342 or consent of the department.

AEE 452 Aerospace Engineering Design II (2-2)3

Preliminary and detail design of aircraft. Demonstration of the design by manufacturing a reduced scale fyling model of the aircraft. Use of computer aided design tool for sizing, trade off and configuration layout studies. Landing gear design, integration of propulsion system, and structural design. Calculation of moments of inertia, weights and balance, center of gravity of the design. Static and dynamic stability, control characteristics and performance prediction of the aircraft.
Prerequisite: AEE 451 or consent of the department

AEE 453 Introduction to Atmospheric Physics I (3-0)3

Introduction to selected topics on solar system, interplanetary space, solar-tenestrial and Earth systems. Properties of the upper atmosphere, ionosphere, magnetic field, and magnetosphere of the Earth. Space weather.

AEE 454 Introduction to Atmospheric Physics II (3-0)3

Selected topics on solar system, interplanetary space, solar-terrestrial and Earth systems. Properties of the upper atmosphere, ionosphere, magnetic field, and magnetosphere of the Earth. Space weather.

AEE 462 Design of Aerospace Structures (2-2)3

Fundamental structural concepts. Structural design criteria – limit, ultimate loads, design strategies. American and European civil and military regulations and design requirements. Aircraft data requirements; structural design speeds, basic load concepts and types of load analyses. Flight Maneuvering loads, V-N Diagrams. Gust loads; Discrete gusts. Gust loads; Continuous gusts. Landing and ground handling loads. Static aeroelastic considerations. Role and lay-out of aerospace structural members. Initial sizing of aircraft structures; emphasis on wing structure. Wing strength requirements and stress analysis methods. Analysis and design of semi-monocoque structures. Buckling design constraints. Structural joints and fittings. Fatigue failure consideration; damage tolerant, fail-safe, safe life designs.
Prerequisite: AEE 362 or consent of the department.

AEE 463 Mechanical Vibrations (3-0)3

Free and forced vibrations of single degree-of-freedom undamped linear systems. Types and characteristics of damping. Free and forced vibrations of multi degree-of-freedom linear systems. Eigenvalue problem, modal vectors and orthogonality. Vibration of continuous systems. Vibration measurement and isolation.
Prerequisite:AEE 262 or consent of the department.

AEE 464 Application of Finite Element Analysis in Aerospace Structures (2-2)3

Introduction to finite element analysis. One dimesional elements and computational procedures. 1D FE code development. Finite element form of Rayleigh Ritz Method. General derivation of element stiffness matrix. Interpolation and shape functions. Application of FE based structural analysis in aerospace engineering.
Prerequisite: AEE 264

AEE 469 Mechanics of Composite Materials (3-2)4

Fiber-reinforced composites. Composite manufacturing techniques. Anisotropic elasticity. Macromechanical behavior of a lamina; Stress strain relations for a lamina. Micromechanical behavior behavior of a lamina. Macromechanical behavior of a laminate; Laminate constitutive equations. Beams, columns and rods of composite materials... Lamina and laminate strength analysis: strength and failure theories.

AEE 477 Space Propulsion (3-0)3

Functional requirements of aerospace propulsive devices. Mission analysis. Fundamental

performance relations. Rocket propulsion systems for launch, orbital, and interplanetary flight. Modeling of solid, liquid-bipropellant, and hybrid rocket engines. Engineering and environmental limitations. Propellant feed systems, turbopumps. Combustion processes in liquid, solid and hybrid rockets. Thermochemistry, prediction of specific impulse. Nozzle flows including real gas and kinetic effects.
Prerequisite:AEE 334 or consent of the department.

AEE 483 Auto. Control Systems II (4-0)4
State equations, canonical forms, eigenvalues, eigenvectors, stability, controllability, observability; state space approach to control system design, state variable feedback, eigenstructure assignment, state observation, model following control, introduction to optimal control, linear quadratic regulator.
Prerequisite:AEE 383 or consent of the department.

AEE 484 Inertial Navigation Systems (3-0)3
Basic navigation quantities and functions; coordinate transformations and kinematics; a unified inertial navigation analysis applicable to both gimballed and strapdown systems; propagation of bias errors through the system; physics of inertial measurements and measurement error sources; navigation analysis with multiple sensors; Kalman filter estimation; practical navigation problems.

AEE 485 Avionic Systems Design (3-0)3
Introduction to microprocessor controlled systems in aerospace applications. Microprocessor based systems architecture. Introduction to assembly language; interrupt handling; data acquisition and processing; Case study: design of a longitudinal autopilot using a microprocessor based hardware; Case study: Position estimation.

AEE 486 Spacecraft Dynamics (3-0)3
Coordinate systems and transformations, Euler equations, torque free motion of spinning bodies, introduction to analytical dynamics, generalized coordinates, constraints, work and energy; orbital motion, orbital parameters, common satellite orbit types, orbital maneuvers.
Prerequisite: AEE 262

AEE 487 Power Systems in Aerospace Engineering (3-0)3
Vehicle electrical power requirements and end uses in aeronautics. Energy sources in aircraft and conversion to electrical energy. Additional and auxiliary power systems. Power distribution systems. Utilization of the generated power by: electric motors, lighting, engine starting systems, ignition systems, fire and smoke detection, ice and rain protection systems, temperature control, air conditioning, conversion of control signals to powered control. Electromagnetic compatibility.

AEE 489 Computer Assisted Analysis of Aircraft Performance, Stability and Control (3-0)3
Review of the equations of motion of a rigid aircraft. Definition and evaluation of stability derivatives. Derivation of transfer functions for stick fixed flight. Computerized analysis of longitudinal static and dynamic stability and control characteristics of an aircraft. Computerized analysis of lateral static and dynamic stability and control characteristics of an aircraft. Performance equations of an aircraft. Computerized analysis of point, path and take-off performance characteristics of an aircraft. Computer project for the analysis of a sample aircraft.
Prerequisites: AEE 172 and AEE 372 or consent of the department.

AEE 490-498 Special Topics in Aerospace Engineering (3-0)3
These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF AEROSPACE ENGINEERING

GRADUATE CURRICULUM

M.S. in Aerospace Engineering

AEE	500	M.S. Thesis	NC
AEE	501	Advanced Mathematics for Engineers I *	(3-0)3
AEE	502	Advanced Mathematics for Engineers II **	(3-0)3
AEE	590	Seminar	(0-2)NC

5 elective courses

Total Minimum Credit: 21
No of Courses with Credit (min): 7

* or ES501 Analytical Methods in Engineering I
**or ES502 Analytical Methods in Engineering II

Ph.D.. in Aerospace Engineering

If admitted by M.S. degree:

AEE	600	Ph.D. Thesis	NC

8 elective courses

Total Minimum Credit: 24
No of Courses with Credit (min): 8

If admitted by B.S. degree:

AEE	600	Ph.D. Thesis	NC
AEE	590	Seminar	(0-2)NC
AEE	501	Advanced Mathematics for Engineers I *	(3-0)3
AEE	502	Advanced Mathematics for Engineers II **	(3-0)3

13 elective courses

Total Minimum Credit: 45
No of Courses with Credit (min): 15

* or ES501 Analytical Methods in Engineering I
**or ES502 Analytical Methods in Engineering II

GRADUATE COURSES

Following is the list of graduate courses that will be offered according to the demand and availability of staff. These courses are supplemented by graduate courses of other departments relevant to the field of specialization of the student.

AEE	500	M.S. Thesis	NC
AEE	501	Advanced Mathematics for Engineers I	(3-0)3
AEE	502	Advanced Mathematics for Engineers II	(3-0)3
AEE	531	Advanced Engine and Process Thermodynamics	(3-0)3
AEE	532	Advanced Aircraft Engine Design	(3-0)3
AEE	534	Advanced Heat and Mass Transfer	(3-0)3
AEE	538	Combustion in Engines	(3-0)3
AEE	539	Advanced Combustion in Engines	(3-0)3
AEE	541	Advanced Computational Fluid Dynamics	(3-0)3
AEE	542	Turbulent Boundary Layers	(3-0)3
AEE	543	Internal Fluid Mechanics	(3-0)3
AEE	544	Advanced Airfoil and Propeller Theory	(3-0)3
AEE	545	Advanced Fluid Mechanics	(3-0)3
AEE	546	Computational Fluid Dynamics on Unstructured Grids	(3-0)3
AEE	547	Experimental Aerodynamics	(2-2)3
AEE	548	Fundamentals of Aerodynamic Noise	(3-0)3
AEE	549	Linear Stability Theory and Laminar- Turbulent Boundary Layer Transition	(3-0)3
AEE	551	Introduction to Space Sciences	(3-0)3
AEE	552	Selected Topics On Space Applications: Microgravity	(3-0)3
AEE	554	Applied Orbital Mechanics	(3-0)3
AEE	555	Basic Satellite Operations	(1-4)3
AEE	562	Theory of Plates	(3-0)3
AEE	564	Wave Analysis and Wave Propagation in Structures	(3-0)3

AEE	566	Aeroelasticity	(3-0)3
AEE	568	Experimental Analysis of Vibrating Structures	(3-0)3
AEE	569	Composite Materials in Aerospace Structures	(3-2)4
AEE	577	Physics of Gases	(3-0)3
AEE	578	Non-equilibrium Gas Dynamics	(3-0)3
AEE	581	Automatic Flight Control Systems	(3-0)3
AEE	582	Robust Control in Aerospace System	(3-0)3
AEE	590	Seminar	(0-2) NC
AEE	600	Ph.D. Thesis	NC
AEE	7XX	Special Topics in Aerospace Engineering	(3-0)3
AEE	8XX	Special Studies	(4-2) NC
AEE	9XX	Advanced Studies	(4-0) NC

DESCRIPTION OF GRADUATE COURSES

AEE 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester.

AEE 501 Advanced Mathematics for Engineers I (3-0)3
Linear spaces and operators. Matrix algebra. Tensor fields. Complex analysis. Calculus of variations.

AEE 502 Advanced Mathematics for Engineers II (3-0)3
General consideration on differential equations. Power series solutions and special functions. Boundary-value problems. Transform methods. Green's functions. Partial differential equations. Perturbation methods.
Prerequisite: AEE 501 or consent of the department.

AEE 531 Advanced Engine and Process Thermodynamics (3-0)3
General thermodynamics, fundamental laws, property relations, mixtures, chemical equilibrium, stability, Jacobian derivatives, second law analysis of aerospace systems; applied statistical thermodynamics for determination of thermophysical properties.

AEE 532 Advanced Aircraft Engine Design (3-0)3
Performance and characteristics of aircraft engines. Two and three-dimensional flows. Theories of compressors and turbines. Matching of components and evaluation of the performance.

AEE 534 Advanced Heat and Mass Transfer (3-0)3
Integral transform techniques, conjugate and nonlinear heat conduction; rarefied and compressible flow heat transfer around cylindrical objects; radiation properties of gases and applications to combustion chambers.

AEE 538 Combustion in Engines (3-0)3
Basic modes of combustion; laminar flames, turbulent flames, ignition and flame stabilization, explosion and detonation. Diffusion flame, and droplet combustion: Application of chemical reactor theory, physical modeling, basic diagnostic techniques; combustion in practical systems; reciprocal engines, gas turbines, environmental and economic considerations.

AEE 539 Advanced Combustion in Engines (3-0)3
Turbulent flames, diffusion and premixed types, wrinkles. Combustion in two-phase flow systems, spray combustion. Ignition. Combustor design.

AEE 541 Advanced Computational Fluid Dynamics (3-0)3
Solution of partial differential equation by discrete methods (finite difference, finite volume, panel). Treatment of Potential, Euler and Navier Stokes equations in general nonorthogonal, curvilinear coordinates. Emphasis on error, accuracy, stability and convergence criteria.

AEE 542 Turbulent Boundary Layers (3-0)3
Generalities on flows and t.b.l.: physical description, mathematical formulation, averaging, Reynolds eqn. energy eqn. dissip., homogeneity, isotropy, correlations, micro and macro scales, energy spectrum, intermittency, hot-wire anemometry; t.b.l. equations: continuity, momentum, total enthalpy, closure problem, Crocco's integral; transition: stability, nature of transition, transition criteria, numerical methods: F.D. formulation, nature of the parabolic equations.

AEE 543 Internal Fluid Mechanics (3-0)3
General features of internal flows as applied to compressors and turbines. Concepts of unsteady rotating flows. Blade element theory. Effect of viscosity and compressibility. Loss Mechanisms.

Secondary flows. Flow instabilities in turbomachines.

AEE 544 Advanced Airfoil and Propeller Theory (3-0)3
Theory and design of airfoil sections lifting and thickness problem. Lifting line and lifting surface theory as applied to propellers and airfoils. Integral boundary layer methods. Propeller thrust and torque.

AEE 545 Advanced Fluid Mechanics (3-0)3
Introduction to Cartesian Tensors (refresher); definition, transformations, co and contra variant tensors, Kroenecker delta and antisymmetric tensor , invariants of 2. order tensors, jacobian, dilatation. Basic Notions of Fluid Mechanics; Reynolds transport theorm (re-visited), Mathematical Basis of Inviscid Flow; Gauss and Stokes Theorems as applied to Fluid flow problems and consequences,Helmholtz equations , connectivity, uniqueness theorems for ideal fluids Depending on the choice of the studying group one of the follwing paths is followed.
1: Mathematical basis of Panel Methods
2: Physics and Calculation of Turbulent Shear Flows. Some turbulence models are also used for illustration.

AEE 546 Computational Fluid Dynamics on Unstructured Grids (3-0)3
Navier-Stokes equations in integral form, boundary conditions, entropy condition. Turbulence and its modeling, one-equation turbulence models. Unstructured grid generation, Delaunay triangulation, advancing front triangulation., data structures. Finite Volume method, convective and diffusive fluxes, flux vector splitting methods, shock-tube and the Riemann problem, approximate Riemann solvers. Euler forward/backward time integration, higher order reconstruction of flow variables and higher order methods.

AEE 547 Experimental Aerodynamics (2-2)3
Experimental techniques in aerodynamics; Pressure, temperature, and velocity measurement techniques. Steady and unsteady pressure measurements and various types of pressure probes and transducers, errors in pressure measurements. Measurement of temperature using thermocouples, resistance thermometers, temperature sensitive paints and liquid crystals. Measurement of velocity using hot wire anemometry. Calibration of single and two wire probes. Velocity measurement using Laser Doppler Velocimetry. Data acquisition and digital signal processing techniques.

AEE 548 Fundamentals of Aerodynamic Noise (3-0)3
Basic equations of fluid dynamics, linearized Euler equations, speed of sound. Classical acoustics: the wave equation, solutions in Cartesian, cylindrical, and spherical coordinates. Fourier transform and convolution integrals, Green's function for the wave equation. Compact, noncompact sources. Lighthill's theory of aerodynamic noise: acoustic analogy, jet noise, scaling laws. Turbomachinery noise: duct acoustics, mode generation mechanisms, sound attenuation. Noise from moving bodies: helicopter noise, propeller noise, airframe noise. Computational aeroacoustics: high-resolution numerical algorithms, boundary conditions.

AEE 549 Linear Stability Theory and Laminar-Turbulent Boundary Layer Transition (3-0)3
Stages of laminar-turbulent transition. Basic concepts of hydrodynamic stability theory. Method of small disturbances. Method of normal modes. Orr-Sommerfeld equation. Temporal and spatial amplifications. Eigenvalue problem. Solution of the Orr-Sommerfeld equation. Smith-van Ingen en transition prediction method. Gaster's transformation.

AEE 551 Introduction to Space Sciences (3-0)3
The sun and its interaction with the near earth space; Earth's neutral atmosphere; fenosphere and magnetosphere, some selected topics on quiet and disturbed ionosphere.

AEE 552 Selected Topics On Space Applications: Microgravity (3-0)3
Space systems and conditions for manufacturing in space, the fluid mechanics of microgravity, phase transitions in microgravity, applications.

AEE 554 Applied Orbital Mechanics (3-0)3
Coordinate systems, ime systems; two body problem, geometry of conic sections, three body problem; orbital perturbations; orbital maneuvers, Hohman transfer, inclination and station keeping maneuvers, interplanetary trajectories; methods of determination of an orbit.; satellite attitude dynamics, stability of orbital motion, spacecraft attitude control.

AEE 555 Basic Satellite Operations (1-4)3
Introduction to Orbital Dynamics and Satellite Subsystems, Eclipses caused by either Earth or Moon, basic operations performed during Eclipse Seasons, basic principles of Station Keeping Modes

(SKM), East-West and North-South Maneuvers Planning, Yaw Angle Computation, SKM with Optical Reference with different thruster branches, Gyro Calibration in Normal mode, SKM with Gyro Reference (S).

AEE 562 Theory of Plates (3-0)3
Introduction to "Boundary Value Problems" in elasticity theory. Stress resultants in plates. Strain-displacement relations and displacements. Stress-displacement relations. Basic assumptions in thin plate theory. Governing equations of classical plate theory. Classical and numerical methods of solution of plates in aerospace, mechanical and civil engineering structures. Introduction to vibrations, stability and shear theory of plates. Introduction to shear theory of plates. Introduction to composite plates.

AEE 564 Wave Analysis and Wave Propagation in Structures (3-0)3
Introduction to the dynamics of wave motion. Energy carrying mechanisms. Forced motion in infinite, uninterrupted uniform structures. Wave characteristics of one-dimensional and two-dimensional continuous systems. Coupled vibrations of open-section, thin-walled channels. Effects of warping. Wave propagation in mono and multi-coupled periodic structures. Characteristics of propagation constants. Characteristics of multi-bay periodic and non-periodic structures.

AEE 566 Aeroelasticity (3-0)3
Static aeroelasticity: lift distribution on an elastic surface, divergence, aileron effectiveness and reversal. Unsteady aerodynamics: oscillatory and arbitrary motions of a 2-D thin airfoil, strip theory. Dynamic response (to gusts, etc.).

AEE 568 Experimental Analysis of Vibrating Structures (3-0)3
Modal analysis theory. Vibration measurement and testing. Test planning and structure preparation. Vibration exciters, transducers, sensors and analyzers. Modal analysis methods including time and frequency domain methods. Structural modification. Finite element analysis and model updating. Structural health monitoring and damage identification.

AEE 569 Composite Materials in Aerospace Structures (3-2)4
Fiber-reinforced composites. Fiber and matrix properties. Composite processing and manufacturing. Laboratory demonstrations of composite manufacturing of aerospace sub-structures. Anisotropic elasticity. Macromechanical behavior of a lamina. Micromechanical behavior behavior of a lamina. Macromechanical behavior of a laminate. Plates, beams, and rods of composite materials. Vibration and buckling of composite plates and beams. Lamina and laminate failure analysis. Finite element applications in composite aerospace structures.

AEE 577 Physics of Gases (3-0)3
Quantum theory background. The vector model of the atom. Statistical mechanics. Calculation of the thermodynamic properties. Chemical thermodynamics, equilibrium gas properties

AEE 578 Nonequilibrium Gas Dynamics (3-0)3
High temperature flows. Equilibrium and nonequilibrium kinetic theories. Flows with translational nonequilibrium. Flows with vibrational and chemical nonequilibrium.
Prerequisite: AEE 577 or consent of the department

AEE 581 Automatic Flight Control Systems (3-0)3
Aircraft equations of motion; sensors and actuators used in flight control systems; design of stability augmentation, attitude and flight path control systems; flight simulation; guidance and navigation; control system design examples on other aerospace flight vehicles; aircraft automatic flight control system, implementation, testing and certification process.
Prerequisite:AEE 384 or consent of the department.

AEE 582 Robust Control in Aerospace Systems (3-0)3
Review of frequency domain feedback design techniques, matrix algebra, signal and system norms. Mathematical modeling of uncertainties in linear time invariant systems. Robust stability and robust performance analysis, H_2, H and synthesis control design techniques for multivariable systems.
Prerequisite:AEE 384 or consent of the department.

AEE 590 Seminar (0-2)NC
Presentation involving current research given by graduate students and invited speakers.

AEE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

AEE 7XX Special Topics in Aerospace Engineering (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge.

AEE 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member normally his/her advisor.

AEE 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study-advanced topics under the guidance of a faculty member normally his/her supervisor.

DEPARTMENT OF CHEMICAL ENGINEERING

PROFESSORS

BAYRAM, Göknur: B.S., M.S., Ph.D., METU.
BÖLÜKBAŞI , Ufuk: B.S., M.S., METU; Ph.D., Iowa State University.
ÇALIK, Pınar: B.S., M.S., Ph.D., Ankara University.
DOĞU, Timur: B.S., METU; M.S., Stanford University; Ph.D., University of California at Davis.
EROĞLU, İnci: B.S., M.S., Ph.D., METU.
GÜRKAN, Türker: B.S., M.S., METU; Ph.D., Missouri University of Science and Technology.
KALIPÇILAR, Halil ***(Department Chair)***: B.S., M.S., Ph. D., METU.
KARAKAŞ, Gürkan : B.S., M.S., Ph.D., METU.
ÖZGEN, Canan ***(Director of the Graduate School of Natural and Applied Sciences):***
B.S., M.S., Ph.D., METU.
SELÇUK, Nevin: B.S., METU; M.S. Tech., Ph.D., University of Sheffield.
TOSUN, İsmail: B.S., M.S., METU; Ph.D., University of Akron.
ÜNER, Deniz : B.S., M.S., METU, Ph.D., Iowa State University.
YILMAZ, Levent: B.S., M.S., METU; Ph.D., University of Illinois at Urbana Champaign.
YILMAZER, Ülkü: B.S., METU; M.S., Stevens Institute of Technology; Ph.D.,University of Iowa.
YÜCEL, Hayrettin: B.S., M.S., METU; Ph.D., University of New Brunswick.

ASSOCIATE PROFESSORS

DİLEK HACIHABİBOĞLU, Çerağ: B.S., M.S.. METU, Ph.D., Wayne State University.
KÜLAH, Görkem: B.S., M.S., METU, Ph.D., University of British Columbia
SEZGİ, Naime Aslı: B.S., M.S.,Ph.D., METU.
ULUDAĞ, Yusuf**:** B.S., M.S., METU; Ph. D., University of California at Davis.

ASSISTANT PROFESSORS

BAT, Erhan ***(Vice Chair)***: B.S., M.S., METU, Ph.D., University of Twente.
ÇULFAZ EMECEN, Pınar Zeynep ***(Vice Chair)***: B.S., M.S., METU, Ph.D., University of Twente.
KINCAL, Serkan: B.S., METU, M.S., Ph.D., University of Florida
KOKU, Harun: B.S., METU, M.S., Ph.D., University of Delaware

INSTRUCTORS

GERÇEKER, Ayhan: B.S., M.S., METU
ÖZTİN, Cevdet ***:*** B.S., M.S., Ph. D., METU.

GENERAL INFORMATION: The Department of Chemical Engineering offers courses with laboratory training leading to the degrees of Bachelor of Science, Master of Science, and Doctor of Philosophy. The courses are designed with consideration of the modern concepts of chemical engineering education and new requirements of the industry.

The rapid growth of the chemical and related industries since the beginning of the 20^{th} century, and strong competition in these industries, have resulted in the establishment of new standards and requirements for the chemical engineering profession; so it has become obvious that the knowledge and the training of an industrial chemist is no longer sufficient to meet the new responsibilities.

The advancement in unit operations and transport phenomena has produced new methods for more economical design and better control. The developments and accumulation of knowledge in fluid transportation, combustion, heat transmission, diffusional processes, reaction kinetics, engineering thermodynamics, instrumentation and automatic control have opened the way to the design of continuous processes thus increasing the yield and reducing the manufacturing cost of products with higher purity and more uniform composition. In recent years, novel applications in biotechnology and advanced materials widely extended the scope of the chemical engineering profession.

Today a chemical engineer is expected to perform research, development and design work in addition to assuming production responsibilities. He/she must be capable of evaluating new projects, competitive bids and of carrying out economic analysis at an advanced level. He/she is expected to be qualified in the supervision of the operation of the plants. His/her responsibilities range from the evaluation of raw materials to the competitive marketing of finished products while observing regulations and laws associated with employee and public safety and with environment.

The program is designed to give students not only the fundamentals of modern chemical engineering, but also instruction in a variety of subjects, both technical and non-technical, so as to develop a broader view leading to a more intelligent approach to industrial and organizational problems. Along with the academic training, the students are required to participate in a Summer Training Program.

MISSION OF THE DEPARTMENT: The mission of the Chemical Engineering Department is to educate students to acquire up-to-date knowledge and skills, in order to fulfill the needs and expectations of industry and society and to play a leadership role in their advancement. The Chemical Engineering Department develops educational programs in accordance with the contemporary requirements, advances chemical technology through research and contributes to the application of knowledge and technology for the benefit of society.

UNDERGRADUATE PROGRAM OBJECTIVES

Our graduates are expected to

1. have successful careers in chemical engineering practice and research in industry, government agencies, business and/or universities
2. demonstrate leadership qualities within their chosen career path
3. successfully earn advanced degrees or certificates where appropriate to pursue their chosen careers
4. conduct themselves with the highest standards of ethical practice and careful consideration of the societal and global responsibilities of the engineering profession.

The student outcomes that prepare our graduates to attain the program educational objectives are

a. an ability to apply knowledge of mathematics, science, and engineering
b. an ability to design and conduct experiments, as well as to analyze and interpret data
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multi-disciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. a recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

GRADUATE PROGRAM OBJECTIVES

Our M.Sc. program graduates are expected to

1. have active roles in carrying out Research and Development projects
2. act as team leaders in chemical engineering processes and applications
3. be preferred in organizations offering chemical and engineering technology, services and products
4. be accepted to Ph.D. programs of prestigious universities in Turkey and abroad
5. stand out with their enterpreneurial features in their careers

Our Ph.D. program graduates are expected to

1. develop, manage and carry out Research and Development projects
2. act as leaders in innovative and advanced industrial applications of their profession
3. work as faculty in universities in Turkey and abroad
4. stand out with their enterpreneurial features in their careers

RESEARCH INTERESTS AND FACILITIES: Chemical Engineering has a rich past and a bright future. The new millennium are reshaping the structure of Chemical Engineering career and the department is augmenting its undergraduate program and graduate research activities in parallel in order to prepare its graduates to the market of the future. Chemical Engineering graduates at all levels will continue to find career opportunities at the established Turkish chemical industries like petrochemicals, drugs, sugar, cement, pulp and paper as well as in emerging new technologies such as biotechnology, material science and computer aided design and control of manufacturing processes.

There are several major research topics currently under study in the Chemical Engineering Department of METU. They may be broadly categorized as follows: studies related to heat, mass and momentum transfer, separation technology such as membrane processes and reactive extraction, process design, modeling and control, radiative heat transfer, reaction engineering and catalysis, material science including polymers, zeolites, biological materials, biotechnology and energy related subjects such as coal combustion, liquid fuels and energy economy in process industries.

The Department has the following research facilities and laboratories:

1. Basic Measurements Laboratory: Research and teaching equipment such as conductivitimeters, pH meters, spectrophotometers, gas chromatographs used to carry out undergraduate experiments and graduate research in applied physical chemistry, kinetics, chemical and physical equilibria.

2. Unit Operations Laboratory: This laboratory is used for activities of undergraduate laboratory courses, aimed to help students to develop skills for accurate and reliable collection, reduction and evaluation of experimental data on unit operations equipment and to help students to reinforce their knowledge about unit operation courses and to compare the actual performance of the equipment with the theoretical principles covered in related courses. The experiments performed are; fluid flow, pressure drop characteristics of a packed column, fluidization, unsteady state heat conduction, agitated tank heater, double-pipe heat exchanger, gas absorption, distillation cooling tower, spray drying, thin film evaporation, size reduction and filtration. Pilot scale research is also carried out in this laboratory.

3. Clean Combustion Technology Laboratory: A 300 kW hybrid fluidized bed combustor test rig and a 150 kW circulating fluidized bed test rig are available in this laboratory. These test facilities are used both for research and by the energy industry to evaluate the effect of operating conditions, sorbent and solid fuels such as coal, biomass etc. characteristics on combustion and emission performances.

4. Process Control Laboratory: Experimental work relating to process control is carried out in this laboratory. The experiments that can be performed in this laboratory are: Level Control , Flow Control, Pressure Control, Pulse Testing, Control-loop Tuning and Temperature Control.

5. Computer Laboratories: There are two computer rooms (35 PC's each) accessible by graduate and undergraduate students all with chemical engineering software installed

6. Central Instrumental Analysis Laboratory: The main function of this laboratory is to provide support for research activities pursued in the department and for undergraduate experiments. The chemical analysis and material characterization equipment involve an X-ray diffractometer, a thermal analysis system (TGA, DTA, DSC, TMA), a dual channel gas chromatograph, a high performance liquid chromatograph, an infrared spectrophotometer, an ultraviolet and visible spectrophotometer, an atomic absorption spectrophotometer, mercury porosimeter, computerized N_2 and CO_2 surface area analyzer, Helium pycnometer and several other analysis equipment.

7. Chemical Reaction Engineering and Catalysis Laboratories: These laboratories are equipped with homogeneous and heterogeneous reaction systems, high pressure reaction and extraction equipment, chemical vapor deposition system and analysis equipment such as Fourier Transform, Infrared Spectrometer, Gas Chromatographs, Gas spectrometers, intelligent gravimetric analyzer. The laboratories have also access to mercury porosimeter, surface area analyzer; pycnometer; X ray diffractometer and other equipment in the Central Instrumental Analysis Laboratory.

8. Fuel and Petroleum Laboratory: This laboratory is equipped with instruments for testing and characterization of gaseous, liquid and solid fuels, crude oil and petroleum derivatives. Some of the equipments are elemental analyzer, bomb calorimeter, sulfur determination apparatus, standard equipment for fire and flash points, automatic distillation equipment, viscometers, and centrifuges furnaces.

9. Polymer Laboratory: This laboratory supports research in polymer studies. The equipment involved are; rheometer, universal testing machine, thin film forming apparatus, viscometers, twin screw extruder, compression molding machine and access to thermal analysis equipment.

10. Biotechnology Laboratory: This laboratory is equipped with instruments to support research activities in microbial biotechnology. The equipment involved are a number of incubators, autoclaves, fermenters, orbital incubators, protein purification and characterization systems, refrigerated centrifuges, microcentrifuges, ultrafiltration systems, laminar flow hoods, UV/Vis spectrophotometers, balances, refrigerators and freezers.

11. Membrane and Membrane Process Laboratory: In this laboratory, research to develop new membranes and membrane processes are being carried out. Various equipment to measure performance of different membrane processes (such as ultrafiltration, gas separation coupled to a gas chromatograph, nanofiltration, reverse osmosis, pervaporation) is available. It also contains an automatic membrane casting equipment and a hollow fiber spinning setup.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
MATH	119	Calculus with Analytic Geometry	(4-2)5	MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	105	General Physics I	(3-2)4	PHYS	106	General Physics II	(3-2)4
CHEM	111	General Chemistry I	(3-2)4	CHEM	112	General Chemistry II	(3-2)4
ME	105	Computer Aided Engineering Graphics	(2-2)3	CENG	200	Introduction to Computers and Fortran Programming	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4	CHE	102	Introduction to Chemical Engineering	(1-0)1
IS	100	Introduction to Information Technologies and Applications	NC	ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
CHEM	220	Organic Chemistry	(3-2)4
Restricted Elective*			(3-0)3
CHE	203	Chemical Process Calculations	(4-0)4
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

METE	230	Fundamentals of Materials Science and Engineering	(3-0)3
CHEM	230	Analytical Chemistry for Engineers	(3-2)4
ES	361	Computing Methods in Engineering	(3-0)3
CHE	204	Thermodynamics I	(4-0)4
CHE	222	Fluid Mechanics	(4-0)4
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

ECON	210	Principles of Economics	(3-0)3
CHEM	353	Physical Chemistry II	(4-0)4
CHE	305	Thermodynamics II	(4-0)4
CHE	327	Heat and Mass Transfer Operations	(4-0)4
Non-technical Elective			
CHE	300	Summer Practice I	NC
TURK	303	Turkish I	NC

Sixth Semester

Restricted Elective **			
CHE	311	Chemical Reaction Engineering	(4-0)4
CHE	320	Chemical Engineering Laboratory I	(0-4)2
CHE	328	Separation Processes	(3-2)4
CHE	352	Mathematical Modeling in Chemical Engineering	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

CHE	407	Process Control	(3-0)3
CHE	410	Chemical Engineering Laboratory II	(0-4)2
CHE	417	Chemical Engineering Design I	(3-2)4
CHE	423	Chemical Engineering Economics	(3-0)3
CHE	400	Summer Practice II	NC
Technical Elective			

Eighth Semester

CHE	418	Chemical Engineering Design II	(3-2)4
CHE	420	Chemical Engineering Laboratory III	(0-4)2
Technical Elective			
Technical Elective			
Non-technical Elective			
Free Elective			

All elective courses are minimum 3 credits.

* One of the following courses : EE 209, EE 309, ES 223 or ES 303.

** One of the following courses : CHEM 301, CHEM 350, CHEM 455, BIO 317, BIO 420, PHYS 207, PHYS 312 or MATH 260.

The Chemical Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

MINOR PROGRAM IN CHEMICAL REACTION ENGINEERING

The main objective of this program is to provide working knowledge on the basic principles of kinetics and thermodynamics of chemical reactions, heat, mass and momentum transport effects in chemical reactors, with an ultimate aim of chemical reactor design; for those majoring in chemistry and in other engineering fields.

Compulsory Courses:

CHE	203	Chemical Process Calculations	(4-0)4
CHE	204	Thermodynamics I	(4-0)4
CHE	305	Thermodynamics II	(4-0)4
CHE	301*	Physical Chemistry	(3-0)3
CHE	311	Chemical Reaction Engineering	(4-0)4
CHE	426**	Reactor Design	(3-0)3
	* OR CHEM 353	Physical Chemistry II	(4-0)4

** OR One of CHE 510 Advanced Chemical Reaction Engineering (3-0)3, CHE 511 Catalysis (3-0)3, CHE 512 Multiphase Reactors (3-0)3

DOUBLE MAJOR PROGRAM IN CHEMICAL ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the Department.

DESCRIPTION OF UNDERGRADUATE COURSES

CHE 102 Introduction to Chemical Engineering (1-0)1
Basic concepts of chemical engineering profession; ethical issues, environmental responsibilities and future trends; literature survey and oral presentation of a term project.

CHE 203 Chemical Process Calculations (4-0)4
Basic chemical engineering concepts and methods of analysis. Introduction to mass and energy balance calculations applied to solution of problems in systems of interest to chemical process industries.

CHE 204 Thermodynamics I (4-0)4
Concepts of equilibrium, temperature and reversibility. First law and concepts of heat and work; second law and entropy. Equations of state and thermodynamic properties of pure substances. Engineering applications of these principles in the analysis and design of closed and open systems. Thermodynamic analysis of cyclic processes including power generation and refrigeration.
Prerequisite: PHYS 105.

CHE 220 Principles of Transport Phenomena (3-0)3
Introduction to basic concepts of momentum, heat and mass transfer. Transport by molecular motion and in laminar flow in one dimension. Transport between two phases and in large flow systems. *(For non-CHE students only).*

CHE 222 Fluid Mechanics (4-0)4
Hydrostatics. Fundamentals of momentum transport. Newton's law of viscosity. Interphase momentum transport and friction factors. Flow in conduits and around submerged objects. Mechanical energy balances and Bernoulli equation. Dimensional analysis. Applications to practical problems. Principles of settling and filtration.
Prerequisite: MATH 119.

CHE 300 Summer Practice I NC
A practical training for a period of 20 works-days in an organization with sizeable operations that are of interest to chemical engineering. Emphasis is made on the application of mass and energy balances. A formal report is required to reflect the work carried out.
Prerequisite: CHE 102 and (CHE 203 or CHE 222).

CHE 301 Physical Chemistry (3-0)3
Kinetic theory of gases. Chemical kinetics. Surface thermodynamics Electrochemistry. The solid, liquid and gaseous states of matter.
Prerequisite: CHE 204.

CHE 305 Thermodynamics II (4-0)4
Thermodynamic properties of pure fluids and mixtures. Phase equilibrium. Chemical reaction equilibrium. Applications to real and ideal processes.
Prerequisite: CHE 204.

CHE 311 Chemical Reaction Engineering (4-0)4
Nonequilibrium processes including chemical reaction mechanisms, rate equations and reactor design applied to homogeneous and heterogeneous systems. Under isothermal and non isothermal conditions.
Prerequisite: One of CHE 301, CHEM 353.

CHE 320 Chemical Engineering Laboratory I (0-4)2
Laboratory studies demonstrating the principles of physical chemistry and fluid mechanics. Emphasis is on laboratory safety, correlation of experimental results and on written reports and oral presentations.
Prerequisite: Three of CHE 222, CHEM 220, CHEM 230, CHEM 353.

CHE 327 Heat & Mass Transfer Operations (4-0)4
Molecular mechanisms of heat and mass transfer. Fourier's law and Fick's law. Transport of heat and mass in one dimension by molecular mechanism and by convection. Transport of heat and mass in turbulent regime, analogies between heat and mass transfer. Heat transfer by radiation. Heat transfer to fluids with phase change. Evaporation. Heat exchanger design.
Prerequisite: One of CHE 222, CHE 203.

CHE 328 Separation Processes (3-2)4
Principles of stagewise and continuous contact operations. Absorption, distillation, extraction, and simultaneous heat and mass transfer. Applications and design of separation process units.
Prerequisite: Two of CHE 203, CHE 222, CHE 327.

CHE 352 Mathematical Modeling in Chemical Engineering (3-0)3
Mathematical model formulation of chemical and physical processes. Solutions of problems related to fluid flow, heat transfer, mass transfer and chemical reaction engineering.
Prerequisite: MATH 219.

CHE 400 Summer Practice II NC
A practical training for a period of 20 works- days in an organization where chemical engineering is extensively practiced. A formal report is required to reflect the work carried out.
Prerequisite: One of CHE 222, CHE 327.

CHE 407 Process Control (3-0)3
Modeling of steady and unsteady-state behavior of chemical processes. Optimal control strategies of processes of particular interest to chemical engineers. Discussion of both classical and modern control theory with applications.
Prerequisite: MATH 219 and one of CHE 327, CHE 328.

CHE 410 Chemical Engineering Laboratory II (0-4)2
Laboratory studies demonstrating the principles of instrumental analysis, heat transfer, fluid mechanics and chemical kinetics. Emphasis on correlation of experimental results and on written and oral presentation.
Prerequisite: Three of CHE 311, CHEM 220, CHEM 230, CHEM 353.

CHE 414 Chemical Technology (3-0)3
A general study of chemical process industries (CPI), considering raw materials, energy, intermediate chemicals, and final products, Future trends in CPI.

CHE 416 Gas Purification Technology (3-0)3
Principles of adsorption, absorption and chemical conversion. Gas dehydration and purification by adsorption. Catalytic conversion of gas impurities.

CHE 417 Chemical Engineering Design I (3-2)4
Application of chemical engineering principles and methods of chemical process synthesis, simulation and economics on open ended process and/or product design problems. Use of computer programming and/or design packages in iterative decision making and optimization. Emphasis on process safety and ethical issues.
Prerequisites: Three of CHE 305, CHE 311, CHE 327, CHE 328.

CHE 418 Chemical Engineering Design II (3-2)4
Continuation of CHE 417, equipment selection and design. Cost estimation, project evaluation process and product safety and ethical issues.
Prerequisite: CHE 417.

CHE 420 Chemical Engineering Laboratory III (0-4)2
Intensive laboratory experiments to illustrate the application of chemical and physical principles to chemical processes. Emphasis is given to mass transfer, simultaneous heat and mass transfer, process control and instrumental analysis. Report writing is emphasized.

Prerequisite: Two of CHE 320, CHE 407, CHE 410.

CHE 423 Chemical Engineering Economics (3-0)3
Importance of economics in engineering, role of engineers in economics. Market and Process surveys in relation to feasibility analysis. Site selection, capital investment and production cost analysis. Interest, taxes, insurance, depreciation, profitability, alternative investments and replacements in chemical engineering.
Prerequisite: ECON 210.

CHE 426 Reactor Design (3-0)3
Multiple reaction systems, multiple and multifunctional reactors. Optimum design of chemical reactors. Introduction to reactor stability. Non ideal flow in reactors. Analysis of coupled transport processes, heat effects and chemical reaction in various types of chemical reactors. Design of heterogeneous reactors.
Prerequisite: CHE 311.

CHE 427 Novel Topics in Separation Processes (3-0)3
Emphasis on adsorption, ion-exchange, chromatography and membrane separation processes. Applications of supercritical extraction and crystallization.
Prerequisite: CHE 327 or consent of the department.

CHE 428 Introduction to Process Principles (3-0)3
A brief survey of chemical process principles with a clear orientation to biotechnology. Material and energy balances, basic principles of thermodynamics, kinetics and transfer operations. It aims to provide knowledge of process handling from engineering point of view to non-engineering students.

CHE 432 Design of Fluidized Bed Reactors (3-0)3
Design of Fluidized Bed Reactors. Hydrodynamics. Heat Transfer. Chemical Reactions. Design considerations. Gas-solid separations. Management of solid residues.

CHE 440 Industrial Organization and Management (3-0)3
Industrial organization, organization techniques, management, research and development, procurement and contracting, production, marketing, personnel and administration, employer-employee relations, financing, accounting, plant supervision. Special emphasis is given to chemical and related industries and major problems encountered in Turkish industry. ISO 9000, Just in time, TQM techniques.

CHE 442 Polymer Technology (3-0)3
Chemistry of polymerization; mechanisms such as step, radical chain, emulsion, ionic chain, chain copolymerization, ring opening, etc. Production, properties and fabrication of plastic materials of industrial importance. Rheology of polymers and polymer solutions. Polymer composites, new polymers.

CHE 443 Downstream Processing of Bio-products (3-0)3
Fundamentals and importance of downstream processing. Recovery, separation and purification of both low and high molecular weight biotechnological products by various methods.

CHE 444 Structure Property Relations in Macromolecular Media (3-0)3
Macromolecular chains. Thermodynamics of macromolecules. Diffusion in macromolecules. Gelation, rheological properties.

CHE 446 Fundamentals of Industrial Waste Treatment (3-0)3
Introduction to waste treatment in industrial plants. Kinetics of reactions involved in different methods. Chemical study of unit processes and unit operations. Design of treatment devices for purification of waste water and control procedures for environmental protection.

CHE 447 Chemical Processes in Microelectronics (3-0)3
Introduction to microelectronics processing. Silicon Refining. Crystal growth. Chemical rate processes and kinetics. Chemical vapor deposition incorporation and transport of dopants. Physical and physico-chemical rate processes. Design of chemical reactors and process equipment used in microelectronics manufacturing.

CHE 448 Ceramic Technology (3-0)3
Raw materials, structure and properties of clays, feldspars, and silicate minerals. Forming and firing of ceramics, vitrification. Rate process theory and use of phase equilibrium diagrams. Whitewares, refractories, enamels, and glazes. Glass and glass forming. Special ceramics.

CHE 452 Chemical Process Optimization (3-0)3
The nature and organization of optimization problems. Formulation of the objective functions. An overview of optimization of individual units as well as complete flowsheets.

CHE 453 Computer Applications in Chemical Engineering (3-0)3
The use of contemporary computational tools, techniques and algorithms for advanced computations in chemical engineering, illustrated with case studies. Topics include: comtemporary numerical computing environments, computational complexity, model checking, linear and non-linear systems, systems of ordinary/partial differential equations, classical and probabilistic parameter estimation, optimization and visualization.
Prerequisite: CENG 200.

CHE 454 Polymer Process Analysis and Design (3-0)3
Development of tools of continuum mechanics necessary for the quantitative description of viscoelastic media. Use of principles of chemical kinetics, fluid and continuum mechanics and heat and mass transfer to describe the production and processing of polymeric materials.

CHE 461 Polymer Additives, Blends and Composites (3-0)3
Additives for processing, surface and optical property modification, fire retardants, UV protecting agents, blowing agents. Principles of blending and compatibilization. Thermodynamics, rheology and morphology of polymer blends. Principles of composites, interfaces, geometrical aspects, elastic properties. Introduction to laminate theory. Short fiber reinforced plastics. Processing of composites.

CHE 462 Polymer Solutions (3-0)3
Fundamentals of dilute polymer solutions, single chain conformations and configurations. Polymer solution thermodynamics, lattice models, equation of state approach. Phase equilibria and phase separation in polymeric solutions. Behavior of concentrated and/or multicomponent solutions, physical gelation. Diffusion in polymeric systems.

CHE 464 Polymer Material Evaluation and Product Design (3-0)3
Stress, strain, linear elasticity, finite strain elasticity, viscoelastic properties of solid polymers. Tensile and tear strength of polymers, yielding, crazing, brittle fracture, environmental stress cracking, fatigue, toughness, impact and tear. Material evaluation based on mechanical and other properties. Conception of part. Analytical design of plastic products. Process design of plastic products. Testing of products. Case studies on plastic product design.

CHE 471 Water Treatment Technology (3-0)3
Nature of water. Impurities in water and their harmful effects. Removal of nonionic suspended and colloidal impurities. Softening by precipitation. Ion exchange. Demineralization process and systems. Demineralizer equipment designs.

CHE 472 Industrial Rheology (3-0)3
Time-independent non-Newtonian fluids, structural time-dependency, linear viscoelasticity, suspensions, viscometric and extensional flows, measurable rheological properties, experimental methods for rheological property measurements. Applications to glassmaking, paint, coatings and polymer industries.

CHE 473 Heat Transfer in Radiating and Combusting Systems (3-0)3
Black body radiation laws and their application. Radiative exchange in black enclosures. Radiative exchange in gray enclosures with no absorbing medium. Radiative exchange in gray enclosures with an absorbing medium. Radiation exchange in combustion chambers. Applications Radiation transport equation. Solution of the transport equation in combustion chambers.

CHE 482 Chemical Process Safety (3-0)3
Industrial hygiene and loss statistics, toxicology, source models (fluid flow through holes in tanks, pipes etc.) toxic release and dispersion models, fires and explosions, designs to prevent accidents, hazard identification and risk assessment, accident investigations with some sample case historie.

CHE 490 Fundamentals of Biochemical Engineering (3-0)3
Review of basic biological concepts such as cell construction, cell nutrients, and enzyme kinetics. Large scale production of enzymes. Selection of bioreactors. Recovery and purification of products.

CHE 491 Chemical Production Engineering I (3-0)3
Statistics theory relevant to process engineering. Data collection, management and quality in production environments, basic design of experiments, statistical process control, process health monitoring, reliability and yield enhancement, process development cycle, total quality management.

CHE 492 Materials Resources and Conversion Processes (3-0)3
Introduction of green process engineering with effective use of resources. Fast depletion of natural resources and environmental impacts. Synthesis and use of chemicals. Basic principles of equilibrium

and rate concepts in physical, biological and chemical processes. Case studies illustrating sustainable chemical processes and trends in chemical technology.

CHE 493 Chemical Production Engineering II (3-0)3
Operation of batch, continuous and hybrid processes. Synthesis of reaction and separation systems and integrated processes for the smaller scale production of speciality chemicals. Introduction to the process intensification and utility integration in chemical production facilities. Mathematical modeling and optimization of batch semi-batch processes for the production of more than one product. Resource planning, chemical production scheduling, and feed stock management.

CHE 494 Resource Engineering II (3-0)3
Assessment of current and potential energy systems, covering extraction, conversion and end-use, with emphasis on meeting regional and global energy needs in a sustainable manner. Examination of energy technologies in each fuel cycle stage for fossil, nuclear, and renewable (solar, biomass, wind, hydro, and geothermal) energy types, along with storage, transmission, and conservation issues. Evaluation and analysis of energy technology systems in the context of political, social, economic, and environmental goals.

CHE 495 Green Chemical Engineering (3-0)3
Environmental laws, regulations, and issues related with chemical processes. Environmental risks associated with chemicals, production methods and exposures. Green chemistry and chemical processes. Risk assessment, sustainability and life cycle analysis of products and processes. Case studies related with carbon and water footprint of chemical processes.

CHE 496 Interfacial Phenomena (3-0)3
Interfacial tension and work associated with interface formation. Laplace and Kelvin equations, their applications and consequences. Capillarity and wetting. Surfactants and micelles. Forces acting at interfaces. Formation, properties and stability of emulsions and colloids. Case studies.

CHE 499 Topics in Chemical Engineering (1-4)3
Faculty-supervised term projects assigned to individual students or groups on new and developing areas of chemical engineering. A written and an oral presentation are required.

GRADUATE PROGRAMS AT THE DEPARTMENT OF CHEMICAL ENGINEERING

GRADUATE CURRICULUM

M.S. in Chemical Engineering

CHE	500	M.S. Thesis	NC
CHE	501	Advanced Chemical Engineering Thermodynamics	(3-0)3
CHE	510	Advanced Chemical Reaction Engineering	(3-0)3
CHE	520	Transport Phenomena	(3-0)3
CHE	550	Chemical Engineering Mathematics*	(3-0)3
CHE	597	Graduate Seminar	(0-2)NC

3 elective courses

Total minimum credit: 21
Number of Courses with credit (min): 7

* or CHE 551, CHE 556, ES 501, ES 502, ES 504, ES 508, ME 510, ME 501 with consent of department

Ph.D. in Chemical Engineering
If admitted by M.S. degree:

CHE	600	Ph.D. Thesis	NC

7 elective courses

Total minimum credit : 21
Number of Courses with credit (min) : 7

If admitted by B.S. degree:

CHE	501	Advanced Chemical Engineering Thermodynamics	(3-0)3
CHE	510	Advanced Chemical Reaction Engineering	(3-0)3
CHE	520	Transport Phenomena	(3-0)3
CHE	550	Chemical Engineering Mathematics*	(3-0)3
CHE	597	Graduate Seminar I	(0-1)NC
CHE	697	Graduate Seminar	(0-1)NC
CHE	600	Ph.D. Thesis	NC

10 Elective Courses

Total minimum credit : 42
Number of Courses with credit (min) : 14

GRADUATE COURSES

CHE	500	M.S. Thesis	NC
CHE	501	Advanced Chemical Engineering Thermodynamics	(3-0)3
CHE	502	Phase Equilibrium Thermodynamics	(3-0)3
CHE	509	Structure, Property and Processing Relations in Polymers	(3-0)3
CHE	510	Advanced Chemical Reaction Engineering	(3-0)3
CHE	511	Catalysis	(3-0)3
CHE	512	Multiphase Reactors	(3-0)3
CHE	513	Biochemical Reaction Engineering	(3-0)3
CHE	514	Membrane Processes	(3-0)3
CHE	515	Microkinetics of Heterogeneous Catalysis	(3-0)3
CHE	517	Metabolic Engineering	(3-0)3
CHE	520	Transport Phenomena	(3-0)3
CHE	521	Advanced Fluid Flow	(3-0)3
CHE	522	Advanced Heat Transfer	(3-0)3
CHE	523	Advanced Mass Transfer	(3-0)3
CHE	524	Advanced Separation Processes	(3-0)3
CHE	525	Transport Phenomena in Multiphase Systems	(3-0)3
CHE	526	Combustion Phenomena	(3-0)3
CHE	527	Transport Processes in Turbulent Flow	(3-0)3
CHE	528	Nonlinear Phenomena I: Statistical and Nonequilibrium Thermodynamics	(3-0)3
CHE	529	Bioseparation Engineering	(3-0)3
CHE	530	Multicomponent Distillation	(3-0)3
CHE	531	Crystallization	(3-0)3
CHE	532	Fluidization	(3-0)3
CHE	535	Nuclear Reactor Theory I	(3-0)3
CHE	536	Nuclear Reactor Theory II	(3-0)3
CHE	537	Reactor Physics Experiments	(3-0)3
CHE	538	Nonlinear Phenomena II: Chaos and Fractals	(3-0)3

CHE	540	Coal Technology	(3-0)3
CHE	541	Petroleum Refinery Engineering	(3-0)3
CHE	543	Nuclear Technology	(3-0)3
CHE	544	Fundamentals of Waste Disposal	(3-0)3
CHE	545	Combustion Technology	(3-0)3
CHE	546	Adsorption and Ion Exchange Technology	(3-0)3
CHE	547	Air Pollution and Control Methods	(3-0)3
CHE	550	Chemical Engineering Mathematics	(3-0)3
CHE	551	Applied Data Analysis Techniques	(3-0)3
CHE	552	Process Analysis	(3-0)3
CHE	553	Process Modeling and Simulation	(3-0)3
CHE	554	Advanced Process Control	(3-0)3
CHE	555	Prediction of Properties of Fluids	(3-0)3
CHE	556	Computational Methods in Chemical Engineering	(3-0)3
CHE	557	Process Synthesis and Design	(3-0)3
CHE	558	Chemistry and Manufacture of Cement	(3-0)3
CHE	560	Computer Aided Process Plant Design	(3-0)3
CHE	572	Paint Technology	(3-0)3
CHE	578	Biotechnology Process Principles	(3-0)3
CHE	579	Nuclear Fuels and Fuel Management	(3-0)3
CHE	597	Graduate Seminar I	(0-2)NC
CHE	599	Graduate Seminar II	(0-2)NC
CHE	600	Ph.D. Thesis	NC
CHE	7XX	Special Topics in Chemical Engineering	(3-0)3
CHE	8XX	Special Studies	(4-2)NC
CHE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF THE GRADUATE COURSES

CHE 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester.

CHE 501 Advanced Chemical Engineering Thermodynamics (3-0)3
Laws of thermodynamics from phenomenological and statistical point of view. Reactions and phase equilibria. Properties of solutions. Analysis of chemical engineering processes from the standpoint of thermodynamics. Introduction to statistical and irreversible thermodynamics.

CHE 502 Phase Equilibrium Thermodynamics (3-0)3
Calculation of fugacities in gaseous and liquid mixtures. Theory of liquid solutions. Fluid phase equilibria at high pressures. Phase equilibria in condensed systems. Case studies.

CHE 509 Structure, Property and Processing Relations in Polymers (3-0)3
Effect of monomer structure and chain length on the morphology and mechanical properties of polymers. Polymer statistics. Thermodynamics of polymer solutions. Polymer crystallization theory. Principles of polymer rheology. Effect of rheological properties on polymer processing and product structure.

CHE 510 Advanced Chemical Reaction Engineering (3-0)3
Kinetics of chemical reactions. Batch and ideal flow reactors, semibatch reactors. Laminar flow reactors. Axial and radial dispersion in tubular reactors. Axial and radial temperature variations in tubular reactors. Design principles of gas-solid catalytic reactors. Reactor stability. Residence time distribution and segregation in flow reactors.

CHE 511 Catalysis (3-0)3
Conservation equations in heterogeneous systems. Intrapellet transport effectiveness factor, applications to heterogeneous catalytic reactor design. Principles and mechanism of catalysis; surface chemistry and surface structure. Physical properties of porous catalysts, reaction mechanisms.

CHE 512 Multiphase Reactors (3-0)3
Introduction to multiphase reactors, classification, hydrodynamics and rate processes. Modeling of fluid-solid; gas-liquid-liquid and gas-liquid-solid systems. Generally applicable dynamic analysis techniques. Industrial applications.

CHE 513 Biochemical Reaction Engineering (3-0)3
Applications of chemical kinetics and reaction engineering principles to bioreactors. Biological reactor and fermentor design and scale-up. Kinetics of microbial growth, product formation, enzyme catalyzed reactions.

CHE 514 Membrane Processes (3-0)3
Membrane concept. Principles of membrane separations and applications in biotechnology. Membrane preparation techniques, applications of membranes in stream purification in product recovery and in industrial wastewater treatment.

CHE 515 Microkinetics of Heterogeneous Catalysis (3-0)3
Applications of the principles of micro kinetic analysis, statistical and classical thermodynamics on the heterogeneous surface chemical reactions. Transition state theory, surface energetics. Advanced catalyst characterization techniques : incorporation of the characterization information in the chemical reaction analyses.
Prerequisite : CHE 510 or 511 or equivalent

CHE 517 Metabolic Engineering (3-0)3
Microorganism as a microbioreactors; Industrially important microorganisms. Influence of bioreactor operation conditions on the bioreaction networks and regulation of metabolic pathways: fermentation physiology. Principles of metabolic engineering: Determination of the metabolic bottlenecks. Metabolic control analysis. Thermodynamic analysis of cellular pathways. Pathway design.

CHE 520 Transport Phenomena (3-0)3
Analytical and approximate solutions of equations of mass, momentum and energy transport. Introduction to creeping, potential and laminar boundary layer flows. Description of heat and mass transfer in multicomponent systems. Interphase momentum, heat and mass transfer.

CHE 521 Advanced Fluid Flow (3-0)3
Inviscid fluid, Euler equation, Bernoulli equation, Kelvin's theorem, irrational motion, Stoke's stream function, vorticity; analytical and numerical solutions of Navier-Stokes equation; creeping flow equation, introduction to lubrication theory; vorticity transport equation, laminar boundary layers, turbulent boundary layers; introduction to turbulence.

CHE 522 Advanced Heat Transfer (3-0)3
Steady, unsteady and multidimensional conduction in different geometries. Basic equations for convection; laminar, free and forced convection. Turbulent convection. Analogy between heat and momentum transfer. Radiative energy transfer in enclosures with and without an absorbing emitting medium.

CHE 523 Advanced Mass Transfer (3-0)3
Mechanism and theory of mass transport. Transfer under laminar and turbulent flow conditions and with large fluxes. Mass transfer and simultaneous chemical reaction. Multicomponent systems. Applications in specific unit operations.

CHE 524 Advanced Separation Processes (3-0)3
Barrier separation processes; stage and continuous contacting operations. Residence time distribution in flow reactors; probability theory; method of moments; Brownian motion, diffusion and sedimentation.

CHE 525 Transport Phenomena in Multiphase Systems (3-0)3
Transport equations for mass, momentum and energy in multicomponent systems; jump conditions at phase interfaces; the spatial averaging theorem and the method of volume averaging; flow in porous media. Darcy's law for one and two phase flows; dispersion of heat and mass in bundles of capillary tubes; the general problem of dispersion in porous media.

CHE 526 Combustion Phenomena (3-0)3
Chemistry and physics of combustion. Kinetically controlled combustion phenomena. Diffusion flames in liquid fuel combustion. Combustion of solid fuels. Flames in premixed gases, heat transfer in furnaces.

CHE 527 Transport Processes in Turbulent Flow (3-0)3
Introduction to turbulent flow. Methods of measurement in turbulent region. Definitions and equations of change in turbulence. Mathematical models of turbulent momentum, heat and mass transfer.

CHE 528 Nonlinear Phenomena I: Statistical and Nonequilibrium Thermodynamics (3-0)3
Boltzmann equation and its linear solutions. Irreversibilities and irreversible thermodynamics. Nonlinearity and stability. Mathematical theories of chaos. Fractal approach to nonlinear dynamics. Studies in selected topics like turbulence, gelation, adsorption, clustering, and phase transition.

CHE 529 Bioseparation Engineering (3-0)3

Separation processes in biological systems. Enzyme/cell isolation, product enrichment by methods of ion-exchange, filtration, centrifugation, chromatography, reverse-osmosis, precipitation, salting-out, electrophoresis, membrane separations.

CHE 530 Multicomponent Distillation (3-0)3

Fundamental concepts involved in multicomponent distillation calculations. Solution of the material balance and equilibrium relationships for conventional distillation columns. Further refinements for conventional columns. Complex columns. Conventional and complex columns at minimum reflux and q-method of convergence. Efficiency calculations.

CHE 531 Crystallization (3-0)3

Order and symmetry. Space and point groups. Phase equilibria in condensed systems. Theories of nucleation and crystal growth. Surface diffusion theory of Burton, Cabrea and Frank. Experimental techniques in crystal growth. Analysis of continuous crystallization. Case studies.

CHE 532 Fluidization (3-0)3

Principles of fluidization. Heat and mass transfer in fluidized beds. Advanced design principles of fluidized bed reactors. Adsorption, desorption, channeling, solid recovery, stability, particle size reduction and solid regeneration are emphasized.

CHE 535 Nuclear Reactor Theory I (3-0)3

Interaction of neutron with matter. Fission. Diffusion equation. Neutron slowing down and Fermi age theory. Moderation with absorption. Diffusion and interaction of thermal neutrons.

CHE 536 Nuclear Reactor Theory II (3-0)3

Fermi theory of bare thermal reactor. Criticality and sixfactor formula. Multiregion reactors. Multigroup theory. Reactor kinetics, reactivity and reactor control. Temperature dependence of reactivity. Poisoning and core age. Control rod theory.

CHE 537 Reactor Physics Experiments (3-0)3

Selected experiments in neutron physics like adsorption, slowing down, spectral hardening, build-up factor, neutron activation.

CHE 538 Nonlinear Phenomena II: Chaos and Fractals (3-0)3

Waves in turbulent systems, dispersion relations. Solutions in fluid flow and macromolecules. Percolations in heterogeneous media. Fractal structures, pattern formations, and self organizations in flows and stationary systems. Selected examples from polymers, ceramics, zeolites, coal, catalysts, and biomaterials.

Prerequisite : CHE528 or equivalent

CHE 540 Coal Technology (3-0)3

Coal classification systems. Physical, chemical and plastic properties of coals. Analytical techniques in coal characterization. Beneficiation, carbonization, gasification and liquefaction of coals. Environmental aspects of coal utilization.

CHE 541 Petroleum Refinery Engineering (3-0)3

Summary of refinery operations, physical and chemical petroleum refining processes. Application of chemical engineering principles to petroleum processing methods and equipment.

CHE 543 Nuclear Technology (3-0)3

Nuclear and radioactive properties, radiation detection instrumentation. The radionuclides and their use in industrial process control; nuclear methods in analytical chemistry, radiation chemistry; chemical aspects of nuclear reactors, reactor fuel reprocessing.

CHE 544 Fundamentals of Waste Disposal (3-0)3

Introduction to waste treatment in industrial plants. Kinetics of reactions involved in different methods; chemical study of unit processes and unit operations, design of treatment devices for purification of waste water and control procedures for environmental protection.

CHE 545 Combustion Technology (3-0)3

Fuels used for combustion. Coal fired furnaces, stokers and pulverized fuel burners. Burners and furnaces for liquid fuels. Burners and furnaces for gaseous fuels. Stream generators. Performance calculations. Combustion generated air pollution. Measurements in industrial flames.

CHE 546 Adsorption and Ion Exchange Technology (3-0)3

Sorption and sorbent materials. Physical properties of sorbent materials. Typical sorption processes. Fundamental factors in performance of adsorption and ion exchange. Design principles of adsorption and ion exchange equipment. Industrial applications of adsorption and ion exchange processes.

CHE 547 Air Pollution and Control Methods (3-0)3

Effects and sources of air pollutants. Meteorological effects on air pollution. Dispersion of pollutants in the atmosphere. Particulate emission control. Control of gases and vapors. Adsorption, adsorption principles. Atmospheric photochemical reactions.

CHE 550 Chemical Engineering Mathematics (3-0)3

Macroscopic balances and elementary formulation of physical problems. Application of complex variable theory and Laplace transforms. Rigorous application of partial differential equations. Matrices and their application to staged processes. Vectors and tensors. Coordinate systems. Calculus of variations, including some optimization methods. Application of these methods to chemical engineering problems.

CHE 551 Applied Data Analysis Techniques (3-0)3

Basic concepts about probability. Statistical inferences. Data fitting by linear and non-linear regression methods. Design of experiments. Factorial and fractional factorial designs. Special experimental designs for parameter estimation and model discrimination. Applications in chemical engineering; process modeling with computer programming.

CHE 552 Process Analysis (3-0)3

Principles of systems analysis. Numerical solution of algebraic and ordinary differential equations. Basic modeling and decomposition of large-scale system. Signal flow reaction kinetics, and distributed systems.

CHE 553 Process Modeling and Simulation (3-0)3

Introduction to the basic principles of process analysis, modeling and simulation techniques in chemical engineering. Classification of transport phenomena and population balance models. Subsystem analysis and distributed parameter systems. Numerical examples on tank systems, vapor-liquid equilibria, reaction kinetics, fluid flow and stagewise operations. Solution of these examples by microcomputer techniques will be emphasized.

CHE 554 Advanced Process Control (3-0)3

System models; system matrices; state space characterization of multivariable systems; discrete-time systems and z-transforms. Liapunov theory; definitions of stability and applications to linear and nonlinear control theory, quadratic optimal control problems.

CHE 555 Prediction of Properties of Fluids (3-0)3

Estimation methods for P-V-T properties of gases, densities of liquids. Vapor liquid equilibria of pure fluids and mixtures using corresponding states principles and mixing rules. Thermodynamic property estimations of solutions. Transport properties of fluids, viscosity, conductivity and diffusivity estimations.

CHE 556 Computational Methods in Chemical Engineering (3-0)3

Floating point arithmetics and errors; vector and matrix norms; numerical solution of linear system of equations; function approximation; numerical differentiation and integration, application to chemical engineering problems. Initial value problems of ordinary differential equations; two-point boundary value problems, applications to chemical engineering cases. Solutions of non-linear system of equations.

CHE 557 Process Synthesis and Design (3-0)3

Strategies of process synthesis. Heuristic and optimization approaches. Synthesis of separation systems and heat exchanger networks. Batch process engineering. Case studies.

CHE 558 Chemistry and Manufacture of Cement (3-0)3

History of Calcareous Cements Portland Cement: Classification and manufacture clinker and cement components and their phase relations. The constitution and specification of Portland cements. Manufacturing processes. Energy and material balances in rotary kiln. Relations between chemical reactions, phase content and strength of Cement. Hydration of Cement.

CHE 560 Computer Aided Process Plant Design (3-0)3

Material and energy balances, data bases for properties. Design of unit operations. Equipment flow sheeting.

CHE 572 Paint Technology (3-0)3

Basic principles of colour and constitution, chromophores and auxochrome groups. Technology of dyes and pigments widely used in the industry. Technology of oil and water based paints and their constituents. Formulation principles and testing methods.

CHE 578 Biotechnology Process Principles (3-0)3

Momentum, heat and mass transfer between phases

in biosystems. Non-Newtonian fluid flow in suspensions and polymeric solutions. Power consumption in mixing and agitation, scale-up of process equipment, sterilization and media preparation.

CHE 579 Nuclear Fuels and Fuel Management (3-0)3
Fissile and fertile fuels, fuel cycle operations, solvent extraction, processing of ores at nuclear purity. Metallic, alloy, oxide, and carbide fuels, mixed fuels. In-core fuel management. Methods of removal of cladding, dissolution of nuclear fuels. Fuel reprocessing methods. Isotope separation methods.

CHE 597 Graduate Seminar I (0-1)NC
Each student is required to present objective and scope of his/her research subject, and actively participate in the discussions of other students presentations.

CHE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester.

CHE 697 Graduate Seminar (0-1)NC
As a very important part of the PhD training, each student is required to thoroughly review the literature around the objective and scope of his/her research topic, and demonstrate ability to read, interpret and discuss the academic literature. Participation in the discussions of other presentations is also required.

CHE 7XX Special Topics in Chemical Engineering (3-0)3
Courses not listed in the catalogue. Contents vary from year to year according to interest of students and instructor in charge.

CHE 8XX Special Studies (4-2)NC
M.S. Students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

CHE 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her advisor.

DEPARTMENT OF CIVIL ENGINEERING

PROFESSORS

AKKAR, Dede Sinan; B.S., M,S., Ph.D., METU
AKYÜREK, Zuhal: B.S., M.S., Ph.D., METU.
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BAKIR, B. Sadık: B.S., M.S., METU; Ph.D., Iowa State University.
BİRGÖNÜL, Talat: B.S., M.S., Ph.D., METU.
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ÇETİN, Kemal Önder: B.S., METU; M.S., Ph.D., University of California at Berkeley.
ÇOKÇA, Erdal: B.S., M.S., Ph.D., METU.
ERGUN, Ufuk: B.S., M.S., METU; Ph.D., Imperial College, University of London.
EROL, Orhan: B.S., M.S., METU; Ph.D., Iowa State University.
GÖĞÜŞ, Mustafa: B.S., M.S., İ.T.Ü.; Ph.D., University of Iowa.
GÜNDÜZ, Murat: B.S., METU; M.S., Georgia Institute of Technology;
Ph.D., University of Wisconsin, Madison.
KARSLIOĞLU, Mahmut Onur: B.S., Karadeniz Technical University; M.S., University of Bonn;
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YANMAZ, Melih: B.S., M.S., Ph.D., METU.
YILMAZ, Çetin: B.S. METU; M.S., Ph.D., Lehigh University
YÜCEMEN, Semih M.: B.S., METU; M.S., Georgia Institute of Technology Atalanta; Ph.D., University of
Illinois Campaign Urbana

ASSOCIATE PROFESSORS

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ASKAN GÜNDOĞAN, Ayşegül: B.S., METU; M.S., Ph.D., Carnegie Mellon University.
BURAK Burcu: B. Sc., METU; M. Sc., Ph.D., Structural Engineering, University of Michigan.
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CANER Alp: B.S., METU; M.S., Ph.D., North Carolina State University.
ERDOĞAN, Sinan Turhan: B.S., METU; M.S., Ph.D., University of Texas at Austin.
ERBERİK, Murat Altuğ: B.S., M.S., Ph.D., METU.
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TÜRER, Ahmet: B.S., METU, M.S., Ph.D. University of Cincinnati.
YÜCEL, İsmail: B.S., ITU; M.S., Ph.D., University of Arizona.

ASSISTANT PROFESSORS

AKÇAMETE, Aslı: B.S., M.S., METU; Ph.D., Carnegie Mellon University.
GÖKTEPE, Serdar: B.S., METU; M.S., Ph.D., Universitat Stuttgart.
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YILMAZ, Tuğrul; B.S., METU; M.S., Vrije University; PhD., Amsterdam George Mason University

INSTRUCTORS

ACAR, Osman: B.S., M.S., Ph.D., METU.
ERANT, Engin: B.S., M.S., METU; Ph.D., İTÜ.
TOKER, Kartal: B.S., METU; M.S., Ph.D., Massachusetts Institute of Technology.

GENERAL INFORMATION: The curriculum of the Civil Engineering Department is planned to provide a sound professional education for the students. After completing their first-year courses in basic sciences, students are offered courses in Applied Mechanics, Hydraulics, Hydromechanics, Coastal and Harbour Engineering, Geotechnical Engineering, Structures, Earthquake Engineering, Geodesy, Transportation Engineering, Materials, Construction Engineering and Management fields. Courses in mathematics, computer programming and non-technical subjects are also obligatory in the program. Throughout their studies, students are encouraged to take part in applied and theoretical research, as well as in practical professional training.

Mission Statement for our Unit / Department.

- To provide the most high quality undergraduate and graduate education in the area of Civil Engineering in our country so as to turn students possessing high potential into graduates with maximum added value
- Without neglecting the international standard and dimension, to conduct high level research projects giving priority to the needs of Turkish industry, providing mobility to intellectual capital and to merge them with graduate educational activities
- To share and disseminate accumulated expert knowledge for use in the solution of problems faced by institutions in the relevant sector and by society
- To ensure the continuous provision of quality both in necessary physical conditions and in human resources in order to fulfill educational, research and public service duties

Vision Statement for our Unit / Department.

Our future is our difference, our difference is our future.

- Being conscious of the necessity of efficiency, to continuously review, starting from within the University, our responsibilities to society, to the country, to our profession, to science and to humanity
- To create required methods and mechanisms for the swift and effective transfer into the curriculum and research topics of the latest developments in technology, knowledge access and information processing
- To take account of the ethical, social, cultural, environmental and economic aspects of the profession as much as to the technical dimension in all educational and research activities
- To plan for the future and to adapt to innovation
- To uphold the positive traditional qualities that have undeniably contributed to the present successful position
- To equip students with the knowledge, ability and creative thinking required for the identification, solution, synthesis and design of civil engineering problems

- To exert attention so that research activities in addition to being suitable for the needs of our country should also be pioneering studies that contribute to the profession and to science
- To transfer and share the accumulation of knowledge firstly for the benefit of our country and in general for the benefit and development of all humanity
- To always improve and develop the required physical environment for education and research
- In short, in all areas of endeavor, with students, faculty, administrative staff and graduates to be always the pioneer, the leader and to strive for perfection

It is this will and effort that makes METU Civil Engineering Department different from others. For this reason, **What makes our future is our difference, what makes us different is our future.**

PROGRAM EDUCATIONAL OBJECTIVES:

The bachelor's program graduates of METU Civil Engineering Department:

- Work as experts, technical staff or project managers in the area of civil engineering in the leading companies of private sector or governmental institutions.
- Have successful research identities and academic careers in civil engineering related departments of national and international universities.
- Come to the forefront in their careers with their lifelong learning habits and research abilities.
- They are preferred in international projects due to their communication and leadership skills.

STUDENT OUTCOMES:

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs.
d. An ability to function on multi-disciplinary teams.
e. An ability to identify, formulate and solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
i. Recognition of the need for and an ability to engage in life-long learning.
j. Knowledge of contemporary issues.
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

UNDERGRADUATE PROGRAM

Students successfully completing their fourth year are entitled to a "Bachelor of Science in Civil Engineering" degree. Practical experience is required for the degree and accordingly, students are required to go into summer practice at the end of their second and third years and to have a satisfactory record of their summer employment approved by the Department. During the fourth year technical elective courses are offered to enable the students to advance their knowledge in specific fields.

GRADUATE PROGRAMS

Graduate courses are offered in each of the mentioned below fields of specialization leading to the degrees of "Master of Science" and "Doctor of Philosophy." The course program for the M.S. degree is decided by the advisor of the student according to his intended field of specialization and to his future career plans. He is required to take a minimum of 60 credit hours from the courses which are approved by the Department. Thesis is obligatory and each student is assigned a thesis supervisor. For studies leading to the Ph.D. degree see Graduate School Rules and Regulations.

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: Civil Engineering graduate programs provide for the inculcation of state-of-the-art knowledge in applied science and technology and aim at the

creation of new and original information in all civil engineering disciplines. Specific attention is paid to national and regional research needs.

RESEARCH FACILITIES AND DIVISION

At present the Civil Engineering Department has nine active fields of specialization; eight of these are associated with laboratories with a total floor area of 12 000 m^2.

1. Structural Engineering Division: This laboratory, with a total floor area of 1500 m^2 is established both for instruction and research. The laboratory is equipped with a modern programmable dynamic loading system and a thirty channel digital recording system. Various types of tests can be made using various testing frames available. The laboratory has its own machine shop and carpenter shop. In the 500 m^2 main testing hall, full or small-scale structural elements and models can be tested. The laboratory has all the necessary facilities for experimental stress analysis.

2. Hydraulics Engineering Division - Coastal and Ocean Engineering Laboratory: The Coastal and Ocean Engineering Laboratory is established both for education and research. The laboratory has a covered area of 3000 m2 and an open area of 1000m2, with mechanical (regular and irregular) wave generators, etc., and carries out basic and applied research on coastal sediment transport , sea outfalls and coastal pollution, coastal structures, wave mechanics, wave climate, harbour design, marinas, coastal management and related engineering and management problems. On these topics, various sponsored research projects for both public and private organizations are investigated in this laboratory.

3. Transportation Engineering Division: This laboratory has the equipment for the performance of the following tests: gravity, penetration, water content, ductility, flash and fire points, loss on heating , distillation, spot, softening point, viscosity and float tests on, asphalts, cut backs, road oils, emulsions; bitument content, Marshall method, Hveem Stability and Centrifuge Kerosene Equivalent tests for highway pavements; LCN evaluation for airport pavements, stripping, soundness and abrasion tests or round or crushed aggregates. In addition to standard tests, research is carried out on the economical treatment of soils and aggregates for highway construction.

4. Hydraulics Engineering Division - Hydromechanics Laboratory: This laboratory, with its 3000m^2 covered Main Hall two 200 m^2 auxiliary halls, five 100 lt/s capacity pump stations; meteorological, wind tunnel, and electronic high speed recording systems; and turbulence measurement instrumentation, concentrates mainly on hydromechanics, hydraulics, sediment transport, environmental and computational fluid mechanics, turbulence, and porous media flow. Demonstrations, basic and applied research of academic and industrial interest are carried out in this laboratory.

5. Construction Materials Engineering Division: This laboratory covers a total floor area of 1800m^2. In the main testing hall there are five universal testing machines and two loading frames ranging in capacities from 1 ton to 500 tons. With these equipment the mechanical properties of various materials can be determined and full scale tests can be performed on structural elements. In other sections there exists the necessary equipment for testing the physical and chemical properties of materials of construction. The laboratory is used both for instruction and research and for services to industry.

6. Geotechnical Engineering Division: This laboratory has all the equipment for standard soil testing as well as some sampling and field testing equipment. Apparatus such as triaxial shear with pore pressure measurement, direct shear, simple shear, unconfined compression, laboratory vane, and oedometers are available to carry out research at an advanced level. The Soil Mechanics Laboratory is at its early stage of development as regards to research in the areas of dynamic soil behavior, machine foundations and earthquake engineering. The laboratories are actively used for teaching purposes.

7. Geomatics Engineering Division: This laboratory provides instruction and research in the fields of geodesy, photogrammetry and engineering seismology. In addition to classical geodetical equipment the laboratory includes electronic distance measuring units, photogrammetric plotters, gravitymeters, accelerographs and a complete vibration and recording system.

8. Hydraulics Engineering Division - Water Resources Engineering Laboratory: The Water Resources Laboratory provides instructional, applied and theoretical researches facilities in the fields of water resources, hydrology and hydraulics.

9. Construction Engineering and Management Division: This field works on decision-making problems of construction at industrial, sectorial and macro-economic levels considering the prevailing conditions of developing countries. Its principal activities are directed towards civil engineering drawing; construction technologies; output and productivity analysis; feasibility and utility analysis; site layout and organization; construction equipment; time, resource, and cost planning and control of construction projects.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MATH	119	Calculus with Analytic Geometry	(4-2)5
PHYS	105	General Physics I	(3-2)4
CHEM	107	General Chemistry	(3-2)4
CE	101	Civil Engineering Drawing	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	106	General Physics II	(3-2)4
CENG	230	Introduction to Computers and C Programming	(2-2)3
GEOE	104	Geology for Civil Engineers	(3-0)3
CE	102	Introduction to Civil Engineering	(2-0)NC
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
ES	202	Mathematics for Engineers	(3-0)3
CE	221	Engineering Mechanics I	(3-0)3
CE	231	Engineering Economy	(3-0)3
CE	241	Materials Science	(2-2)3
Non-technical Elective			
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

CE	204	Uncertainty and Data Analysis	(3-0)3
CE	222	Engineering Mechanics II	(3-0)3
CE	224	Mechanics of Materials	(3-2)4
CE	272	Fluid Mechanics	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
Non-technical Elective			
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

CE	305	Numerical Methods for Engineers	(3-0)3
CE	353	Principles of Transportation and Traffic Engineering	(3-2)4
CE	363	Soil Mechanics	(3-2)4
CE	372	Hydromechanics	(3-2)4
CE	383	Structural Analysis	(3-0)3
CE	300	Summer Practice I	NC
TURK	303	Turkish I	NC

Sixth Semester

CE	332	Construction Engineering and Management	(3-0)3
CE	344	Materials of Construction	(3-2)4
CE	366	Foundation Engineering I	(2-2)3
CE	378	Water Resources Engineering	(4-0)4
CE	382	Reinforced Concrete Fundamentals	(3-0)3
CE	388	Fundamentals of Steel Design	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester				Eighth Semester
CE	410	Civil Engineering Design	(2-2)3	Restricted Elective §
CE	400	Summer Practice II	NC	Restricted Elective §§
Restricted Elective *				Restricted Elective ****
Restricted Elective **				Technical Elective ‡
Restricted Elective ***				Technical Elective ‡
Free Elective				

* Must be selected from a group of technical elective courses (minimum three credits) approved by the CE Department.
** Must be selected from a group of technical elective courses (minimum three credits) approved by the CE Department.
*** Must be selected from a group of technical elective courses (minimum three credits) approved by the CE Department.
**** Must be selected from a group of technical elective courses (minimum three credits) approved by the CE Department.

§ Must be selected from a group of design elective courses (minimum three credits) approved by the CE Department.
§§ Must be selected from a group of design elective courses (minimum three credits) approved by the CE Department.

‡ Out of the two technical elective courses (minimum three credits), one of them could be taken from other engineering departments subject to the approval of the CE department.

The Civil Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org "

MINOR PROGRAM IN GEOTECHNICS

This program is aimed at students in other fields of engineering and science wishing an introduction to the behavior of engineering soils and geotechnical applications, especially those who are likely to collaborate with geotechnical engineers in their future professional life. The program requires basic knowledge of engineering mechanics and hydraulics. The emphasis will be on the principles of soil mechanics and ground investigation which are of value in gaining an understanding of problems such as slope stability, ground water movement, ground improvement and environmental geotechnology.

Prerequisite Courses

CE	221	Engineering Mechanics 1	(3-0) 3
CE	224	Mechanics of Materials	(3-0) 3

Compulsory courses

CE	363	Soil Mechanics	(3-2) 4
CE	366	Foundation Engineering 1	(2-2) 3

One of the following courses

CE	382	Reinforced Concrete Fundamentals	(3-0) 3
CE	383	Structural Analysis	(3-0) 3
CE	423	Advanced Mechanics of Materials	(3-0) 3

Three of the following courses

CE	460	Geotechnical Investigations	(3-0) 3
CE	462	Foundation Engineering 2	(2-2) 3
CE	463	Introduction to Soil Behavior	(3-0) 3
CE	464	Ground Improvement	(3-0) 3
CE	465	Earth Structures	(2-2) 3

CE	467	Introduction to Soil Dynamics	(3-0) 3

MINOR PROGRAM IN STRUCTURAL ANALYSIS AND DESIGN

The purpose of this minor program is to introduce students especially in the architecture department to the modern methods of structural analysis, and to acquaint them with current design procedures. The emphasis is on buildings although other structural forms will also be used to illustrate the underlying concepts.

Prerequisite Courses

CE	221	Engineering Mechanics 1	(3-0) 3
CE	224	Mechanics of Materials	(3-0) 3

Compulsory courses

CE	382	Reinforced Concrete Fundamentals	(3-0)3
CE	383	Structural Analysis	(3-0)3
CE	388	Fundamentals of Steel Design	(3-0)3

Three of the following courses

CE	418	Design of Tall Building Structures	(3-0)3
CE	423	Advanced Mechanics of Materials	(3-0)3
CE	425	Introduction to Finite Elements	(3-0)3
CE	481	Reinforced Concrete Structures	(3-0)3
CE	482	Steel Structures	(3-0)3
CE	483	Advanced Structural Analysis	(3-0)3
CE	484	Prestressed Concrete	(3-0)3
CE	486	Structural Design: Concrete Structures	(3-0)3
CE	488	Computer Applications in Structural Engineering	(3-0)3
CE	490	Earthquake Resistant Design	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

CE 101 Civil Engineering Drawing(2-2)3
An introductory course to provide orientation to the language of engineering graphics and interaction with integrated computer aided drafting. General Cad Terminology and CAD User Interface and Drawing Editor. Technical Drawing Concepts: Orthographic drawing, isometric and oblique projections and sectioning, basic dimensioning techniques, plotting and printing techniques. Introduction to model space and paper space concepts. Civil Engineering applications.

CE 102 Introduction to Civil Engineering (2-0)NC
An orientation course to provide counsel to the students on the major areas of Civil Engineering including information on typical activity of civil engineers, integrated course sequences and content, and an introduction of the faculty. Professional engineering practice. Oral and written engineering communication.

CE 204 Uncertainty and Data Analysis (3-0)3
Introduction to uncertainty and data analysis with emphasis to civil engineering applications. Fundamentals of probability including conditional probability, statistical independence, Bayes' Theorem. Random variables and modeling variability. Functions of random variables. Random vectors, uncertainty propagation. Random sampling and parameter estimation. Statistical inference. Probability model tests. Regression analysis and introduction to simulation. Introduction to reliability-based design concepts and risk analysis.
Prerequisite: MATH 120

CE 221 Engineering Mechanics I (3-0)3
Introduction to rigid body mechanics. Equivalent force systems: Concepts of moment, couple, resultant. Equilibrium: Free-body diagram; equations of equilibrium. Structural analysis: Trusses; beams. Shear force and bending moment diagrams by method of sections and by method of

integration. Properties of surfaces: Area moment and centroid; moments and product of inertia; principal directions.
Prerequisite: MATH 119.

CE 222 Engineering Mechanics II (3-0)3
Kinematics of particles and rigid bodies: absolute motion, relative motion. Kinetics of particles: equations of motion, work-energy and impulse-momentum. Systems of particles. Kinetics of rigid bodies: Euler's equation, plane motion of rigid bodies, kinetic energy of rigid bodies. Introduction to the dynamics of vibrating systems.
Prerequisite: CE 221.

CE 224 Mechanics of Materials (3-2)4
Simple stress and strain. Equilibrium, compatibility and constitutive relations. State of stress and state of strain with emphasis on two dimensional problems. Bending and shear stresses. Deflection of beams. Torsion of circular shafts. Combined stresses. Buckling of columns.
Prerequisite: CE 221.

CE 231 Engineering Economy (3-0)3
Introduction to engineering economy. Interest and money-time relationship. Depreciation, valuation depletion. Basic methods for making economy studies. Risk-decision analysis. Selection between alternatives and the replacement problem. Applications related to various constructions projects. Quantity measurement and cost estimating of a building project.

CE 241 Materials Science (2-2)3
Engineering requirements of materials; the structure of matter; atomic arrangements, structural imperfections, atom movements. Mechanical properties. Concepts of force, stress, deformation and strain; elasticity; elastic and plastic behavior; viscosity; rheological models. Creep, relaxion, brittleness, ductility, hardness, fatigue, toughness, resilience, and damping characteristics of materials.

CE 272 Fluid Mechanics (3-0)3
Definitions, physical properties. Hydrostatics, forces on plane and curved surfaces, buoyancy, hydrostatics in moving and rotating containers. Lagrangian and Eulerian descriptions, derivatives, rate of deformation, flowlines. System and control volume approach, Reynolds transport theorem, principles of conservation of mass, momentum and energy, Bernoulli equation. Dimensional analysis, Buckingam pi theorem, similitude.
Prerequisite: CE221.

CE 300 Summer Practice I NC
Subjects that are acceptable for summer practice: Surveying, time-keeping, checking and testing construction materials, assisting resident engineers. Preparing quantity and cost estimates, unit price estimates, civil engineering drawings and graphs. Use of computational machines, taking part in construction work. The department may organize a compulsory, collective Summer Practice Program in place of the above. (20 working days).

CE 305 Numerical Methods for Engineers (3-0)3
Introduction to mathematical modeling in civil engineering. Accuracy, errors and propagation of errors. Solution methods for solving system of linear and non-linear algebraic equations. Eigenvalue problems. Approximation of functions. Numerical differentiation and integration. Numerical solution of differential equations. Special Topics.
Prerequisite: ES 202

CE 332 Construction Engineering and Management (3-0)3
Profile of the construction sector; company and site organization and types of contracts. Construction projects; estimating, tendering, planning and execution. Professional responsibility and engineering ethics. Productivity, quality, health and safety issues. Construction equipment; selection criteria, hourly cost determination and output analysis of excavators.

CE 344 Materials of Construction (3-2)4
Production, types, uses in construction, properties and tests for these materials: lime, gypsum, hydraulic cements, mineral aggregates, concrete, clay products, ferrous metals, polymers, bituminous materials, timber. Constituents, theories of mix design, principal steps in production, physical and mechanical properties of concrete.

CE 353 Principles of Transportation and Traffic Engineering (3-2)4
Introduction to transportation systems. Vehicles, network and terminals as components of transportation systems engineering. Design of transportation facilities emphasizing land transportation. Operations planning of transportation systems and traffic engineering. Models of traffic flow. Traffic analysis at intersections. Basic definitions and computations of level of service. Planning and management techniques.

CE 363 Soil Mechanics (3-2)4
Introduction: engineering problems involving soils. Basic characteristics of soils, classification and compaction of soils. Principle of effective stress. Permeability and flow of water (seepage) in soils. Shear strength of soils. Slope stability. Lateral earth pressure theories. Consolidation theory.

CE 364 Soil Mechanics (2-2)3
Index properties and classification of soils. Pore pressures, effective stress, permeability, flow of water through soils. Compressibility and consolidation. Shear strength. Lateral earth pressure. Stability of slopes. Principles of foundation design; analysis of settlements, bearing capacity of foundations.
(Offered to non-CE students only).

CE 366 Foundation Engineering I (2-2)3
Site investigations, retaining structures, excavations, dewatering, shallow foundation design, bearing capacity, settlement, stress distribution in soils, initial settlement, consolidation settlement, permissible settlement, deep foundation design, bearing capacity, settlement, types of piles, ground improvement.
Prerequisite: CE 363.

CE 372 Hydromechanics (3-2)4
Laminar and turbulent flows. Friction factor in pipe flow. Computation of flow in single pipes: Hydraulic machinery: pumps and turbines. Pipeline systems and networks. General characteristics and classification of open channel flow: pressure and velocity distribution. Continuity equation. Energy concept. Momentum principle. Uniform flow. Rapidly varied flow gradually-varied flow. Design of nonerodible and erodible channels.
Prerequisite: CE 272.

CE 374 Fluid Mechanics (3-0)3
Definitions and fluid properties, surface and body forces. Hydrostatics. Kinematics. Basic equations and their applications: system and control volume concepts, Reynolds transport theorem, conservation of mass, momentum and energy. Pipe flow: flow in smooth and rough pipes, frictional losses, Moody chart, minor losses, simple pipe systems. General characteristics and states of open channel flow, uniform flow, energy and momentum concepts. (Offered to non-CE students only).
Prerequisite: ES 221 or ES 223 or ES 225

CE 375 Environmental Engineering Hydrology (3-0)3
Hydrologic cycle, precipitation, evaporation, infiltration, basin characteristics, streamflow and hydrograph analysis, floods and routing, statistical analysis, groundwater, environmental impacts, fundamentals of RS and GIS for hydrologic applications. (Offered to non-CE students only).

CE 378 Water Resources Engineering (4-0)4
Introduction to hydrology and water resources engineering. Basin and hydrologic processes: precipitation, stream flow, infiltration. Hydrograph analysis. Reservoir routing. Dams and spillways. Groundwater hydrology. Municipal water supply systems. Wastewater and stormwater collection and removal. Irrigation and drainage.
Prerequisite: CE 372.

CE 382 Reinforced Concrete Fundamentals (3-0)3
Mechanical behavior of concrete in uniaxial and multiaxial states of stress. Time dependent behavior of concrete. Mechanical behavior of reinforcing steel. Behavior and strength of uniaxially loaded members; confinement. Behavior and strength of members in pure bending. Behavior and strength of members under combined bending and axial load. Behavior and strength of members under combined shear and bending.
Prerequisite: CE 224.

CE 383 Structural Analysis (3-0)3
Introduction to structural analysis. Virtual work principles. Displacement methods: Slope deflection, moment distribution, special topics. Stiffness method, derivation of element stiffness matrices, assembly procedures.
Prerequisite: CE 224

CE 388 Fundamentals of Steel Design (3-0)3
General concepts in steel design. Design methods, codes, safety, and serviceability. Behavior of steel structures. Tension members, compression members, beams, beam-columns, types and behavior of connections in steel structures, bolted and welded connections.
Prerequisite: CE224

CE 400 Summer Practice II NC
Subjects that are acceptable for summer practice: quantity and cost estimates, application of plans to site conditions, mix design, taking part in reinforced concrete work. Structural, highway and hydraulic designs. Preparing standard engineering drawings (30 working days).

CE 401-409 Special Studies in Civil Engineering (3-0)3
These numbers are used for courses which are not listed in the catalog and for individual research on a subject selected by the student and approved by the advisor. Courses are open to senior students with advanced standing.

CE 410 Civil Engineering Design (2-2)3
Involving the students in the conception, planning and design of civil engineering projects. Integration of information, ideas, and concepts from previous courses of different disciplines into a comprehensive design effort. Methodology for formulating and solving design problems in an open-ended solution space. Ethics, professional responsibilities
Prerequisite: Consent of the department

CE 411 Advanced Surveying and Geodesy (2-2)3
Earth's gravity field and natural coordinate systems. Differential geometry of ellipsoidal datum: first and second fundamental forms, normal sections, normal and principle curvatures. Least square adjustment: Indirect model, observation equations, covariance law, adjustment calculations. Geodetic vertical control, precise leveling. Terrestrial methods of relative positioning: trilateration and precise traverse. Reduction of observations. Introduction to Global Positioning Systems (GPS).
Prerequisites: ES 303 and ES 305.

CE 413 Introduction to Geographic Information Systems (2-2)3
Introduction to Geographic Information Systems (GIS), basic GIS components, GIS technology, data acquisition, data structures, databases, database systems and concepts, vector and raster GIS systems, GIS applications, error and uncertainty.

CE 414 Physical Geodesy (2-2)3
Review of potential theory: Vector fields, curvilinear coordinate systems, Laplace equation, boundary value problems, Green's identities. Geodetic boundary value problems, Stoke's and Vening-Meinesz's integrals. Gravity measurements and reductions: Free air, Bouguer and isostatic gravity anomalies. Practical methods of geoid computation: Quadrature and integral transform techniques. Combination of satellite and terrestrial data for geoid determination.
Prerequisites: ES 303 and ES 305.

CE 418 Design of Tall Building Structures (3-0)3
Examination of the methods of analysis and design criteria, behavior and modeling for tall buildings. Cast-in place concrete in tall building design: high-strength concrete, concrete-filled steel tubes, ductile structural walls. Steel in tall building design: steel moment resisting frame, steel braced frames, semi-rigid connections in steel frames, cold-formed steel in tall buildings. Mixed structural systems: tube, braced tube in very tall buildings. Foundations for Tall Building Structures. Computer and design applications.
Prerequisites: CE382, CE 384, CE 485.

CE 419 Computer Applications in Hydraulics (2-2)3
Presentation of software and computer tools relevant to hydraulic engineering problems including design of orifices and weirs, water level computations, drainage inlet design, culvert hydraulics, pressure piping systems and water quality analysis, storm sewer design and gravity piping systems and sanitary sewer design.
Prerequisites: CE 372, CE 305.

CE 420 Irrigation and Drainage (3-0)3
The need for correcting the natural distribution of water. Irrigation systems: Rotation system, demand system, limited demand system, unit area unit water system. Types of irrigation networks. Required information for the design of irrigation projects. General principles of system layout. Computational principles for channel design.

CE 421 Applied Surface Hydrology (3-0)3
Hydrologic cycle and climate. Basin characteristics. Precipitation and streamflow data and their analysis. Hydrograph analysis. Statistical analysis of hydrologic data. DAD and IDF curves. Applications in all these subjects.
Prerequisite: CE 378.

CE 422 Design of Diversion Weirs (2-2)3
Planning for water resources development. Characteristics and planning of diversion weirs. Water intake from rivers. Hydraulic design of intake, spillway, sluiceways, energy dissipation basin, sidewalls, diversion facility. Gated weirs
Prerequisite: CE 372

CE 423 Advanced Mechanics of Materials (3-0)3
Analysis of stress in 3D. Strains and stress-strain relations in 3D. Mechanical behavior of materials. Failure theories. Beams on elastic foundations. Elastic stability of axially loaded members. Solution techniques by energy and finite difference approaches.
Prerequisite: CE 224.

CE 424 Urban Hydrology and Hydraulics (3-0)3

Urban climate. Hydrological consequences of urbanization. Intensity-duration-frequency curves. Design hyetograph. Rainfall losses: SCS method, Green and Ampt method. Rational method, Modified Rational method. Detention basins, retention basins. Overland flow. Reservoir routing, hydraulic routing. Overview of important computer models.

Prerequisite: CE 378.

CE 425 Introduction to Finite Elements (3-0)3

Matrix algebra. Potential energy and Rayleigh-Ritz Method. Element interpolation and local coordinates. Elements based on assumed displacement fields in 1-D. Plane stress analysis. Higher order elements. Computer implementation.

Prerequisite: CE 383.

CE 426 Water Supply and Wastewater Engineering Design (3-0)3

Quantity of water and wastewater, aqueducts and waterpipes, pumps and pumping stations, quality of water supplies, treatment of water-clarification and filtration miscellaneous water treatment methods, wastewater collection, sewers, flow in sewers and sewer appurtenances, design of sewer systems.

CE 427 Civil Engineering System Analysis (3-0)3

Introduction to major concepts and analytic procedures for the identification and selection of optimal systems. Systematic survey of theory and applications of mathematical optimization to engineering problems. Evaluation procedures for single and multiattributed problems, covering utility theory and statistical decision analysis.

CE 428 Hydrosystems Engineering and Management (3-0)3

Introduction. Descriptions of hydrosystems, the systems concept, economics of hydrosystems, system analysis techniques, linear programming applications, uncertainty and reliability analysis of hydrosystems, applications in surface and groundwater systems.

CE 429 Water Supply Engineering Design (2-2)3

Introduction. Pumps and valves. Water transmission by pipelines: Pipe friction formulae, hydraulics and operation of pipelines, design of pipelines. Water Distribution: municipal water distribution systems, hydraulic and operation of water distribution systems.

Prerequisite: CE 372

CE 430 Construction Management in Practice (3-0)3

Introduction to management, general description of construction industry, contract systems, types of construction contracts. Review of typical organizational structures for construction companies and projects. Planning and scheduling, resource analyses and leveling, management of resources. Survey of main activities and procedures for starting a new project. Communication basics and communication in construction sites. Monitoring and control systems. Procedures and formalities for project completion.

CE 434 Construction Planning (3-0)3

Economical and juridical basis of construction planning. Methods of planning. Gantt charts, cyclogrammes, networks. (CPM and PERT) Arrow and precedence systems. Resource leveling and time-cost trade-offs. Probabilistic and deterministic networks. Computer applications of construction planning process by using available softwares. Problems encountered during implementation.

CE 435 Construction Site Techniques (3-0)3

Principles of construction job layout: working schedules; materials; manpower and equipment requirements on the job; organization for building, bridge, tunnel, airport, dam, and harbor sites; Rock drilling and blasting operations, service roads, service bridges, narrow gauge railroads.

CE 436 Forms and Scaffolding for Reinforced Concrete Structures (3-0)3

General objectives and economic considerations in formwork and scaffolding design and construction. Form materials and fastening elements used. Fresh concrete pressure of forms. Impact loads and vibration effect. Design of foundation, wall, slab, beam, and column forms. Bridge forms, thin shell roof forms and slipforms.

CE 437 Insulation of Buildings (3-0)3

Heat losses and gains in buildings. Thermal insulation materials. Calculations for thermal insulation. Insulation of buildings against water proofing systems. Sound insulation in buildings airborne and impact noises. Sound absorption and absorbent materials. Effects of fire on building materials and components. Fire proofing materials.

CE 438 Legal Aspects in Construction Works (3-0)3

General information about construction industry. Laws; code of obligations. Documents in a contract

file, types of contracts and contractorship licenses, Bidding Act. No. 2886. Control Regulations for Public Works. General Specifications for Public Works. Documents kept on site. Technical Specifications. Quantity measurement, monthly payments. Final account and payment. Settlement of disputes. Safety in construction

CE 439 Railway and Metro Tunnels (3-0)3

Development of railway and metro tunnels. Profiles and cross-sections of railways and metros. Theories of vertical, lateral and bottom pressures. A numerical example by segment design. Novel techniques and equipment used in construction. Metro tunnel characteristics and general pattern of planning. Subway and deep level stations. Ventilation and aerodynamic aspects. Some important examples. NATM method and cost calculations.

CE 441 Highway Materials (2-2)3

Nature, sources, and uses of asphalt. Production and classification of asphalts. Chemistry of asphalt. Physical properties of asphalt. Tests on asphalts. Classification and properties of mineral aggregates. Test on aggregates. Aggregate calculations. Types of asphalts aggregate combinations and their applications. Significant properties of asphalt paving mixture calculation. Asphalt mix design.

CE 445 Concrete-Making Materials (3-0)3

Properties and types of cements and aggregates. Methods and standards of mixing water. Chemical and mineral admixtures.

CE 446 Properties of Fresh and Hardened Concrete (3-0)3

Properties of fresh concrete: Workability, consistency, bleeding, stiffening, setting, air-entrainment, unit weight, uniformity, batching, mixing, conveying, placing, compaction and curing. Properties of hardened concrete: Nature and significance of concrete strength, kinds of strength, compressive strength, tensile strength, fatigue strength; durability, shrinkage and volume changes.

CE 447 Advanced Materials of Construction (3-0)3

Characteristics of construction materials, deterioration of building materials, ferrous metals and various methods for shaping metals, alloys of metals, steel, structural steel types, non-ferrous metals, precast concrete blocks, brick and tile, wood and wood products, polymers and various adhesives.

CE 451 Analysis of Transportation Systems (3-0)3

Development of transportation demand and supply models. Analysis of cost functions, cost estimating methods and some general cost function. Merging supply and demand models for network equilibration. Simulation and optimizing approaches for equilibrium. Evaluation of alternative transportation systems. Transport regulation in an inefficient or in an excessive competitive environment. Cost and demand conditions of a regulated industry.

CE 452 Traffic Safety and Accident Investigation (3-0)3

Introduction, causes of traffic accidents, statistical report on road accidents, safety effectiveness of highway design elements, identification of problem locations, data analysis of problem locations, accident reporting systems, education and training, rescue and hospital services.

CE 453 Transportation Systems and Modes (3-0)3

A course introducing development of transportation sytems (air, rail, water and land) and available modes (transit bus and rail, private car, etc.) in the world and in Turkey. Freight and passenger transportation. Future aspects (intelligent transportation systems, intermodal, etc.). Graphical representation of transportation networks and costs.

CE 454 Pavement Maintenance and Rehabilitation (2-2)3

Introduction and definitions. Pavement condition surveys, materials, structural, and traffic data evaluations. Flexible pavement rehabilitation techniques: crack sealing, surface rehabilitation, hot mix asphalt overlays. Rigid pavement rehabilitation techniques: joint sealing, pressure relief joints, partial and full-depth repairs, slab stabilization and jacking, load transfer rehabilitation, rigid pavement overlay design. Identification of feasible alternatives. Selection of the preferred alternative.

CE 457 Highway Design (2-2)3

Functional and geometric classification of highways, highway and motorway standards, route location, design controls and criteria for horizontal alignment and vertical alignment, design and application of horizontal circular curves, spirals as transition curves, superelevation applications, design of vertical curves, earthwork calculations, surface and subsurface drainage, box culvert design, types of pavements, paving materials, flexible pavement design according to AASHTO design method.

Prerequisite: CE 353

CE 458 Design of Hydraulic Structures (3-0)3

Dam design concepts. Design of overflow and outlet structures; frontal overflow, side channel, morning glory overfall, siphon, free fall, chute, cascade spillway. Design of dissipation structures; hydraulic jump and stilling basin, drop structures and plunge pools, trajectory basins. Design of bottom outlets; gate types, hydraulics of high-head gates, air entrainment, cavitation. Design of intake structures; hydraulic losses, vortex formation, hydraulic loadings, control gates and valves, penstock.
Prerequisites: CE 372

CE 460 Use of In-Situ Test In Geotechnical Engineering (3-0)3

Methods used in geotechnical investigations. Standard procedures of in-situ tests including standard penetration test, cone penetration test, pressuremeter test, field vane test and field permeability test. Geotechnical site characterization using in-situ tests. Use of in-situ tests in shallow and deep foundation design.
Prerequisite: CE 366

CE 461 Computer Applications in Foundation Engineering (2-2)3

Settlement. Bearing Capacity of Shallow and Deep Foundations. Stability problems and problems of practical interest.

CE 462 Foundation Engineering II (2-2)3

Deep foundations. Piles and pile foundations, types of piles, pile foundation design. Types of sheet pile walls. Single-wall, double-wall and cellular cofferdams. Box open and pneumatic caissons. Underpinning of existing structures.

CE 463 Introduction to Soil Behavior (3-0)3

Introduction, Bonding and crystal structure, Soil mineralogy, Soil formation and soil deposits, Determination of soil composition, Soil water, Soil fabric, Soil composition and engineering properties, Soil structure, Conduction phenomena, Strength, Constitutive modeling of stress-strain-time behavior.
Prerequisites: CE 363 or CE364

CE 464 Ground Improvement (2-2)3

Preloading, vertical drains, deep compaction of cohesionless soils: vibrofloatation, vibratory probes, compaction piles, dynamic compaction, blasting, grouting: permeating grouting, compaction grouting, chemical grouting, jet grouting, deep mixing. Soil reinforcement: Soil nailing, micro piles, reinforced earth, stone columns, lime columns, geotextiles, freezing, electro-osmosis.

CE 465 Earth Structures (2-2)3

Highway and railway fills, earth dams. General principles of design, the choice of the type of dam. The circular arc method of stability analysis; the prediction of pore pressures during construction, steady seepage and rapid drawdown. Special methods of analysis for rock fill dams. Design in earthquake areas.
Prerequisite: CE 363

CE 466 Dam Behavior and Safety (3-0)3

The course focuses especially on performance of dams during construction, throughout the impoundment and during their operation periods in terms of design assumptions. It explores also the guidelines in design of dams and their appurtenant stuructures. Particular case studies of embankment dams will be studied.
Prerequisites: CE 363 and CE366

CE 467 Introduction to Soil Dynamics (3-0)3

Fundamentals of vibration. Earthquakes and ground vibrations. Shear modulus and damping in soils. Response of soil layers to earthquake motions. Lateral earth pressures on retaining walls. Mononobe-Okabe active earth pressure theory. Liquefaction of soils. Stability of slopes and dams under seismic loads. Dynamic Bearing capacity and settlement of foundations.

CE 468 Geotechnical Design (2-2)3

Design problems in geotechnical engineering: Shallow foundations, consideration of differential settlements, foundations on bored and driven piles, dewatering of a foundation pit, stabilization of landslips by various methods, In-situ retaining structures for excavation support, foundations on problem soils, ground improvement against excessive settlements and liquefaction.
Prerequisites: CE 363 and CE366

CE 469 Shear Strength and Slope Stability in Soils (3-0)3

Types and causes of slope instability. Recognition of landslide features, Site investigation and field instrumentation in landslides. Seepage and Groundwater conditions. Drained and undrained shear strength of soils. Slope Stability Analysis Methods. Slope Stabilization/Mitigation Techniques. Earthquake induced landslides. Special Landslide issues.
Prerequisite: CE 363

CE 472 Statistical Techniques in Hydrology (3-0)3
Importance in Hydrology. Properties and model parameter estimation techniques. Use of discrete and continuous functions in hydrology. Point and regional frequency analysis. Applications.
Prerequisite: CE 378, CE 204

CE 473 Open Channel Hydraulics (3-0)3
General equation of gradually varied flows (GVF). Types of channel slopes. Characteristics and classification of GVF profiles. Solution of GVF equations. Characteristics of rapidly varied flow. Flow over spillways. Crest shape and discharge of the overflow spillways. Basic characteristics of the jump. Stilling basins. Flow measurement in open channel. Types of flow measurement structures. Sharp-, short-, and broad-crested weirs.
Prerequisite: CE 372.

CE 474 Soil Physics (2-2)3
Drainage and description of soil physics. Mechanical composition of soil. Soil behavior. Physical and chemical properties of soil. Soil clays and colloids. Organic matter. Soil air and aeration. Soil temperature and color. Soil, water and movement of water, diffusion and dispersion of water. Soil-water-plant relationship. Soil physics in relation with irrigation, drainage erosion.

CE 475 Introduction to Groundwater Flow Modeling (2-2)3
Basic concepts of groundwater modeling. Fundamentals of mathematical models. Governing equations of groundwater flow. Review of modeling techniques and their comparison. Analytical models. Numerical models by finite differences. Application of selected models.
Prerequisite: CE 378.

CE 476 Groundwater Engineering (3-0)3
Fundamental concepts, hydrologic cycle, ground water, aquifer types, differential equations of confined and unconfined aquifers. Well hydraulics. Analytical and graphical solution. Modeling of ground water flow. Construction of wells. Management of ground water: Ground water budget, concepts of basin yield, basin management by conjunctive use, artificial recharge. Surface and subsurface investigations of ground water. Saline water intrusion in aquifers.
Prerequisite: CE 372

CE 477 Design of Wastewater Collection Systems (3-0)3
Waste water systems, sources of waste water, hydraulics of waste water flow, combined and separate sewers. Manning equation, flow in partially filled sewers, self-cleansing of pipes, design of sanitary sewers, system layout main sewers, manholes, house and building connections, sewer profiles, design criteria, population estimate, peak factors, construction and maintenance of sewer systems, Turkish standards for sewerage system construction.

CE 478 Dimensional Analysis and Theory of Hydraulic Models (3-0)3
Introduction. Fundamental principles of dimensional analysis. Dimensions and units. General transformation of units of measurement. Dimensional homogeneity. Buckingham's theorem. Complete set of dimensionless products in fluid mechanics. Geometric, kinematic, dynamic, complete and incomplete similarities. Distorted modeling. Modeling of closed-conduit and free-surface flows. Similarity in sediment transport.
Prerequisite: CE 372.

CE 479 Isotope Techniques in Hydrology (3-0)3
Definitions, types, environmental stable, unstable isotopes, radiation, detection, choice of isotopes. Isotopes in stream flow measurements. Isotopes in water balance studies of lakes and reservoirs. Isotopes in soil moisture studies. Isotopes in ground water hydrology: natural isotopes used in origin determination and dating of ground water, interaction of ground water with surface water, determination of aquifer characteristics and well-techniques.

CE 480 Design and Construction of Special Structures (2-2)3
Review of current state of the art and methods in the design and construction of some special structural systems. Particular considerations and loads in cases of bridges, underground structures, monumental buildings of major sizes and silos. Rationalized technologies in reinforced and prestressed concrete construction. Introduction to precasting in special structures.
Prerequisite: CE 384

CE 481 Reinforced Concrete Structures (3-0)3
General RC behavior: Moment-curvature relationship; plastic hinge, redistribution. Behavior and strength of members under combined shear and torsion: Equilibrium torsion, compatibility torsion, punching, capacity design. Repair/Strengthening Principles: Column, beam, slab repair, structural system improvement. Seismic design principles. Serviceability. Detailing.
Prerequisite: CE 382.

CE 482 Steel Structures (3-0)3
Principles of Plastic Design, Load and Resistance Factor Design, Tapered Columns, Tapered Beams, Torsion, Introduction to Plate Girders, Beam to Column Connections, Roof Trusses, Introduction to Industrial Building design, Light Gage Cold formed members.
Prerequisite: CE 388.

CE 483 Advanced Structural Analysis (3-0)3
Review of basic concepts of structural analysis, direct stiffness analysis of 2D and 3D frame structures, special techniques in stiffness analysis of structures, virtual work principles based on virtual displacements, introduction to finite element method, and nonlinear analysis of frame structures for large deflections.
Prerequisite: CE 383.

CE 484 Prestressed Concrete (3-0)3
The principles of prestressed concrete, construction materials and methods, losses, flexural members, analysis and design, deflections, shear, bond, torsion, disturbed regions. Axially loaded members, introduction to piles, circular prestressing, and continuous beams.
Prerequisite: CE 382.

CE 486 Design of Concrete Structures (3-0)3
Structural design processes, safety, loads, structural systems: framed, wall and combined structures. Design of one-way, two-way slabs, flat plates, beams, columns, and walls. Structural modelling, earthquake resistant design, reinforcement detailing. Preparation of design report and structural drawing.
Prerequisite: CE 382.

CE 488 Computer Applications in Structural Engineering (3-0)3
The components of a computer system. Operating systems. Advanced FORTRAN programming. Finite-difference solution of differential equations. Introduction to finite element method and computer programs. Applications for structural mechanics problems. Utilization of package programs in modeling of structures. Three dimensional building analysis programs.
Prerequisite: CE 383.

CE 489 Experimental Behavior of Concrete Structures (2-2)3
Experimental and theoretical examination of reinforced concrete structural elements as regards (i) uniaxial loading and confinement, (ii) bending behavior, (iii) shear behavior, (iv) torsion behavior, (v) bond, (vi) slab behavior and (vii) current experimental research at METU.
Prerequisite: CE 382.

CE 490 Earthquake Resistant Design (2-2)3
Causes of earthquakes, earthquake magnitude and intensity, earthquake ground motions. Seismic response analysis of simple structures. Elastic response spectra, design spectra. Earthquake design criteria. Equivalent static lateral force procedure. Design codes, design applications.
Prerequisite: CE 305, CE 383

CE 491 Coastal Engineering I (3-0)3
Linear wave theory, wave transformations (shoaling, refraction, breaking, diffraction, reflection), wind-generated waves and their prediction, wave climate, design of rubble mound and vertical wall breakwaters.

CE 492 Coastal Engineering II (3-0)3
Coastal currents, principles of coastal sediment transport, coastal erosion and control, coastal pollution control, data collection in field and laboratory.

CE 493 Design of Sea Outfalls (3-0)3
Sources and types of pollutants; pollutant transport processes in coastal waters; mixing processes and models; data acquisition for sea outfall design; sea outfall design procedure; sea outfall design example, sea outfall practices in Turkey.

CE 494 Port Planning and Design (2-2)3
Importance and classification of ports, ports and shipping technology, site selection. Traffic pattern, economical analysis, optimum capacity, port layout. Determination of design wave characteristics. Breakwater alignment, design of breakwaters, berthing structures, quays, bollards, fenders.
Prerequisite: CE 491.

CE 495 Ocean Engineering and Underwater Operations (3-0)3
Scope of ocean engineering. Basic properties of ocean environment: buoyancy, flotation, stability, flow of ideal fluids, added mass, forces on objects, motion of objects in fluid. Ocean structures: fixed and floating ocean structures, phases of design, loads on ocean structures, probabilistic aspects of design. Principles of diving, human body in ocean environment, decompression sickness, safety, underwater communication, diving in special and extreme conditions, protection of scuba environment.

CE 496 Designs of Marinas (2-2)3
Classification of marinas, marina developments. Facilities and components of marinas, preliminary studies and investigations. Site selection. Layout planning and design. Economics. Environmental and social impacts of marinas. Marina management. Legal and administrative considerations. Term project on design of marinas.
Prerequisite: CE 491.

CE 497 Coastal Zone Management (3-0)3
The coast and coastal issues; the boundaries, shoreland and coastal waters subsystems; introduction to coastal ecosystems; coastal resources and uses; sustainable resource development and ecocoastal engineering; environmental impact assessment; coastal water quality management; beach management; marine and coastal protected area management; coastal zone management tools and instruments; institutional arrangements, coastal management in Turkey.

CE 498 Coastal and Harbor Engineering (2-2)3
Classification of ports, marinas, small craft harbours, developments, facilities and components of ports and marinas, preliminary studies and investigations, site selection, layout alternatives, layout planning and design of port and /or marina structures, optimum capacity, economics, environmental and social impacts of ports, marinas, management, legal and administrative considerations.
Prerequisite: CE 491

CE 4301 Construction Productivity Measurement and Improvement (3-0)3
Productivity, importance and problems. Work sampling, group timing technique, five minute rating techniques. Craftsmen questionnaire, foreman-delay surveys. Crew balance charts, process charts, flow diagram. Effect of labor, material and equipment on productivity. External factors affecting productivity. Worker motivation and performance.

GRADUATE PROGRAMS AT THE DEPARTMENT OF CIVIL ENGINEERING

The University requirement governing the M.S. and Ph.D. degree are described in Academic Rules and Regulations (Graduate Programs) of this catalog.

The Department offers graduate programs in Structural Engineering Division, Hydraulics Engineering Division (Hydromechanics laboratory, Water Resources Engineering laboratory, Coastal & Ocean Engineering laboratory), Construction Materials Engineering Division, Geomatics Engineering Division, Transportation Engineering Division, Construction Engineering and Management Division and Geotechnical Engineering Division leading to M.S. and Ph.D. degrees. The programs are offered to students who are graduates of civil engineering.

The aim of the Middle East Technical University Civil Engineering Graduate Program is to prepare skilled students to pursue successful professional careers in teaching, research and the practice of Civil Engineering.

GRADUATE CURRICULUM

M.S. in Civil Engineering

CE	500	M.S. Thesis	NC
CE	520	Graduate Seminar	(0-2)NC

7 elective courses

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. in Civil Engineering

If admitted by M.S. degree:

CE	600	Ph.D. Thesis	NC

7 elective courses

Total minimum credit: 21
Number of courses with credit (min): 7

If admitted by B.S. degree:

CE	520	Graduate Seminar	(0-2)NC
CE	600	Ph.D. Thesis	NC

14 elective courses

Total minimum credit: 42
Number of courses with credit (min): 14

GRADUATE COURSES

CE	500	M.S. Thesis	NC
CE	509	Space Geodesy I	(2-2)3
CE	510	Space Geodesy II	(2-2)3
CE	511	Photogrammetry and Air Photo Interpretation	(2-2)3
CE	512	Engineering Seismology	(2-2)3
CE	513	Advanced Geodesy	(2-2)3
CE	514	Electronic Surveying	(2-2)3
CE	515	Adjustment of Observations	(3-0)3
CE	517	Admixture of Concrete	(3-0)3
CE	519	Soil Dynamics in Earthquake Engineering	(3-0)3
CE	520	Graduate Seminar	(0-2)NC
CE	521	Experimental Methods in Engineering	(2-2)3
CE	522	Nonlinear Procedures in Finite Element Analysis	(3-0)3
CE	523	Theory of Plates	(3-0)3
CE	524	Theory of Shells	(3-0)3
CE	525	Theory of Matrix Structural Analysis	(3-0)3
CE	526	Finite Element Method	(3-0)3
CE	527	Theory of Elasticity	(3-0)3
CE	528	Structural Stability	(3-0)3
CE	529	Structural Dynamics	(3-0)3
CE	530	Modeling in Hydrology	(3-0)3
CE	531	Advanced Hydrology I	(3-0)3
CE	532	Advanced Hydrology II	(3-0)3
CE	533	Hydraulic System Design	(3-0)3
CE	534	Fluid Transients in Closed Conduits	(3-0)3

CE	535	Water Resources System Engineering I	(3-0)3
CE	536	Water Resources System Engineering II	(3-0)3
CE	537	Tunnel Design and Construction	(3-0)3
CE	538	Advanced Water Distribution Networks	(3-0)3
CE	539	Advanced Mechanics of Fluids I	(2-2)3
CE	541	Durability of Building Materials	(3-0)3
CE	544	Advanced Concrete Technology	(3-0)3
CE	545	Cement and Concrete Quality	(3-0)3
CE	552	Pavement Design	(2-2)3
CE	555	Traffic Engineering I	(3-0)3
CE	556	Traffic Engineering II	(3-0)3
CE	557	Airport Engineering I	(3-0)3
CE	558	Airport Engineering II	(3-0)3
CE	559	Finite Element Applications in Geotechnical Engineering	(3-0)3
CE	561	Environmental Geotechnics	(3-0)3
CE	562	Applications of Geosynthetics	(3-0)3
CE	563	Advanced Soil Mechanics I	(3-0)3
CE	564	Advanced Soil Mechanics II	(3-0)3
CE	566	Measurement of Soil Properties	(2-2)3
CE	567	Stochastic Techniques in Geotechnical Engineering	(3-0)3
CE	568	Soil Dynamics	(3-0)3
CE	569	Deep Excavations and Retaining Structures	(3-0)3
CE	570	Advanced Mechanics of Fluids	(3-0)3
CE	571	Hydropower Engineering	(3-0)3
CE	572	Irrigation and Drainage Engineering	(3-0)3
CE	573	Fundamentals of River Engineering	(3-0)3
CE	574	Soil and Water Conservation	(3-0)3
CE	575	Sediment Transport I	(3-0)3
CE	576	Sediment Transport II	(3-0)3
CE	577	Diffusion and Dispersion in Water Flows	(3-0)3
CE	578	Porous Media Flow	(3-0)3
CE	579	GIS Applications in Hydrology	(2-2)3
CE	580	Computational Techniques for Fluid Dynamics	(3-0)3
CE	581	Behavior of Reinforced Concrete Members and Structures	(3-0)3
CE	582	Stochastic Processes in Water Resources	(3-0)3
CE	583	Advanced Analysis Techniques in Structural Engineering	(3-0)3
CE	584	Limit Analysis	(3-0)3
CE	585	Advanced Steel Design	(3-0)3
CE	586	Earthquake Engineering	(3-0)3
CE	587	Structural Optimization	(3-0)3
CE	588	Bridge Design	(2-2)3
CE	589	Structural Reliability	(3-0)3
CE	590	Bridge Hydraulics	(3-0)3
CE	591	Wave Hydrodynamics	(3-0)3
CE	593	Statistical Analysis in Coastal Engineering	(3-0)3
CE	594	Modeling of Coastal Engineering Problems	(3-0)3
CE	595	Coastal Sedimentation	(3-0)3
CE	596	Coastal Pollution	(3-0)3
CE	598	Coastal and Harbour Structures Design	(3-0)3
CE	599	Groundwater Hydraulics	(3-0)3
CE	5601	Geotechnical Earthquake Engineering	(3-0)3
CE	5602	Numerical Modeling in Geomechanics	(3-0)3
CE	5603	Seismic Hazard Assessment	(3-0)3
CE	5604	Unsaturated Soils	(3-0)3
CE	5701	Hydroclimatology	(3-0)3
CE	5801	Condition and Vulnerability Assessment of Buildings	(3-0)3
CE	5802	Structural Health Monitoring	(3-0)3
CE	5803	Seismic Base Isolation	(3-0)3
CE	5804	Analysis and Design of Structural Masonry	(3-0)3
CE	600	Ph.D. Thesis	NC
CE	7XX	Special Topics in Civil Engineering	(3-0)3
CE	8XX	Special Studies	(4-2)NC
CE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

CE 500 MS Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester. (F&S)*

CE 509 Space Geodesy I (2-2)3
Basic concepts of space geodesy. Review of classical mechanics: Time and reference systems and their transformations. Euler's kinematical and dynamical equations of motion. Signal propagation in the atmosphere. Detail description of the theory of satellite motion in space in context with orbit and attitude determination. Methods of positioning and navigation with particular emphasis on new satellite missions. Precise local and global Gravity field determination of the Earth using new methods of satellite geodesy.

CE 510 Space Geodesy II (2-2)3
Review of observation methods of space geodesy. GPS (Global Positioning System) and GLONASS (Russian Navigation System): Satellite motion and

broadcast ephemeris, mathematical models and biases in GPS, point and relative positioning using pseude-ranges and carrier beat phase observations. Integration of GPS and INS (Inertial Navigation System). A brief introduction to other relevant space geodetic methods: VLBI (Very Long Baseline Interferometry), SLR (Satellite Laser Ranging), Satellite Altimetry, Satellite Gradiometry, InSAR (Interferometric Synthetic Aperture Radar). Basic continuum mechanics. Geodetic monitoring and mechanical modeling of geodynamical phenomena.

CE 511 Photogrammetry and Air Photo Interpretation (2-2)3
Principles of photogrammetry, theory of prismatic devices, terrestrial and aerial photogrammetry, theory of parallax, theory and construction of parallax measuring instruments and optical and mechanical projection systems. Interior, relative and absolute orientation, map compilation of Zeiss-Sterotop, aerial triangulation. Use of air photo in identifying land forms, interpretation of soil and drainage conditions. (R)

CE 512 Engineering Seismology (2-2)3
Seismic wave theory. Energy content and attenuation, polarization and dispersion of seismic waves. Seismic ray theory. Seismic instrumentation, displacement, velocity, and accelerometers. Adjustment and interpretation of recorded data. Earthquake classification. Geographical seismology. Secondary effects of earthquakes. Spatial components of earthquake motion. Spectral analysis of strong ground motion. Seismic risk analysis. (R)

CE 513 Advanced Geodesy (2-2)3
Introduction to geodetical astronomy, spherical and spheroidal coordinate systems. Different Projection systems and transformations to plane. Brief theory of geodetic line. Solution of direct and inverse geodetic problems. (R)

CE 514 Electronic Surveying (2-2)3
Fundamentals of electronics, electronic surveying systems, circular methods, hyperbolic and other methods. Theory of geodimeter, tellurometer and electrotape. Theory of electromagnetic waves (determination on the curvature of the ray path and propagation velocity), commutation and adjustment in trilateration, universal space coordinate system and inverse problems in electronic surveying. Applications in Civil Engineering. (R)

CE 515 Adjustment of Observations (3-0)3
Geodetic engineering methodology. Classes of mathematical models. Statical models, concept of weight, covariance law. Least squares adjustment: implicit, parametric and condition methods of adjustment. Special adjustment techniques: sequential adjustment, treatment of a priori knowledge of the parameters. Statistical tests for outliers. Assessment of parameter estimates: confidence regions in one, two and three dimensions. Applications in the adjustment of geodetic networks. (R)

CE 517 Admixtures for Concrete (3-0)3
Concrete properties and use of admixtures; Considerations and precautions in the use of admixtures; Classification of admixtures; Air-entraining admixtures; Water-reducing admixtures; Set Retarders; Accelerators; Pozzolans and other finely divided mineral admixtures; Natural pozzolans; Fly ashes; Silica fumes; Ground granulated blast furnace slags; Miscellaneous admixtures. Properties, standart testing methods and the effects of the above admixtures on the properties of concrete.

CE 519 Soil Dynamics in Earthquake Engineering (3-0)3
A brief review of fundamentals of vibrations, seismicity and fault-rupture mechanism. Discussion of attenuation relationships, design motions and influence df soil behavior an ground shaking characteristics. Methods of analyzing seismic site response. Soil liquefaction phenomena and methods to predict seismic soil liquefaction initiation. Use of in-situ index tests in the estimation of seismic liquefaction risk. Seismic performance of slopes and earth structures.

CE 520 Graduate Seminar (0-2)NC
Offered on a no credit basis only for students electing the option of 'Master of Science in Civil Engineering with thesis'. Student, faculty, and visitor presentations of current research topics in civil engineering. Prerequisite: Graduate standing. (F/S)

CE 521 Experimental Methods in Engineering (2-2)3
Principles of model analysis. Design and construction of models. Loading systems: Loading principles, Methods of load application, loading frames. Load distribution arrangement, safety considerations. Strain measurement systems. Displacement, rotation and curvature measurements. Dynamic measurements.
Nondestructive testing principles. Calibration. Principles of data recording. Principles of data analysis. (R)

CE 522 Nonlinear Procedures in Finite Element Analysis (3-0)3
Materially and Geometrically Nonlinear Problems in Engineering, Incremental Equations of Motion for Nonlinear Problems in Solid Mechanics, General Procedures for the Solution of Nonlinear Equations of Discrete Problems, Microstructural Basis for Material Nonlinearities, Rheological Models for Basic Modes of Material Behaviour, Instantaneous Plasticity and Numeric Procedures for Instentaneous Plastic Material Behaviour, Viscoplasticity and Creep, Numerical Procedures for Viscoplastic Analysis.
Prerequisite: CE 526.

CE 523 Theory of Plates (3-0)3
Classical theory of plates. Classification. Cylindrical bending. Pure bending. General small deflection theory. Boundary conditions. Applications of cartesian and polar coordinates. Approximate and numerical methods. Fundamentals of yield line theory of slabs. (R)

CE 524 Theory of Shells (3-0)3
Introduction. Derivation of shell equations for an arbitrary orthogonal curvilinear coordinate system. Reduction of equations into simpler cases. Numerical methods for shell problems. Associated problems and features related to digital computers. (R)

CE 525 Theory of Matrix Structural Analysis (3-0)3
Structural analysis versus actual response. Principle of virtual displacements. Principal of virtual forces. Betti's law. Influence coefficients. Force and displacement transformations. Transformations of member flexibility and stiffness. Fixed end forces, automated matrix displacement and force methods of structural analysis. Releases. Substructures. Nonlinear analysis. Introduction to finite element method. (R)

CE 526 Finite Element Method (3-0)3
Review of matrix algebra and calculus of variations. Variation and Galerkin formulations. Formulation of second and fourth-order boundary value problems. Elasticity, plate bending and shell elements. Area and isoparametric coordinates. Numerically integrated elements. Implementation of general purpose finite element computer programs. Eigenvalue and time dependent problems. Nonlinear analysis. (R)

CE 527 Theory of Elasticity (3-0)3
Analysis of stress. Analysis of strain. Elasticity: equations of elasticity and general theorems; two dimensional problems in cartesian and polar coordinates; special problems in three dimensional elasticity; variational methods. (R)

CE 528 Structural Stability (3-0)3
Concepts of stability; types of buckling; mechanical stability models; elastic and inelastic buckling of columns; elastic buckling of frames; plasticity on frame behavior; design of beam columns; P-Delta effects; energy criterion and energy-based methods; torsional and torsional-flexural buckling of columns; lateral buckling of beams; non-conservative systems; bracing.

CE 529 Structural Dynamics (3-0)3
Dynamic disturbances. Single and multidegree of freedom systems. Continuous systems. Equations of motion. Energy methods in structural dynamics. Applications in structural design. Earthquake response of structures.

CE 530 Modeling in Hydrology (3-0)3
Introduction to hydrologic models, short description of moments, tests of analysis for means and variances, non-parametric methods, optimization techniques (analytical and numerical), multiple to multivariate hydrologic models, computer applications.

CE 531 Advanced Hydrology I (3-0)3
System approach to the hydrologic cycle, deterministic treatments of catchment behaviour linear time-invariant and time variant hydrologic systems, time-invariant and non-linear hydrologic system, numerical simulation of watershed hydrology. Random hydrologic phenomena; probability distributions used in hydrology; estimation methods, statistical inference; correlation and regression analysis. (R)

CE 532 Advanced Hydrology II (3-0)3
Statistical models in hydrology, properties of models, multiple variable models, linearizable models, convolution water yield models. Multivariate models; component regression, factor analysis, non-linear least squares. Time series analysis; autocorrelation, cross correlation, spectral analysis, Markov chains, moving average models. (R)

CE 533 Hydraulic System Design (3-0)3
Review of fundamentals. Analysis and computation of steady and unsteady nonuniform flow in open channel systems. Flood routing methods. Hydraulic analysis and design of controls for free surface. (R)

CE 534 Fluid Transients in Closed Conduits (3-0)3

Fluid transient flow (water hammer) concepts. Basic differential equations for transient flow. Solution of differential equations by Method of Characteristics. Transients caused by turbopumps. Transients in hydroelectric power plants. Column separation, air release and entrapped air. Methods for controlling transients: wave speed reduction methods, air chambers, surge tanks. (R)

CE 535 Water Resources System Engineering I (3-0)3

Systems analysis concepts, terminology, phases. System approach to solving water resource problems. Nature and objective of and mathematical models for water resource systems. Review of optimization techniques. Linear programming: Classical optimization methods, separable programming. Search techniques. Computer applications, case studies. Simulation methods for design of water resource systems introduced. (R)

CE 536 Water Resources System Engineering II (3-0)3

Fundamentals of Dynamic programming. Nonlinear Programming: Classical optimization methods, quadratic programming, geometric programming, separable programming. Search techniques: One dimensional and multivariate search methods. Computer applications and case studies in water resources engineering. Introduction to simulation methods for design of water resource systems. (R)

CE 537 Tunnel Design and Construction (3-0)3

History of tunneling. Tunnel classification. Different theories applied for the determination of vertical, lateral, and bottom pressures. Conventional and modern construction methods and equipment used. Underground urban transportation facilities. (R)

CE 538 Advanced Water Distribution Networks (3-0)3

Formulation of equations in hydraulic network analysis. Review of advanced techniques for network analysis. Calibrated network model building process evaluating aging of pipes, water leakages and unanticipated nodal demands; calibration techniques. Extended period simulation (EPS) leading to the design of water tanks. Node flow analysis for modeling partially satisfied nodes due to inadequate pressure. Reliability analysis investigating the overall performance of the network, sensitivity analysis.

CE 539 Advanced Mechanics of Fluids I (2-2)3

Differential analysis of fluid flow; conservation of mass, steam function, Navier-Stokes equations. Exact solutions for viscous laminar flows. Euler equation, Bernoulli equation. Potential flow; velocity potential, elementary plane flows; superposition. Laminar boundary layers, flat plate, separation, lift and drag. Turbulence; Reynolds averaging, turbulent stresses, eddy viscosity, mixing length theory, near-wall turbulence. Measurement of discharge, pressure, velocity and turbulence.

CE 541 Durability of Building Materials (3-0)3

Factors causing deterioration of materials. Durability of building stones. Decay and preservation of timber-Mechanisms of metal corrosion. Corrosion protection for metals. Deterioration of concrete. Mechanisms of concrete corrosion. Effects of various chemicals, sea water ground water and industrial wastes. Protective measures against concrete corrosion. Corrosion of steel reinforcement in concrete.

CE 544 Advanced Concrete Technology (3-0)3

Types of cements; their composition and potential usage. Effect of properties and composition of cements, aggregates, admixtures and curing of various mechanical properties of fresh and hardened concretes. Compressive, tensile fatigue and impact strengths. Mechanical behaviour of concrete. Shrinkage and volume changes, creep, durability, thermal and acoustic properties, permeability of concrete. (R)

CE 545 Cement and Concrete Quality (3-0)3

Importance of quality control in cement making process. Types and strength classes of cements. Cement standards and quality testing procedures. Physical, chemical and durability properties of cements. Properties of fresh and hardened concretes in relation to the main constituents. Concrete categories and standards. Concrete transfer and pumping. Concrete quality control.

CE 552 Pavement Design (2-2)3

Theories, principles and practice in the structural design and construction of highway and airport pavements including stabilization, design of pavement evaluation performance surveys, and the design of asphaltic mixtures. (R)

CE 555 Traffic Engineering I (3-0)3

Detailed study of the transportation planning process. Inventory of existing travel demand,

different types of O-D studies, analysis and model building, trip generation, trip distribution model split and trip assignment techniques, forecasting and plan evaluation. (R)

CE 556 Traffic Engineering II (3-0)3
Volume, speed and travel time studies. Measurement techniques of fundamental traffic stream characteristics. Statistical distributions, traffic stream models. Capacity of rural highways, freeways, signaled intersections. Traffic management techniques. (R)

CE 557 Airport Engineering I (3-0)3
Introduction to Air Transportation System; Planning approaches and basic elements of airport planning; Airport site selection; Air traffic forecasting; Aircraft characteristics related to airport design. Airport configuration and geometric elements of Airside and Landside; Airport capacity; Demand Management; Airport Management (Airport Ownership and Operation Types, Airport Economics, Performance of Airports, Customer-Airport Relations, Social and Environmental Impacts of Airports) Advanced Subjects related to airports

CE 558 Airport Engineering II (3-0)3
Airport standards. Geometric design of the landing area. Planning and development of the terminal area. Airport lighting. Design of heliports. Airport drainage. Stol aircraft and stolports. Supersonic aircraft. Off-shore (floating) airports. Special consideration in airport site selection. (R)

CE 559 Finite Element Applications in Geotechnical Engineering (3-0)3
Stationary principles. Rayleigh-Ritz method and interpolation. Isoparametric formulation of 2-D and 3-D elements. Plane stress and plain strain analysis. Introduction to nonlinear analysis techniques. Applications in geotechnical engineering.

CE 561 Environmental Geotechnics (3-0)3
Forms of wastes, disposal methods and regulations. Site selection and site investigations for landfills. Geotechnical aspects of landfills. Barrier technology and slurry trench cut-off walls. Stability of landfills. Construction problems in waste disposal sites. Use of waste materials in construction industry. (R)

CE 562 Applications of Geosynthetics (3-0)3
Introduction. Basic information on Geosynthetics. Geotextile functions, properties and test methods. Road and railway (separation) applications. Filtration, drainage and erosion control applications. Soil reinforcement applications. Geomembranes. (R)

CE 563 Advanced Soil Mechanics I (3-0)3
The nature of soils. Stresses within a soil mass. States of stress. Mohr circle. Stress paths. Effective stress principle. Stress-strain relationships. Concepts from elastic theory. Capillarity in soil. Swelling and shrinkage. Consolidation theory. Settlement in sands. (F)

CE 564 Advanced Soil Mechanics II (3-0)3
Concept of failure, Failure theories. Mohr-Coulomb failure criterion. Shear resistance between soil particles. Shear testing methods. Pore pressure parameters. Shear strength of cohesionless soils. Shear strength of cohesive soils. Types of stability analysis. (R)

CE 566 Measurement of Soil Properties (2-2)3
Measurement of engineering properties of soils in laboratory and field. Measurement of shear strength, compressibility and permeability. Measurement techniques in the laboratory, field tests for determining shear strength and compressibility. Field permeability tests in cohesive soils. Basic field instruments in soil engineering and principles of measurement. (R)

CE 567 Stochastic Techniques in Geotechnical Engineering (3-0)3
Review Statistics and Probability Theory. Introduction to one-dimensional and multi-dimensional parameter characterization. Define the statistics of parameters, and the distribution functions. Parameter estimation, prediction and simulation. Applications to engineering. A working knowledge on probability and statistics is required.

CE 568 Soil Dynamics (3-0)3
Foundation vibrations; design of foundations for machinery. Stress strain behaviour of soil during transient and repeated loadings; relation of soil properties to wave velocity. Effects of earthquakes upon structures; amplification by a layer of soil; effect of foundation upon building response. Problems of slope stability and liquefaction as related to earthquakes. Dynamics of lumped systems as applied to problems in soil dynamics. (R)

CE 569 Deep Excavations and Retaining Structures (3-0)3
Earth retaining systems for deep excavations. Water pressure acting on earth retaining systems and related problems. Lateral earth pressure acting on

earth retaining systems. Lateral supporting elements: Ground anchors and struts. Types, components, production and installation, dimensioning, bearing capacity, corrosion protection, testing and prestressing of anchors. Lateral and vertical displacements of adjacent ground. Modes of failure of retaining systems. Sloped excavations in soil and rock. Instrumentation and monitoring of deep excavations. Soil nailing: system description and design. (R)

CE 570 Advanced Mechanics of Fluids (3-0)3
Cartesian Tensors. Analysis of deformation analysis of stress. Relation between stress and rate of strain. Newtonian fluids. Non-turbulent flows. Some exact solution of N.S. equations. Very slow motions. Boundary layers. Engineering solutions. (R)

CE 571 Hydropower Engineering (3-0)3
Fundamentals of hydropower: Hydraulic energy, power capacity, utilization. Planning of hydropower schemes: energy demand, supply types, energy cost, economic analysis, reports. Design of hydropower plants: intakes, canals, tunnels, head ponds, surge tanks, penstocks, valves. Power houses: substructures, superstructures. Turbines: principles of turbine action, types and selection of turbines, dimensions of turbines. (R)

CE 572 Irrigation and Drainage Engineering (3-0)3
Fundamentals of Reclamation. The need for correcting the natural distribution of water, principles of system layout. Capacity determination. Design principles of conduits. Form the development; land preparation, farm irrigation and drainage systems. Economic evaluation; goals, criteria and principles, operation and maintenance: principles, organization, procedure of repayment. (R)

CE 573 Fundamentals of River Engineering (3-0)3
Introduction; classification of rivers, use of rivers. Flood routing in rivers and reservoirs; hydraulic characteristics of alluvial rivers, classification of river flow, steady non-uniform flow. Unsteady flow computations; hydraulic routing, St. Venant equations, explicit FD method of solution, simplified models. Hydrologic routing; Puls method, Euler and Runge Kutta method, Muskingum method, Muskingum-Cunge method. Morphological computations; fundamental aspects of sediment transport, one dimensional morphological modeling; analytical models, numerical model. River stabilization, bank protection; channel improvement, local scour around hydraulic structures. (S)

CE 574 Soil and Water Conservation (3-0)3
Introduction to soil and water conservation engineering, soil water and plant relationships, soil erosion principles; wind erosion control; contouring, strip cropping and tillage; vegetated outlets and water courses; conservation earth embankments; headwater flood control; land grading and forming; subsurface drainage principles; subsurface drainage design; and maintenance of tile drains; legal aspects of soil and water conservation. (R)

CE 575 Sediment Transport I (3-0)3
Introduction, origin and properties of sediment, fall velocity concept, incipient motion of sediment particles, suspended load, bed load and total load theories, bed form mechanics, resistance laws, special topics in sediment transport. (F)

CE 576 Sediment Transport II (3-0)3
Introduction, soil erosion by water, factors affecting soil erosion, mechanics of raindrop and overland flow, delivery ratio, sediment yield, measurement of suspended load, depth-integrating method, measurement of bed load, reservoir sedimentation, local scour around bridge piers and abutments, constriction scour, hydraulic structures scour, sediment transport in closed-conduits. (S)

CE 577 Diffusion and Dispersion in Water Flows (3-0)3
Transport equations. Turbulent Diffusion, Momentum Diffusion in Shear Flow, Diffusion of Mass in Pipes, Diffusion of Mass in Rectangular open Channels, Transverse Mixing in Rivers. Transport in Jets, Empirical Determination of Diffusion Coefficients, Heated Discharges. (R)

CE 578 Porous Media Flow (3-0)3
Mechanics of flow through porous solids. General equations of single phase and multiphase flow. Methods of solving the differential form of these equations. Hydraulics of wells, infiltration and ground water recharge. Other steady state and transient seepage problems in fully and partially saturated materials. (R)

CE 579 GIS Applications in Hydrology (2-2)3
Introduction to geographic information systems and surface hydrology, Introduction to Arc/Info and ArcView, Spatial databases, Coordinate systems and georeferencing, Digital elevation models: TIN and GRID concepts for hydrologic studies, Hydrologic applications.

CE 580 Computational Techniques for Fluid Dynamics (3-0)3
Governing equations, turbulence models. Finite differences, errors and stability. Methods for wave, heat, Laplace, Burgers and Navier-Stokes equations. Grid generation, structured and unstructured mesh systems. Finite volume method, conservative discretization, approximation of surface and volume integrals, interpolation practices, implementation of boundary conditions. (S)

CE 581 Behavior of Reinforced Concrete Members and Structures (3-0)3
Failure patterns of reinforced concrete members and structures, and ultimate load theories. A critical look at various design specifications with emphasis on research results. Review of theoretical and experimental research and their influence on reinforced concrete members and structures. (R)

CE 582 Stochastic Processes in Water Resources (3-0)3
Introduction; Stochastic processes and time series in water resources. Statistical characteristics of time series; Periodicity, nonhomogeneity, and inconsistency; Drought, and storage characteristics; Annual and periodic time series. Stochastic modeling of time series; Basic estimation techniques, normalization, estimation of parameters, tests of goodness of fit. Autoregressive modeling; Annual land periodic AR models; Autocorrelation function of AR(p) models. Computer applications. ARMA models. Disaggregation modeling. Computer applications.

CE 583 Advanced Analysis Techniques in Structural Engineering (3-0)3
Finite element method basics; variation formulation; membrane elements, drilling degrees of freedom; thin and thick plate elements; flat shell elements. Modeling issues. Instruction to nonlinear geometric analysis; shallow and deep truss elements; advanced solution techniques; dynamic analysis in time domain; explicit and implicit solution approaches.

CE 584 Limit Analysis (3-0)3
Basic hypotheses. Simple cases of collapse. Upper bounds, lower bounds and uniqueness theorems. Introduction to design, limit analysis of frames, multi-bay and multistorey buildings, grids. Displacement in beams and frames. Stability considerations. Notes on ultimate load analysis of reinforced concrete structures. (R)

CE 585 Advanced Steel Design (3-0)3
Special connections, plate girders, industrial buildings, multistow steel structures, load and resistance factor design, fatigue in steel, light gauge steel construction. (R)

CE 586 Earthquake Engineering (3-0)3
Introduction to wave propagation in solid media, body and surface waves, reflection and refraction. Causes of earthquakes. Seismicity of the earth with special reference to Turkey. Computation of response to lateral forces. Review of structural vibration theory and response spectra. Analysis of multi-storey structures subjected to earthquake motions. Design of reinforced concrete structures to resist earthquake forces. Earthquake Design Codes.

CE 587 Structural Optimization (3-0)3
Introduction. Structural Design Processes. Classical Tools in Structural Optimization. Linear Programming in Optimum Design of Structures. Unconstrained Optimization. Constrained Optimization. Practical Aspects of Structural Optimization. Sensitivity Analysis.

CE 588 Bridge Design (2-2)3
Historical background and basic definitions. Choice of location and bridge layout. Comparison of different types of bridges, foundation conditions. Piers, abutments and wing walls. Pavement. Drainage design details. Bridge economy. Maintenance and repair. (R)

CE 589 Structural Reliability (3-0)3
Probabilistic bases for the design and evaluation of structural safety and reliability. Random occupancy, wind and earthquake loading, and of variability in material properties. Structural system reliability. Quantitative risk evaluation, systematic assessment and analysis of uncertainties, optimum design accounting for uncertainty and failure consequences. New probabilistically based code specifications. Applications. (R)

CE 590 Bridge Hydraulics (3-0)3
Introduction. Water Surface Profiles at Bridge sites. Flow through bridges. Vortex systems around bridge piers. Mechanisms of local scour around bridge piers. Hydrologic and Hydraulic Design Parameters. Hydroeconomic Analysis for Bridges. Protective Measures Around Bridge Piers and Abutments.

CE 591 Wave Hydrodynamics (3-0)3
Theories of gravity waves; finite amplitude wave theories. Waves generation by wind. Effects of viscosity, mass transport. Wave breaking, Radiation stress and applications. Waves on shear flows. (R)

CE 593 Statistical Analysis in Coastal Engineering (3-0)3
Statistical theory of waves, harmonic analysis, energy density spectrum, probability distribution of waves. Measurement and analysis of waves, measurement techniques, definitions of height and period of irregular waves, spectral analysis. Examples of statistical analysis of coastal engineering problems. (R)

CE 594 Modeling of Coastal Engineering Problems (3-0)3
Mathematical modeling, differential equations of wave motion, dimensionless presentations and scaling, initial and boundary conditions, analytical solutions, numerical solutions, computer experiments on selected problems. Physical models of wind waves and long waves on a rigid bed, models with movable bed, estuarine and other physical models. (R)

CE 595 Coastal Sedimentation (3-0)3
Coastal sediment properties, waves and currents oscillator boundary layers, incipient motion, onshore and offshore sediment movement, littoral drift, beach processes. Coastal protection structures, groins, jetties, breakwaters and harbour entrances, seawalls and revetments, beach nourishment, maintenance of river mouths. Dredging. Estuarine sedimentation. (R)

CE 596 Coastal Pollution (3-0)3
Various aspects and problems of water pollution control, sources and types of pollutants. Hydraulics of turbulent jets and plumes. Turbulent diffusion, dispersion. Bacterial disappearance. Sea outfall design. Heated dischargers. Oil pollution. Estuarine Pollution of marinas. (F)

CE 598 Coastal and Harbour Structures Design (3-0)3
Wave climate, Harbour structures; quays, piers, gravity and floating breakwaters. Seawalls revetments and groins. Wave forces on vertical walls, rubble mounds and circular cylinders. Design of concrete block quaywalls, sheet pile walls and piled quay walls. Seismic design. (R)

CE 599 Groundwater Hydraulics (3-0)3
Groundwater and Aquifers; Groundwater Balance; Groundwater motion; Fundamental Equations of Groundwater Flow; Initial and Boundary Conditions; Methods of Solutions; Hydraulics of Well; Hydrodynamics Dispersion; Modelling of Aquifer Systems; Salt Water Intrusion; Groundwater Management. (R)

CE 5601 Geotechnical Earthquake Engineering (3-0)3
A brief review of seismicity, fault-rupture mechanisms, and fundamentals of vibrations. Discussion of attenuation relationships, design motions and influence of soil behavior on ground shaking characteristics. Methods of analyzing seismic site response. Soil liquefaction phenomena and methods to predict seismic coil liquefaction initiation. Use of in- situ index tests in the estimation of seismic liquefaction risk. Seismic performance of slopes and earth structures and soil-structure interaction effects.

CE 5602 Numerical Modeling in Geomechanics (3-0)3
A brief review of some fundamental methods in numerical modeling with emphasis on finite element formulation. Development of constitutive laws for geotechnical materials including linear or nonlinear elastic (hyperbolic), linear elastic perfectly plastic, and non-linear elastic-plastic models based on the Critical State Soil Mechanics theory. Employment of a finite element computer program for the analyses of a geotechnical engineering problem. Discussion of the new developments in numerical modeling of geotechnical problems including modeling of dynamic problems and new constitutive models.

CE 5603 Seismic Hazard Assessment (3-0)3
A brief of probability concepts, and epistemic and aleatory uncertainties. Deterministic vs. probabilistic seismic hazard analysis. Source characterization and attenuation relationships. Hazard computer code: deaggregation of hazard. Development of design spectra: equal hazard spectra, directivity and basin effects. Design of time histories: scaling vs. spectrum compatibility. Numerical simulation methods for time histories.

CE 5604 Unsaturated Soils (3-0)3
Interfacial tension, cavitation, capillarity. Soil suction, water retention and drainage of porous media. Micromechanics/microhydraulics of unsaturated soil. Testing of unsaturated soils: suction measurement and control, volume measurement. Flow and balance laws, hydraulic conductivity function, 1-D flow, infiltration and evaporation. Shear strength; effective stress and independent state variables approaches. Deformation and consolidation; expansive and collapsing of soils. Constitutive modeling.

CE 5701 Hydroclimatology (3-0)3
Precipitation formation process, the surface and atmospheric branch of the hydrologic cycle, land

surface-atmosphere interaction, surface energy balance, evapotranspiration, heat and moisture fluxes into the soil and atmospheric boundary layer.

CE 5801 Condition and Vulnerability Assessment of Building (3-0)3
Seismic performance objectives and code design criteria. Linear and nonlinear seismic analysis. Procedures for evaluating existing buildings. Vulnerability assessment techniques. Introduction to loss estimation and earthquake insurance.

CE 5802 Structural Health Monitoring (3-0)3
General concepts in structural health monitoring; necessities; commonly used monitoring techniques; fields of application; data acquisition systems and transducer types; determination of critical measurement types and location; design of measurement setup; cost estimation; alert systems; remote communication; analytical simulation; structural properties extraction from data; analytical calibration; structural condition evaluation; damage detection; introduction to heuristic and statistical approaches in monitoring.

CE 5803 Seismic Base Isolation (3-0)3
General features; isolator devices and systems; mechanical characteristics and modeling of isolators; structures with seismic isolation; code provisions for seismic isolation; stability of elastomeric isolators; ground motion characteristics.

CE 5804 Analysis and Design of Structural Masonry (3-0)3
Introduction to masonry and non-engineered construction. Mechanical properties of clay brick, cellular concrete block, autoclave aerated concrete (AAC) block, adobe and stone masonry units. In-plane and out-of-plane behavior of masonry buildings. Design principles and code specifications for masonry construction. Repair and strengthening techniques for damaged masonry buildings after earthquakes. Confined and reinforced masonry construction. Historical masonry structures.

CE 600 Ph.D. Thesis NC
Program of research leading to a Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their first semester.

CE 7XXX Special Topics in Civil Engineering (3-0)3
These courses are not listed in the University Catalogue. Their contents may vary from year to year according to the contents of subject matters involved in recent technological applications. (R)

CE 8XX Special Studies (4-2)NC
MS students choose and study a topic under the guidance of a faculty member, normally his/her supervisor. (F&S)

CE 9XX Advanced Topics (4-0)NC
Ph.D. students choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor. (F&S)

* F: Fall, S: Spring, A: Alternative Year, R: Upon request, WE: Wide elective.

MASTER OF SCIENCE AT THE DEPARTMENT OF CIVIL ENGINEERING (Without Thesis)

M.S. in Hydrosystems Engineering

GENERAL INFORMATION: Master of Science 2nd Programme is a course-only professionally oriented degree programme offered by the Department of Civil Engineering within the framework of the Evening Training Scheme. The programme aims at training qualified practicing engineers capable of developing innovative solutions in the field of civil engineering. The Department of Civil Engineering offers the programme in the following area of specialization:

- M.S. in Hydrosystems Engineering

OBJECTIVES: The civil engineering undergraduate curriculum is intended to give the students a general civil engineering background by establishing the general principles of each of the major areas of interest of the profession. This Programme aims at the development of professional skills in the chosen field of civil engineering. The following are the major objectives of the programme:

- To give the students an insight into the problems of hydraulics engineering;
- To equip them with the modern methods of analysis and design;
- To provide an innovative thinking medium where the students are trained towards a critical and analytical treatment of problems;
- To improve the students' sense of responsibility towards the society and the environment;
- To improve their technical report writing and presenting skills.

ADMISSION REQUIREMENTS : Admission requirements are similar to those of the existing Masters Degree (M.S.) programme. However, admission priority is based on the assessment of the applicant's capacity to pursue the programme successfully. Consideration is given to,

- Applicant's undergraduate record
- Graduate Selection Examination (ALES)
- Applicant's preference
- Letters of reference (especially for Non-METU graduates)
- English Proficiency (TOEFL ≥ 190 or IYS ≥ 65)

Well qualified applicants with minor admission deficiencies may be admitted provisionally subject to completion of an articulation programme.

DURATION: Completion of the programme takes normally four semesters. Students who cannot complete the programme in six semesters are dismissed.

CURRICULUM OF M.S. IN HYDROSYSTEMS ENGINEERING

Students in this programme must complete a minimum of 10 courses with total credit hours not less than 30. Each student shall submit a report and shall also make a presentation of a non-credit graduation project. Completion of the programme takes normally four semesters. Students who cannot complete the programme in six semesters are dismissed.

Core Courses

All students must complete the following 7 courses and the graduation project.

HE	571	Hydrology in Rural And Urban Environments (New)	(3-0) 3	HE	573	Closed Conduit Hydraulics (Eqiv. To CE 534)	(3-0) 3
HE	572	Open Channel Hydraulics (Equiv. To CE 533)	(3-0) 3	HE	574	Groundwater Hydraulics (New)	(3-0) 3

HE	575	Water Transmitting Systems (New)	(3-0) 3	HE	577	Basic Coastal Engineering (Equiv. To CE 491)	(3-0) 3
HE	576	Planning And Management of Hydrosytems (New)	(3-0) 3	HE	599	Graduation Project	NC

Elective Courses

All students must complete at least 3 of the following courses (the list can be modified by the approval of the Department):

HE	581	Sediment Transport (Equiv. to CE 575)	(3-0)3	HE	585	Rs/Gis Applications in Hydrosystems (New)	(3-0)3
HE	582	Environmental Hydraulics (Equiv. to CE 577)	(3-0)3	HE	586	Shoreline Engineering (Equiv. to CE 595)	(3-0)3
HE	583	Advanced Hydrology (New)	(3-0)3	HE	587	Design of Coastal Structures (Equiv. to CE 598)	(3-0)3
HE	584	Design of Hydrosystems (Equiv. to CE 571)	(3-0)3				

DESCRIPTION OF COURSES

HE 571 Hydrology in Rural and Urban Environments (3-0)3
Physical principles of rural hydrologic systems; Hydrologic system analysis; Probability in hydrology; Rural hydrology applications; Urban hydrology; Urban hydrology applications.

HE 572 Open Channel Hydraulics (3-0)3
Review of fundamentals of Open Channel Flow; Analysis and computation of steady nonuniform flow in Open Channels; Scope and range of problems in unsteady Open Channel Flow; Governing Equations of Unsteady Open Channel Flow; Analysis and computation of Open Channel Flows; Flood Routing methods; Hydraulic analysis and design of controls for free surface.
(Equiv. to CE 533)

HE 573 Closed Conduit Hydraulics (3-0)3
Review of fundamentals of pressurized fluid flow. Fluid transient flow concepts. Scope and range of problems in unsteady flow. Basic differential equations for transient flow. Wave speeds in special conduits. Solution of basic differential equations by the Method of Characteristics. Basic boundary conditions. Transients caused by turbo pumps. Column separation, air release, and entrapped air concepts. Methods for controlling transients.
(Equiv. to CE 534)

HE 574 Groundwater Hydraulics (3-0)3
Introduction; Groundwater motion; Governing equations of groundwater flow; Methods of solving groundwater flow problems; One dimensional flows; Well hydraulics; Fresh water-salt water interface in coastal aquifers; Modeling of aquifer systems; Groundawater management.

HE 575 Water Transmitting Systems (3-0)3
Design of water supply systems: planning of water supply conduits; appurtenances for conduits; pumps; pumped water supply; gravity water supply; design problem. Design of water distribution systems; definitions for water distribution networks; solvability rules; dead point method by İller Bankası; Hardy-Cross method; computer workshop and design problem. Design of wastewater collection systems: hydraulics of sewers; design of sanitary sewers; design of storms sewers.

HE 576 Planning and Management of Hydrosytems (3-0)3
Introduction, description of hydrosystems, the system concept, issues in hydrosystems engineering linear, dynamic, and nonlinear programming with applications to hydrosystems.

HE 577 Basic Coastal Engineering (3-0)3
The field of coastal engineering, water waves, lineer wave theory, wave shoaling, refraction, diffraction, breaking, reflection, run up and overtopping, wind generated waves, wave prediction, wave statistics, field measurements, introduction to coastal processes and pollution, types and function of coastal structures.
(Equiv. to CE 491)

HE 581 Sediment Transport (3-0)3
Introduction; Properties of sediment; Incipient motion of sediment particles; Modes of sediment transport; Bed form mechanics; Resistance to flow and velocity distribution in alluvial streams; Measurements of sediment discharge; Scour hydraulics structures; Sediment control methods; Reservoir sedimentation; Transportation of sediment in pipes.
(Equiv. to CE 575)

HE 582 Environmental Hydraulics (3-0)3
Transport equations; Diffusion through conduits; Diffusion through a Porous Medium; Stratified Flows; Hydraulic Modelling.
(Equiv. to CE 577)

HE 583 Advanced Hydrology (3-0)3
Introduction to hydrologic modelling; Techniques used in mathematical modelling; Point and regional frequency analysis; Deterministics/statistical and stochastic methods of modelling approach with application; Description of model input parameters for event based and continuous hydrologic models.

HE 584 Design of Hydrosystems (3-0)3
Hydropower engineering; fundamentals, electrical power engineering, elements of energy and power, hydropower potential, capacity selection, apputenances of hydropower plants, powerhouse and turbines. Design of control structures; diversion, overflow spillways, channel transitions.
(Equiv. to CE 571)

HE 585 RS/GIS Applications in Hydrosystems (3-0)3
Basic Principles of remote sensing; Basic Principles of geographic information systems; GIS/RS integration; Precipitation; Snow hydrology; Runoff; Evapotranspiration and Soil Moisture; Groundwater; Water Quality; Water Resource Management and Monitoring

HE 586 Shoreline Engineering (3-0)3
Nearshore hydrodynamics, radiation stresses, wave set up and set down, wave induced currents, boundary layer flow. Coastal sediment properties, incipient motion, mechanics of sediment transport by waves and currents, longshore and cross-shore sediment transport. Mathematical modeling of shoreline and beach profile changes. Functional design of coastal defense structures, beach nourishment.
(Equiv. to CE 595)

HE 587 Design of Coastal Structures (3-0)3
Wave climate and design wave characteristics. Wave forces on rubble mound breakwaters, vertical walls, vertical and horizontal cylinders. Design of breakwaters (rubbe-mound, block type and floating), concrete-block quay walls, sheet-pile walls, and structures on piles. Reliability-based risk assessment and management of coastal structures.
(Equiv. to CE 598)

M.S. in Structural Mechanics

GENERAL INFORMATION: Master of Science 2nd Programme is a course-only professionally oriented degree programme offered by the Department of Civil Engineering within the framework of the Evening Training Scheme. The programme aims at training qualified practicing engineers capable of developing innovative solutions in the field of civil engineering. The Department of Civil Engineering offers the programme in the following area of specialization:

- M.S. in Structural Mechanics

OBJECTIVES: The civil engineering undergraduate curriculum is intended to give the students a general civil engineering background by establishing the general principles of each of the major areas of interest of the profession. This Programme aims at the development of professional skills in the chosen field of civil engineering. The following are the major objectives of the programme:

- To give the students an insight into the problems of structural mechanics;
- To equip them with the modern methods of analysis and design;
- To provide an innovative thinking medium where the students are trained towards a critical and analytical treatment of problems;
- To improve the students' sense of responsibility towards the society and the environment;
- To improve their technical report writing and presenting skills.

ADMISSION REQUIREMENTS: Admission requirements are similar to those of the existing Masters Degree (M.S.) programme. However, admission priority is based on the assessment of the applicant's capacity to pursue the programme successfully. Consideration is given to,

- Applicant's undergraduate record
- Graduate Selection Examination (ALES)
- Applicant's preference
- Letters of reference (especially for Non-METU graduates)
- English Proficiency (TOEFL ≥ 190 or IYS ≥ 65)

Well-qualified applicants with minor admission deficiencies may be admitted provisionally subject to completion of an articulation programme.

DURATION: Completion of the programme takes normally four semesters. Students who cannot complete the programme in six semesters are dismissed.

CURRICULUM OF M.S. IN STRUCTURAL MECHANICS

Students in this programme must complete a minimum of 10 courses with total credit hours not less than 30. Each student shall submit a report and shall also make a presentation of a non-credit graduation project. Completion of the programme takes normally four semesters. Students who cannot complete the programme in six semesters are dismissed.

Core Courses

All students must complete the following 4 courses and the term project. Those who have already taken the equivalent of any one of these courses will have to take one additional structural elective in lieu of the course taken earlier.

ST	501	Advanced Structural Analysis I	(3-0)3	ST	503	Computer Applications in Structural Engineering	(3-0)3
ST	502	Structural Design	(3-0)3	ST	504	Earthquake Engineering Fundamentals	(3-0)3
				ST	599	Term Project	NC

Elective Courses

Each student should take at least 6 of the following structural courses (the list can be modified by the approval of the Department).

ST	511	Finite Element Method (ETS Equivalent to CE 526)	(3-0)3			(ETS Equivalent to CE 588)	(3-0)3
ST	512	Theory of Elasticity (ETS Equivalent to CE 527)	(3-0)3	ST	520	Structural Reliability (ETS Equivalent to CE 589)	(3-0)3
ST	513	Behaviour Of Rc Mem. and Str. (ETS Equivalent to CE 581)	(3-0)3	ST	521	Nonlinear Proc. in Finite Elem. Analysis (ETS Equivalent to CE 522)	(3-0)3
ST	514	Prestressed Concrete (ETS Equivalent to CE 484)	(3-0)3	ST	522	Theory Of Plates (ETS Equivalent to CE 523)	(3-0)3
ST	515	Seismic Rehabilitation Principles	(3-0)3	ST	523	Theory Of Shells (ETS Equivalent to CE 524)	(3-0)3
ST	516	Advanced Structural Analysis II (ETS Equivalent to CE 583)	(3-0)3	ST	524	Theory of Matrix Structural Analysis (ETS Equivalent to CE 525)	(3-0)3
ST	517	Advanced Steel Design (ETS Equivalent to CE 585)	(3-0)3	ST	525	Limit Analysis (ETS Equivalent to CE 584)	(3-0)3
ST	518	Earthquake Engineering (ETS Equivalent to CE 586)	(3-0)3	ST	526	Structural Optimization	
ST	519	Bridge Design					

(ETS Equivalent to CE 587) (3-0)3

ST 527 Experimental Methods in Engineering (ETS Equivalent to CE 521) (3-0)

DESCRIPTION OF THE UNDERGRADUATE COURSES

ST 501 Advanced Structural Analysis I (3-0)3
Review of basic concepts of structural analysis; approximate methods of structural analysis; flexibility and stiffness matrices, assembly processes; special topics in analysis; use of the finite difference method.

ST 502 Structural Design (3-0)3
One-two way slabs, joist floors. Wall, individual, combined and continuous footings, mat foundations. Stairs. Structural systems: Framed, wall and combined structures, flat slabs, flat plates, masonry. Modeling. Approximate methods of structural analysis, most unfavorable loading. Introduction to advanced methods of construction: Prefabricated prestressed concrete, composite structures, etc. Professional authority and responsibility.

ST 503 Computer Applications in Struc. Eng. (3-0)3
The components of a computer system. Operating systems. Advanced FORTRAN programming. Finite-difference solution of differential equations. Introduction to finite element method and computer programs. Applications for structural mechanics problems. Utilization of package programs in modeling of structures. Three dimensional building analysis programs.

ST 504 Earthquake Engineering Fundamentals (3-0)3
Causes of earthquakes, characteristics of earthquake ground motions, earthquake magnitude and intensity measurements. Seismic response analysis of simple structures. Derivation of elastic response spectra and earthquake design spectra. Earthquake design criteria. Free and forced vibration analysis of frame structures. Modal spectral analysis and equivalent static lateral force method. Design codes, design applications.

ST 511 Finite Element Method (3-0)3
Review of matrix algebra and calculus of variations. Variation and Galerkin formulations. Formulation of second and fourth-order boundary value problems. Elasticity, plate bending and shell elements. Area and isoparametric coordinates. Numerically integrated elements. Implementation of general purpose finite element computer programs. Eigenvalue and time dependent problems. Nonlinear analysis.
(ETS Equivalent to CE 526)

ST 512 Theory Of Elasticity (3-0)3
Analysis of stress. Analysis of strain. Elasticity: equations of elasticity and general theorems; two dimensional problems in Cartesian and polar coordinates; special problems in three dimensional elasticity; variational methods.
(ETS Equivalent to CE 527)

ST 513 Behaviour Of Reinforced Concrete Members and Structures (3-0)3
Failure patterns of reinforced concrete members and structures, and ultimate load theories. A critical look at various design specifications with emphasis on research results. Review of theoretical and experimental research and their influence on reinforced concrete members and structures.
(ETS Equivalent to CE 581)

ST 514 Prestressed Concrete (3-0)3
The principles of prestressed concrete, construction materials and methods, losses, flexural members, analysis and design, deflections, shear, bond, torsion, disturbed regions. Axially loaded members, introduction to piles, circular prestressing, and continuous beams.
(ETS Equivalent to CE 484)

ST 515 Seismic Rehabilitation Principles (3-0)3
In preparation.

ST 516 Advanced Structural Analysis II (3-0)3
Energy theorems and extremum principles in structural mechanics. Special methods for deflection computations, equilibrium formulation of structural problems. Transformation matrices for force and displacement systems.
(ETS Equivalent to CE 583)

ST 517 Advanced Steel Design (3-0)3
Special connections, plate girders, industrial buildings, multistow steel structures, load and resistance factor design, fatigue in steel, light gauge steel construction.
(ETS Equivalent to CE 585)

ST 518 Earthquake Engineering (3-0)3
Introduction to wave propagation in solid media, body and surface waves, reflection and refraction. Causes of earthquakes. Seismicity of the earth with special reference to Turkey. Computation of response to lateral forces. Review of structural vibration theory and response spectra. Analysis of multi-storey structures subjected to earthquake motions. Design of reinforced concrete structures to resist earthquake forces. Earthquake Design Codes.
(ETS Equivalent to CE 586)

ST 519 Bridge Design (3-0)3
Historical background and basic definitions. Choice of location and bridge layout. Comparison of different types of bridges, foundation conditions. Piers, abutments and wing walls. Pavement. Drainage design details. Bridge economy. Maintenance and repair.
(ETS Equivalent to CE 588)

ST 520 Structural Reliability (3-0)3
Probabilistic bases for the design and evaluation of structural safety and reliability. Random occupancy, wind and earthquake loading, and of variability in material properties. Structural system reliability. Quantitative risk evaluation, systematic assessment and analysis of uncertainties, optimum design accounting for uncertainty and failure consequences. New probabilistically based code specifications. Applications.
(ETS Equivalent to CE 589)

ST 521 Nonlinear Procedures in Finite Element Analysis (3-0)3
Materially and Geometrically Nonlinear Problems in Engineering Incremental Equations of Motion for Nonlinear Problems in Solid Mechanics, General Procedures for the Solution of Nonlinear Equations of Discrete Problems, Microstructural Basis for Material Nonlinearities, Rheological Models for Basic Modes of Material Behaviour, Instantaneous Plasticity and Numeric Procedures for Instantaneous Plastic Material Behaviour, Viscoplasticity and Creep, Numerical Procedures for Viscoplastic Analysis.
(ETS Equivalent to CE 522)

ST 522 Theory Of Plates (3-0)3
Classical theory of plates. Classification. Cylindrical bending. Pure bending. General small deflection theory. Boundary conditions. Applications of Cartesian and polar coordinates. Approximate and numerical methods. Fundamentals of yield line theory of slabs.
(ETS Equivalent to CE 523)

ST 523 Theory of Shells (3-0)3
Introduction. Derivation of shell equations for an arbitrary orthogonal curvilinear coordinate system. Reduction of equations into simpler cases. Numerical methods for shell problems. Associated problems and features related to digital computers.
(ETS Equivalent to CE 524)

ST 524 Theory of Matrix Structural Analysis (3-0)3
Structural analysis versus actual response. Principle of virtual displacements. Principal of virtual force. Betti's law. Influence coefficients. Force and displacement transformations. Transformations of member flexibility and stiffness. Fixed end forces, automated matrix displacement and force methods of structural analysis. Releases. Substructures. Nonlinear analysis. Introduction to finite element method.
(ETS Equivalent to CE 525)

ST 525 Limit Analysis (3-0)3
Basic hypotheses. Simple cases of collapse. Upper bounds, lower bounds and uniqueness theorems. Introduction to design, limit analysis of frames, multi-bay and multistory buildings, grids. Displacement in beams and frames. Stability considerations. Notes on ultimate load analysis of reinforced concrete structures.
(ETS Equivalent to CE 584)

ST 526 Structural Optimization (3-0)3
Introduction. Structural Design Processes. Classical Tools in Structural Optimization. Linear Programming in Optimum Design of Structures. Unconstrained Optimization. Constrained Optimization. Practical Aspects of Structural Optimization. Sensitivity Analysis.
(ETS Equivalent to CE 587)

ST 527 Experimental Methods in Engineering (3-0)3
Principles of model analysis. Design and construction of models. Loading systems: Loading principles, Methods of load application, loading, frames. Load distribution arrangement, safety considerations. Strain measurement systems. Displacement, rotation and curvature measurements. Dynamic measurements. Nondestructive testing principles. Calibration. Principles of data recording. Principles of data analysis.
(ETS Equivalent to CE 521)

DEPARTMENT OF COMPUTER ENGINEERING

PROFESSORS

ALPASLAN, Ferda Nur: B.S., M.S., METU; Ph.D., University of North Texas.
ATALAY, Volkan ***(Vice President)***: B.S., M.S., METU; Ph.D., Université René Descartes- Paris V.
COŞAR, Ahmet: B.S., METU; M.S. Bilkent University; Ph.D., University of Minnesota.
ÇİÇEKLİ, Nihan Kesim: B.S., METU; M.S., Bilkent University; Ph.D., Imperial College.
DOĞRU, Ali H.: B.S., ITU; M.S., University of Texas at Arlington; Ph.D., Southern Methodist University.
GENÇ, F. Payidar: B.S., METU; D.I.C., M.S., Imperial College; Ph.D., University of Manchester.
İŞLER, Veysi: B.S., METU; M.S., Bilkent University; Ph.D., Bilkent University.
POLAT, Faruk: B.S., METU; M.S., Ph.D., Bilkent University.
TARI, Sibel: B.S., Hacettepe Uiversity; Ph.D., Northeastern University.
TOROSLU, İ. Hakkı: B.S., METU; M.S., Bilkent University; Ph.D., Northwestern.University.
ÜÇOLUK, Göktürk: B.S., M.S., Boğaziçi University; Ph.D., METU.
YARMAN-VURAL, Fatoş Tünay: B.S., ITU; M.S., Boğaziçi University; Ph.D., Princeton University.
YAZICI, Adnan ***(Department Chair)***: B.S., ITU; M.S., University of Tulsa; Ph.D., University of Tulane.

ASSOCIATE PROFESSORS

CAN, Tolga: B.S., METU; M.S., Ph.D., University of California at Santa Barbara.
KARAGÖZ, Pınar ***(Vice Chair)***: B.S., M.S., Ph.D. METU.
OĞUZTÜZÜN, Halit: B.S., M.S., METU; Ph.D., University of Iowa.
ONUR, Ertan: B.S., Ege University; M.S., Ph.D., Bogazici University.
MANGUOĞLU Murat: B.S., METU; M.S, The University of Utah USA; Ph.D.: Purdue University, West Lafayette, USA.
SARANLI, Uluç: B.S., METU; M.S., Ph.D., The University of Michigan; Ann Arbor MI.
ŞAHİN, Erol: B.S., Bilkent University; M.S., METU; Ph.D., Boston University.

ASSISTANT PROFESSORS

AKYÜZ, Ahmet Oğuz: B.S., METU; Ph.D.: University of Central Florida, USA.
ALTINGÖVDE, İsmail Sengör: B.S., M.S., Ph.D., Bilkent University.
KALKAN, Sinan: B.S., METU; M.S., METU; Ph.D.: University of Stirling, UK; BCCN Goettingen, Germany.
TEMİZER, Selim; B.S., METU; M.S., Ph.D., Massachusetts Institute of Technology (MIT), Cambridge, MA, USA.

INSTRUCTORS

BİRTÜRK, Ayşenur: B.S., M.S., Ph.D., METU.
ÇAKICI, Ruket: B.S., M.S., METU; Ph.D., University of Edinburgh, UK.
ÖZGİT, Attila: B.S., M.S., Ph.D., METU.
ŞEHİTOĞLU, Onur: B.S., M.S., Ph.D., METU.
ŞENER, Cevat ***(Vice Chair)***: B.S., M.S., Ph.D. METU.
TOKDEMİR, Faruk: B.S., M.S., Ph.D., METU.

GENERAL INFORMATION: An undergraduate program leading to a Bachelor of Science degree in Computer Engineering started in the 1977-1978 academic year. The undergraduate program, aimed at meeting the demand for B.S. level computer engineers in industry, business and in higher education, focuses on the totality of the areas of Computer Engineering such as programming languages, computer architecture, algorithms, databases, operating systems, networks, software engineering, computer graphics and other core and supporting areas.

The Computer Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org".

MISSION OF THE DEPARTMENT: The goal of the Department of Computer Engineering is to teach, produce, and disseminate theory, principles, practice, and know-how of computing for the critical analysis, design, evaluation, and improvement of computer-based systems in the contexts of computers and man, computers and the society, computers and the industry and services.

PROGRAM EDUCATIONAL OBJECTIVES: Graduates of the Bachelor of Science program in Computer Engineering at METU will have the following competencies and qualifications.

1. They have breadth in the discipline of computing covering the full range of core concepts, and depth in a range of state-of-the-art topics.
2. They have an understanding of the fundamentals of mathematics, natural sciences and engineering sciences.
3. They are capable of designing, constructing and operating computer-based systems.
4. They can analyze problems from a computational viewpoint, propose algorithmic solutions, and implement them correctly and efficiently.
5. They are aware of the potentials and the responsibilities of the computing profession in the context of science, technology and society.
6. They have a strong background for further professional development in industrial and academic settings.

STUDENT OUTCOMES: Our BSc program in Computer Engineering strives to ensure that our students attain the following outcomes:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function on multidisciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- a recognition of the need for, and an ability to engage in life-long learning
- a knowledge of contemporary issues
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- an ability to apply design and development principles in the construction of software systems of varying complexity.

UNDERGRADUATE PROGRAM: The four year undergraduate education program is designed so that the first two years focus on foundational courses while the last two year courses are related to engineering, applied and advanced topics. Undergraduate students are expected to have a total of twelve weeks industrial practice during summers. Graduates have very good career opportunities both home and abroad in various private and public sector organizations.

The Department also offers a number of undergraduate courses to students of engineering, arts and sciences as well as other disciplines as part of its service to the University. These courses are designed to provide a sound understanding for effectively utilizing computers in various application areas.

GRADUATE PROGRAMS: The aim of graduate program is to provide qualified personnel for the needs of Computer Engineering and Software Engineering fields as well as to train students who plan to enter academic profession in universities. The graduate program has been designed to meet the demands of specialized computer scientists and engineers in industry and in higher education. It provides opportunity to qualified students from various academic disciplines for further education at an advanced level in Computer Engineering and Software Engineering. The graduate students fulfilling the requirements of the University are

granted the degree of Master of Science (M.S.) in Computer Engineering or Software Engineering or Doctor of Philosophy (Ph.D.) in Computer Engineering.

RESEARCH INTERESTS AND FACILITIES: Research activities are conducted in the following areas: Artificial Intelligence, Databases, Parallel Computing, Software Engineering and Information Systems, Distributed Systems, Theoretical Computer Science, Computer Networks, Pattern Recognition, Modeling and Simulation, Computer Graphics, Image Processing, Computer Vision, Bioinformatics, and Evolutionary Computing. The research work is supported by various national and international organizations. The laboratory facilities of the Department are as follows:

Undergraduate Laboratories: Three laboratories have 80 Core 2 Duo personal computers which are used by undergraduate students. Personal computers work under Linux and Windows operating systems, using 1000 Mbit/s connection to department network and the Internet. There is also a laboratory allocated to self owned student laptops using departmental wireless connections for Internet.

Graduate and Staff Laboratories: Personal computers along with laser printer, color laser printer and a scanner are open to the use of department staff in this laboratory.

Hardware and Electronics Laboratory: This laboratory contains various logic design experiment boards, microcomputers, logic analyzers, oscilloscopes other tools and components. The microprocessor, computer architecture and electronics courses use this facility for the practical training of students.

HPC (High Performance Computing): The department hosts a High Performance Computing system with the following computational and storage capacity: 46 x 2 = 92 CPUs, 46 x 2 x 4 = 368 Cores, 46 x 16 GB = 736 GB Memory, 46 x 146 GB = 6.5 TB Local Disk (halved by RAID), 2 x 3 TB = 6 TB Common Storage Area (halved by RAID).

CENG 200-230 Laboratories: There are two laboratories each containing 35 Core 2 Duo personal computers which are connected to a two Quad Core XEON server with 16 Gb Ram (all working under LINUX operating system) and to the campus network. Assisted laboratory experiments are held in these laboratories.

Department Infrastructure: There are a total of 14 servers running on Linux and Solaris operating systems to provide necessary computation power and web, e-mail, database services. There are 3 LAN segments with C class subnets having more than 250 connected nodes in total. All faculty and student computers are connected through a Gbit Ethernet LAN. Department servers are connected through 1 Gbit/s Ethernet connection. The Department LAN is connected to the campus network backbone through fiber links. All department users can connect to the department wireless network. The network is authenticated by central department user name and password, over RADIUS and LDAP. All areas of the department (including garden) are covered by 8 “Cisco 1131 AG” Access points, supporting 802.11a/b/g, and running on “Power Over Ethernet”. In addition, an array of 7 disks, each consisting of 146 GB 10000 rpm SCSI disk, serve the department's storage needs. There are two laser printers available for use by staff and students.

Image-Processing and Pattern Recognition Laboratory: This laboratory is used for research purposes and for graduate courses on image processing, pattern recognition and computer vision. Current projects are on Content-Based Image Retrieval, Face Detection-Recognition, Intelligent Detection of Geographical Objects from Satellite Images and Extracting Semantic Information from both Image and Text Databases, Medical Diagnosis using Gait Analysis, Multimedia Retrieval and Querying Systems. Research projects are supported by METU, TUBITAK and various other resources (DPT, State-Planning Agency), while the international collaborations are granted by TUBITAK-NSF and the French Ministry of Foreign Affairs. The homepage of the laboratory can be reached at: http://image.ceng.metu.edu.tr/ .

KOVAN (Cooperative and Cognitive Agents) Research Lab.: The Kovan research laboratory is founded to study the synthesis of intelligent systems inspired from nature. Our inspiration stems from a wide range fields ranging from social insects to biological neural systems and evolution. Autonomous robots are preferred as a major test-bed in our studies. We have two major active research tracks: Swarm robotics and Cognitive Robotics. Our research in swarm robotics is funded by a TUBITAK Career Project. Within this project, we are developing mobile robot platforms to be used in swarm robotics research and studying how self-organization can be controlled. Our research in cognitive robotics is funded by a

European Commission research project, called MACS. In this project, we are developing an affordance-based control architecture for a mobile robot with object manipulation capabilities. The laboratory is also a member of the EURON (European Robotics Network of Excellence) funded by the European Commission. The laboratory has a number different mobile robot platforms ranging from simple Mindstorm kits to a professional mobile robot platform equipped with pan-tilt cameras and laser range scanners. The laboratory also has infrastructure to develop small embedded systems. Web: http://kovan.ceng.metu.edu.tr

Laboratory for Computational Studies of Language (LcsL): The goal of LcsL is to conduct interdisciplinary research in computational linguistics and cognitive science. Current research areas are morphological, syntactic and morphosyntactic analyses and generation (mainly Turkish), multidimensional grammars, and the structure of discourse. Applied projects are web-based language learning tools, text segmenters, and machine translation systems. Web site: http://www.LcsL.metu.edu.tr.

Parallel Computing Laboratory: The laboratory includes a cluster of PCs, a fast Ethernet network and PVM/MPI message passing libraries. The Laboratory serves undergraduate and graduate students projects and independent research.

METU Computer Graphics and Visualization Research Group: METU Computer Graphics and Visualization Research Group (CGV) is formed to study various research areas of computer graphics, virtual reality and visualization in 1996. More specifically CGV has been involved in the following specific research areas: Game Technologies: massively multiplayer online games, serious games, architectures; Geometrical Modeling: multiresolution, virtual sculpting; Global Illumination and Rendering: ray Tracing and radiosity, occlusion culling; GPU Programming: gpu ray casting, volume rendering, smoke generation; Modeling and Simulation: C4ISR systems, agent based simulations, driving simulators; Visualization for different domains: volumetric objects, bioinformatics, cultural heritage, military and road safety. Detailed information can be found at the group web site which is http://cgv.ceng.metu.edu.tr/ .

Fuzzy Object-Oriented Multimedia (FOOMM) Database Research Laboratory: The FOOMM research laboratory (http://multimedia.ceng.metu.edu.tr) is established in 2006 at Computer Engineering Department of Middle East Technical University. The laboratory is intended for enabling new research facilities in multimedia database area. The aim of the laboratory is to conduct research on various topics related to multimedia databases, especially video databases. In the lab there are a number of main active research tracks: multimedia database modeling, indexing, and querying. A current research project going on in the lab now is titled as "Modeling and Development of an Intelligent and Fuzzy Object-Oriented Database for Multimedia Database Applications," which is supported by TUBITAK (The Scientific and Technical Research Council of Turkey.) The scope of the project is to develop an intelligent database management system for modeling multimedia database applications, a fuzzy inference engine that can make inferences on multimedia information, an index structure for efficiently accessing multimedia data, a language for describing and querying multimedia data and finally developing a framework that integrates all of the components. The laboratory has a server and a number PCs and some multimedia related hardware and software. Currently there are a number of PhD and MS students doing their research on multimedia databases in the lab.

Intelligent System Lab – ISL: The Intelligent Systems Laboratory (ISL) primarily supports research on various aspects of intelligent systems, including semantic-web systems, multimedia databases, knowledge engineering, knowledge-based systems, automated reasoning, natural language processing, text mining, web service composition, artificial life, intelligent collaborative systems for technology-enhanced learning, neural networks, genetic algorithms, and robotics. Intelligent Systems lab was established in 2000 with initially four research groups working on various intelligent system projects. These are namely, Robotics and Artificial Life, Action Languages, Neuro-fuzzy Systems, and Distance Learning. ISL researchers carried out many national and international projects. The national projects were supported by METU and TUBITAK while the international collaborations were granted by TUBITAK-NSF and the French Ministry of Foreign Affairs.

Bioinformatics and Computational Biology Research Laboratory: The laboratory is founded with the purpose of developing and applying computational techniques for the analysis of data and modeling of processes related to molecular biology. The broad aim of research conducted in the laboratory is to provide computational tools to assist researchers in understanding, explaining, and predicting the behavior of complex biological systems. Methodologies from the areas of machine learning, statistical modeling, and graph theory

are applied to provide solutions to bioinformatics problems such as protein functional classification, gene expression analysis, protein-protein interaction network analysis. There are a number of active research projects currently carried out in the laboratory supported by funding organizations including TUBITAK.

Mobility Research Group: Research topics are mainly focused on modeling movement of the objects that can move (generally robotic cars and quadrocopters), how these mobiles act under physical conditions such as friction and forces comes from world and accomplish a job with these mobile devices using a scenario.

IDAG (Intelligent Data Analysis Research Group): The Intelligent Data Analysis Group at METU focuses on the analysis of very large data sets, especially mining and querying aspects. Our research domain usually includes applications for Web mining, Databases and Bioinformatics.

The Department actively supports the activities of the METU-MODSİMMER **Modeling and Simulation Research Center**.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MATH	119	Calculus with Analytic Geometry	(4-2)5
PHYS	105	General Physics I	(3-2)4
CHEM	107	General Chemistry	(3-2)4
CENG	100	Computer Engineering Orientation	(2-0)NC
CENG	111	Introduction to Computer Engineering Concepts	(3-2)4
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	106	General Physics II	(3-2)4
MATH	260	Basic Linear Algebra	(3-0)3
CENG	140	C Programming	(3-2)4
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
EE	281	Electrical Circuits	(2-2)3
CENG	213	Data Structures	(3-0)3
CENG	223	Discrete Computational Structures	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

STAT	221	Statistics for Engineers I	(3-0)3
CENG	232	Logic Design	(3-2)4
CENG	242	Programming Language Concepts	(3-2)4
CENG	280	Formal Languages and Abstract Machines	(3-0)3
EE	282	Int. to Digital Electronics	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

CENG	315	Algorithms	(3-0)3
CENG	331	Computer Organization	(3-0)3
CENG	351	Data Management and File Structures	(3-0)3
Restricted Elective*			
Non-technical Elective			
CENG	300	Summer Practice I	NC
TURK	303	Turkish I	NC

Sixth Semester

CENG	334	Introduction to Operating Systems	(3-0)3
CENG	336	Int. to Embedded Systems Development	(2-2)3
CENG	350	Software Engineering	(3-0)3
CENG	384	Signals and Systems for Computer Engineers	(3-0)3
Non-technical Elective			
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

CENG	477	Int. to Computer Graphics	(3-0)3
CENG	491	Computer Engineering Design I	(2-0)2
Technical Elective			
Technical Elective			
Non-technical Elective			
CENG	400	Summer Practice II	NC

Eighth Semester

CENG	436	Data Communications and Computer Networking	(3-0)3
CENG	492	Computer Engineering Design II	(1-2)2
Technical Elective			
Technical Elective			
Free ElectiveAll elective courses are minimum 3 credits.			

Restricted Elective* :One of the following courses: AEE 231, AEE 244, AEE 261, CHE 204, CHE 222,ES 221, ES 223, ME 203, ME 205, ME 305, ME 351, METE 230, CE 221, CE 371, CE 374.

Technical Elective :Technical elective courses offered by the department or one of the following courses: CE 413, CENG 382, EE 212, EE 301, EE 312, IE 407, IE 451, IE 455, IE 466, IS 514, IS 533, IS 536, IS 551, IS 564, IS 572, IS 573, MATH 301, MATH 321, MATH 341, MATH 353, MATH 365, MATH 390, MATH 401, MATH 402, MATH 478, MATH 489, MATH 490, STAT 222, STAT 253, CEIT 321.

DOUBLE MAJOR PROGRAM IN COMPUTER ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses taken from other departments is determined by the Department.

MINOR PROGRAM IN INFORMATION SYSTEMS

Information Systems minor program aims at particularly fulfilling the educational requirements of an `information-based society`, which calls for a know-how in informatics in almost all areas of expertise. The program will consist of subjects in databases, software engineering, information systems and some other basic subjects in computer engineering and is open to all students whose major area is outside computer engineering. At least one course in programming is recommended for application.

Compulsory Courses

CENG	230	Introduction to Computers and C Programming	(2-2)3
CENG	301	Algorithms and Data Structures	(3-0)3
CENG	350	Software Engineering	(3-0)3
CENG	351	Data Management and File Structures	(3-0)3

Three of the following courses

CENG	352	Database Management Systems	(3-2)4
CENG	436	Data Communications and Computer Networking	(3-0)3
CENG	451	Information Systems Development	(3-0)3

Technical Elective courses offered by the department.

DESCRIPTION OF UNDERGRADUATE COURSES

CENG 100 Computer Engineering Orientation (0-2)NC
An orientation course to provide counsel to the students about the Department and Computer Engineering in general. An introduction to the faculty and their activities. Visit to several Computer Centers in and outside the University.

CENG 111 Introduction to Computer Engineering Concepts (3-2)4
Introduction to fundamentals of computer systems, including computer organization, operating systems, language processors and user interfaces. Introduction to algorithms and programming. Reasoning informally about the correctness and efficiency of programs. A functional programming language will be used for practical work.

CENG 140 C Programming (3-2)4
Advanced programming with C: storage and control structures, recursion and programming with dynamic data structures. Homeworks are required to run on Unix environment.

CENG 200 Introduction to Computers and Fortran Programming (2-2)3
Basic introduction to computers and programming. Flowcharting, Fortran control statements, input-output statements, loops, arrays and subprograms. Labs covering an introduction to DOS, word processors, database overview and other general topics. *(Offered to non-CENG students only).*

CENG 210 Computers and Fortran Programming (3-2)4
Fortran: Algorithmic approaches and flowcharting, elements of Fortran control statements, loops, arrays, formatted I/O, subprograms, character expressions, File I/O, advanced statements, external lib. handling. Literacy: Computers, their components, terminology, peripherals, operating system concept, spectrum of softwares, some software tools and packages.
(Offered to non-CENG students only).

CENG 213 Data Structures (3-0)3
Classification of data structures, space and time considerations. Linked lists, stacks and queues. Tree structures, binary search trees. Array and pointer based implementations. Recursive applications. Sorting and searching.
Prerequisite: CENG 140.

CENG 223 Discrete Computational Structures (3-0)3
Fundamentals of logic, set theory, relations, functions, induction, graph theory, trees, introduction to algebraic structures, lattices.

CENG 230 Introduction to C Programming (2-2)3
Introduction. Constants, variables, expressions, statements. Selective structures. Repetitive structures and arrays. Functions. Pointers. Multi-dimensional arrays.
(Offered to non-CENG students only.)

CENG 232 Logic Design (3-2)4
Introduction to computer hardware. Number systems. Boolean Algebra. Logic Gates and Flip Flops. Combinational and sequential circuit design. Registers, counters. Bus transfer. RAM, ROM units. Instruction execution and hardwired control.

CENG 242 Programming Language Concepts (3-2)4
Evolution of programming languages. Overview of language translation, virtual machines, and run-time environments. Names, bindings and scopes. Values, expressions and types. Type compatibility and type checking. Storage, variables, and commands. Procedural abstraction. Generic units. Overview of functional programming paradigm. Overview of object-oriented programming paradigm: encapsulation, classes and objects, inheritance, polymorphism, dynamic binding.
Prerequisites: CENG 111 and CENG 213.

CENG 280 Formal Languages and Abstract Machines (3-0)3
Introduction to strings, languages and grammars. Concept of abstract machines and language acceptance. Deterministic and non-deterministic finite state machines. Regular expressions.

Machines with pushdown tape. Turing Machines and recursive functions.
Prerequisite: CENG 223.

CENG 300 Summer Practice I NC
A minimum of six weeks (30 working days) of training in computer centers involving observation of the computer system and the software developed and used in the center, and discussion of various aspects of the system. The training is based on the contents of the summer practice manual.

CENG 301 Algorithms and Data Structures (3-0)3
Linked lists, stacks, queues, recursion, trees, sorting, searching, introduction to graphs, space and time consideration.
(Offered to non-CENG students only).

CENG 302 Introduction to Database Management Systems (3-0)3
Introduction to DBMSs, Relational Databases, Relational Algebra, SQL, Entity Relationship Model. Theory of Database Design, Physical Database Design, Example DBMS.
(Offered to non-CENG students only).

CENG 305 Object Oriented Programming with Java (3-0)3
Fundamentals of classes and objects; Java language elements; attributes, selection, iteration, arrays, file I/O, defining custom methods; overloading constructors and methods; inheritance, exception handling, overriding, abstract classes and interfaces.
Prerequisite: CENG 220 or CENG 230.

CENG 315 Algorithms (3-0)3
Selected computer algorithms: sorting, searching, string processing and graph algorithms. Algorithm design and analysis techniques. Time and computational complexities of algorithms. Introduction to NP-completeness, parallelization of algorithms, linear and dynamic programming.
Prerequisite: CENG 213.

CENG 316 Practice of Algorithms (2-2)3
Advanced algorithmic problems in graph theory, combinatorics, and artificial intelligence. Creative approaches to algorithm design. Efficient implementation of algorithms.
Prerequisites: CENG 315 and the consent of the department.

CENG 331 Computer Organization (3-0)3
Instruction sets and CPU. Execution of instructions. Memory hierarchy and memory management. Fast arithmetic: fast multipliers and floating point operations. Reduced instruction set computer. Input/Output.
Prerequisite: CENG 232.

CENG 332 Systems Programming and Support Environments (3-0)3
Basic System Software. Assemblers. Macro Processors. Compilers. Interpreters. Loaders and Linkers. Run-Time Support Environments. Networking Software. Network Programming. Issues of Systems Integration over Networks. Graphical User Interfaces. Windows Programming.
Prerequisite: CENG 331.

CENG 334 Introduction to Operating Systems (3-0)3
Introduction to Operating Systems. Memory Management. Process Management. Concurrent Processes. Deadlocks. Processor Management. I/O and Device Management. File Management and File Systems. Introduction to Distributed Operating Systems. Synchronization in Distributed Systems. Distributed File Systems. Overview of contemporary OS technology.
Prerequisite: CENG 331.

CENG 336 Introduction to Embedded Systems Development (2-2)3
Assembly language and controller architecture. Peripheral interfaces: A/D and D/A conversion, parallel and serial ports, interrupts and timers/counters. I/O bus architectures. Sensors and actuators. Design and analysis techniques. Real time operating systems.
Prerequisite: CENG 232.

CENG 340 Rapid Application Development (2-2)3
Overview of the base language of a Rapid Application Development (RAD) tool; object definitions, methods, properties and inheritance. Form design using visual components Application development using the libraries of an industry standard RAD tool.

CENG 350 Software Engineering (3-0)3
Software Project Management: metrics, estimation, planning. Software requirement analysis techniques. Software design techniques. Software implementation. Software quality assurance Software testing. Software maintenance. Review of CASE technology.
Prerequisite: CENG 213 or CENG 301.

CENG 351 Data Management and File Structures (3-0)3
Sequential files. Unordered sequential files. Ordered sequential files. External sorting. Heap sort. Replacement selection sort. Large memory sorting.

B+tree index. Hashing. Classical hashing. Linear hashing. Introduction to DBMSs. Relational databases. Relational query languages. Relational algebra. Relational calculus. SQL. QBE. QUEL. Implementing the join operation. Entity-Relationship data model.

CENG 352 Database Management Systems (3-2)4
Relational model of data. Relational algebra. SQL. Query optimization. Entity-Relationship data model. Normalization, physical database design. Concurrency control in DBMSs. Crash recovery. Client-server architectures. Introductions to object databases, distributed databases, web data management.
Prerequisite: CENG 351.

CENG 356 LISP and PROLOG (3-0)3
The list processing language LISP and the logic programming language PROLOG.

CENG 371 Scientific Computing (3-0)3
Accuracy in numerical analysis. The sources and propagations of errors. Solution of non-linear equations. Interpolating polynomials. Solution of linear algebraic equations and eigenvalue problems. Least squares curve fitting. Numerical integration and differentiation. Numerical solution of ordinary differential equations.
Prerequisites: MATH 120, MATH 260.

CENG 382 Analysis of Dynamic Systems with Feedback (3-0)3
Mathematical modelling of systems. Difference and differential equations. State-space representation. Solutions of state equations. Linear-time-invariant systems and impulse response (discrete and continuous time). Stability. Routh-Hurwitz method. Feedback. Controllability. Observability. An introduction to nonlinear systems.
Prerequisites: MATH 219 and MATH 260.

CENG 384 Signals and Systems for Computer Engineers (3-0)3
Linear time invariant systems; Frequency domain; Periodic and finite signals; Frequency response; Fourier series and transforms; Filtering; Finite impulse response filters; Sampling and reconstruction.
Prerequisites: MATH 219 and MATH 260.

CENG 400 Summer Practice II NC
A minimum of six weeks (30 working days) of training in computer centers involving observation of the computer system and the software developed and used in the center, and discussion of various aspects of the system. The training is based on the contents of the summer practice manual. Students are expected to be involved in the software development projects of the computer center.

CENG 424 Logic for Computer Sciences (3-0)3
Overview of propositional and first-order logic. Computational aspects of logic: definite clauses, resolution, unification, and clausal forms. Modal, temporal, and other non-standard logics. Applications of various logics in computer science.
Prerequisite: CENG 223 or Consent of the Department.

CENG 436 Data Communications and Computer Networking (3-0)3
Introduction to data communications. OSI Reference Model. Physical layer. Electrical interface and data transmission. Data link layer. Media access sublayer. LAN/MAN technologies. Network layer. Inter networking. Bridging and routing. Transport layer. Introduction to upper layers' issues.

CENG 437 Advanced Computer Architecture (3-0)3
Architectural approaches to parallelism, pipelining, vector processors, shared memory multiprocessors and interconnection networks, array processors, message passing, dataflow mechanisms.
Prerequisite: CENG 331.

CENG 443 Introduction To Object-Oriented Programming Languages And Systems (3-0)3
Object-Oriented Programming Concepts. Exception handling. I/O Streams and Decorator Pattern. Concurrency. GUI Development. Security Issues. Objects over Networks. Database Connectivity. Serialization and Deserialization. Remote Method Calls. Introduction to Enterprise Components.

CENG 444 Language Processors (3-0)3
Formal description and classification of programming languages. Specifications syntax. The parsing problem. Top-down and bottom-up parsing. Attaching semantics to syntax. Translator writing systems. Translator writing case study.

CENG 451 Information Systems Development (3-0)3
Information systems life cycle. Effective human communications. Common tools for information gathering. Some classical tools. Some structured tools. Organizational structure and personnel for information systems department. Computer systems evaluation and selection. Modeling and simulation.

An information systems development methodology. A Case tool.
Prerequisite: CENG 350.

CENG 462 Artificial Intelligence (3-0)3
Basic LISP programming; picture analysis WALTZ algorithm; game playing, game trees, the mini-max rule, alpha-beta pruning technique; natural language understanding, transformational grammar, ATN grammars, techniques used in semantics.

CENG 463 Introduction to Natural Language Processing (3-0)3
Introduction to linguistic theory and techniques used in natural language processing (NLP). Template and keyword systems. Declarative and procedural approaches to NL parsing. Phrase Structure. Unification-based grammar. Parsing algorithms. Semantics. Morphology and Lexicon.
Prerequisite: CENG 280, or consent of the department.

CENG 465 Introduction to Bioinformatics (3-0)3
DNA and protein sequence alignment, phylogenetic trees, protein structure prediction, motif finding, microarray data analysis, gene/protein networks.

CENG 466 Fundamental Image Processing Techniques (3-0)3
Image transforms. Image acquisition. Image representation and data structures. Image analysis. Image enhancement. Pattern recognition basics. Edge detection and segmentation.

CENG 469 Computer Graphics II (3-0)3
Local illumination models and surface rendering methods. Ray-tracing algorithm and speed-up techniques. Radiosity lighting model and radiosity method. Adding surface detail: Texture mapping, bump mapping, and procedural texture mapping. Three dimensional object representations: Polygon meshes, parametric cubic curves, parametric bicubic surfaces, quadratic surfaces, surface of revolution, sweep surfaces, fractal-geometry methods. Volume rendering. Color models. Introduction to computer animations.
Prerequisite: CENG 477.

CENG 476 System Simulation (3-0)3
Introduction to simulation as a general scientific problem solving technique. Methodology of simulation and use of computers. Classifications of simulation models. Introduction to simulation programming languages.

CENG 477 Introduction to Computer Graphics (3-0)3
Hardware and software components of graphics systems. Output and filled-data primitives. Fourier analysis, convolution, sampling, quantization, aliasing. 2D and 3D geometric transformations. Two-dimensional viewing. Three-dimensional viewing: Viewing pipeline, viewing parameters, projections, viewing transformations, clipping. Visible surface detection. Introduction to illumination models and surface rendering.

CENG 478 Introduction to Parallel Computing (3-0)3
History and basic concepts of parallel computing. Classification of parallel processing systems. Organization of data and parallel storage. Design and analysis of parallel and vector algorithms. Performance and complexity of parallel algorithms. Examples and applications of some parallel algorithms.

CENG 483 Introduction to Computer Vision (3-0)3
Image formation, camera models and parameters, stereo vision, shape from stereo, shape from single image cues, apparent motion, optical flow, introduction to 3D shape representation and recognition.

CENG 491 Computer Engineering Design I (2-0)2
Analysis, requirement specification and design phases of a project. Team setting and working as an individual. Engineering design and brainstorming. Project management, planning and scheduling.
Prerequisite: CENG 350.

CENG 492 Computer Engineering Design II (1-2)2
Implementation and test phases of a project. Engineering and software engineering standards. Configuration management, revision control. Engineering ethics and legal issues. Testing and quality assurance. Final product preparation and deployment.
Prerequisite: CENG 491.

CENG 493-498 Special Topics in Computer Engineering (3-0)3
These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF COMPUTER ENGINEERING

The graduate program is designed to meet the demands for specialized computer scientists and engineers in industry and in higher education which also gives opportunity to qualified students from various academic disciplines for further education at an advanced level in Computer Engineering and Software Engineering.

Graduate students may specialize in Algorithms and Data Structures, Artificial Intelligence, Databases, Computer Networks and Distributed Systems, Computer Graphics, Pattern Recognition and Image Analysis, Numerical Computation, Operating Systems, Parallel Computing, Programming Languages, Software Engineering, Natural Language Processing, Bioinformatics, and Modelling and Simulation.

The graduate students fulfilling the requirements of the University are granted the degree of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) in Computer Engineering. The Department of Computer Engineering runs three exclusive programs for Master of Science (M.S.): M.S. in Computer Engineering, M.S. in Computer Engineering without thesis and M.S. in Software Engineering without thesis. The latter two programs are designed for those who are not willing to do thesis work but would like to further their educational and professional goals with extensive coursework and a term project. Graduate Students in these programs must demonstrate sufficient breadth of knowledge of Computer Engineering or Software Engineering by satisfying an enhanced coursework requirement.

Graduate curriculum for M.S. and Ph.D. programs are outlined below. Ph.D. program, in addition to courses and thesis also involves a written and oral qualifying examination.

GRADUATE CURRICULUM

M.S. in Computer Engineering

CENG 500 Master Thesis NC
CENG 591 Graduate Seminar NC
1 course from theory area,
1 course from systems area,
5 free courses

Total minimum credit: 21
No of courses with credit (min): 7

M.S. in Computer Engineering without Thesis

CENG 599 Term Project NC
1 course from theory area,
1 course from systems area,
2 courses from breadth electives[3]
6 free courses

Total minimum credit: 30
No of courses with credit (min): 10

M.S. in Software Engineering without Thesis

SE 550 Software Engineering (3-0)3
SE 560 Software Development Studio (1-4)3
SE 599 Term Project NC
3 courses from SE free electives[1,]
5 courses from SE restricted electives[4]

Total minimum credit: 30
No of courses with credit (min): 10

Ph.D. in Computer Engineering

If admitted by M.S. degree:

CENG 600 Ph.D. Dissertation NC
1 course from theory area[2],
1 course from systems area[2],
5 free courses

Total minimum credit: 21
No of courses with credit (min): 7

If admitted by B.S. degree:

CENG 591 Graduate Seminar NC
CENG 600 Ph.D. Dissertation NC
2 courses from theory area[2],
2 courses from systems area[2]
10 free courses-

Total minimum credit: 42
No of courses with credit (min): 14

[1] Courses offered in the non-thesis M.S. programs of Department of Computer Engineering and Software Management and Modeling and Simulation programs of Informatics Institute are also accepted for the SE free electives area.

[2] Courses taken during MS studies at METU Department of Computer Engineering may satisfy the course requirements of theory and systems areas. A student has to take another course (free) in place of each counted course.
[3] Breadth Electives: CENG 538/ MS 522, CENG 551/ MS 529, CENG 553, CENG 561/ MS 527, CENG 563, CENG 564, CENG 566, CENG 568, CENG 569, CENG 574/ MS 517, CENG 575, CENG 577
[4] SE Restricted Electives: SE 541, SE 542, SE 546, SE 547, SE 548, CENG530, CENG546, CENG551, CENG553, CENG567

GRADUATE COURSES

Theory

CENG	540	Programming Languages	(3-0)3
CENG	565	Introduction to the Theory of Computation	(3-0)3
CENG	567	Design and Analysis of Algorithms	(3-0)3

Systems

CENG	513	Wireless Communication and Networks	(3-0)3
CENG	530	Computer Networks and Communications	(3-0)3
CENG	531	Advanced Computer Architecture	(3-0)3
CENG	532	Distributed Computing Systems	(3-0)3
CENG	536	Advanced Unix	(3-0)3
CENG	554	Concurrent and Distributed Programming	(3-0)3

Electives

CENG	500	Master Thesis	NC
CENG	508	Fuzzy Logic and Database Modeling	(3-0)3
CENG	514	Data Mining	(3-0)3
CENG	529	Combinators in Syntax and Semantics	(3-0)3
CENG	535	Performance Evaluation of Parallel Systems	(3-0)3
CENG	538	Advanced Graphics and User Interfaces	(3-0)3
CENG	545	Software Quality Assurance and Testing	(3-0)3
CENG	546	Object-Oriented Programming Languages and Systems	(3-0)3
CENG	550	Logic and Databases	(3-0)3
CENG	551	System Development with Abstract Design	(3-0)3
CENG	553	Database Management Systems	(3-0)3
CENG	556	Distributed DBMSs	(3-0)3
CENG	558	Structured Systems Development and CASE Tools	(3-0)3
CENG	559	Data Protection and Security	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	563	Computational Linguistics	(3-0)3
CENG	564	Pattern Recognition	(3-0)3
CENG	566	Digital Image Processing	(3-0)3
CENG	568	Knowledge Engineering	(3-0)3
CENG	569	Neurocomputing	(3-0)3
CENG	571	Numerical Analysis I	(3-0)3
CENG	572	Numerical Analysis II	(3-0)3
CENG	574	Statistical Data Analysis	(3-0)3
CENG	575	Simulation Modeling and Analysis	(3-0)3
CENG	576	Numerical Methods in Optimization	(3-0)3
CENG	577	Parallel Computing	(3-0)3
CENG	580	Multi Agent Systems	(3-0)3
CENG	581	Automated Reasoning	(3-0)3
CENG	582	Advanced Neural Modelling	(3-0)3
CENG	583	Computational Vision	(3-0)3
CENG	584	Cognitive Aspects of Natural Language Processing	(3-0)3
CENG	585	Fundamentals of Autonomous Robotics	(3-0)3
CENG	591	Graduate Seminar	NC
CENG	600	Ph.D. Dissertation	NC
CENG	7XX	Special Topics in Computer Engineering	(3-0)3
CENG	8XX	Special Studies	(4-2)NC
CENG	9XX	Advanced Studies	(4-0)NC
CENG2	500	Graduate Project	NC
CENG2	591	Graduate Seminar	NC

SE Must Courses

SE	550	Software Engineering	(3-0)3
SE	560	Software Development Studio	(1-4)3
SE	599	Term Project	NC

SE Electives

SE	541	Multimedia and Web Engineering	(3-0)3
SE	542	Human Computer Interaction	(3-0)3
SE	546	Software Architectures	(3-0)3
SE	547	Formal Specification Techniques	(3-0)3
SE	548	Process Modeling	(3-0)3
SE	554	Software System Analysis and Design	(3-0)3
SE	556	Software Project Management	(3-0)3

CENG 500 Master Thesis NC
Program of research leading to M.S. degree, arranged between a student and the faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of the thesis is in progress.

CENG 508 Fuzzy Logic and Database Modeling (3-0)3
This course introduces fuzzy logic (in a great detail) and some recent fuzzy database modeling advances for the non-traditional applications. It focuses on database models for modeling complex information and uncertainty at the conceptual, logical, physical database design levels and on fuzzy integrity constraints defined on the fuzzy relations. A number of special non-traditional databases such as multimedia, spatial and spatio-temporal databases will also be studied. Some of the topics will be studied through reading a relevant paper on the topic.

CENG 513 Wireless Communication and Networks (3-0)3

Introduction to transmission and networks. Antennas, multipath propagation, frequency hopping. Satellite communication. Overview of current systems for cellular for networks, wireless LANs, mobile IP, Ad Hoc networks, the Bluetooth technology and the IEEE802.11 standard.

CENG 514 Data Mining (3-0)3

This course introduces data mining and data warehousing concepts. Data warehousing, OLAP technology, data preparation, association rule mining, classification and prediction, clustering, mining complex types of data, web mining, multirelational data mining are the basic concepts covered in this course.

CENG 520 Electronic Commerce Technology (3-0)3
Introduction to Electronic Commerce, Electronic Commerce Business Models, Current State of the Art, An introduction to enabling technologies and standards, World Wide Web Consortium's Recommendations: XML and RDF, Storing and Querying XML Documents, XML Query Languages: XML-QL and XSLT, Workflow Systems for Electronic Commerce, Message Oriented Middleware, Current B2B Electronic Commerce Frameworks: Open Buying on the Internet (OBI), Common Business Library (CBL), CommerceNet's eCo Framework, RosettaNet, BizTalk, Electronic Marketplaces, Personalization on the Internet, Agents and Negotiation in Electronic Commerce, Supply Chain Integration on the Internet, Issues in Mobile Electronic Commerce, Security Issues in Electronic Commerce, Research issues

CENG 529 Combinators in Syntax and Semantics (3-0)3

Combinators. Semantic dependencies and lambda calculus. Variable elimination. Syntacticizing the combinators. Systems with and without logical forms. Choice of universal dependencies. Computation with combinators (combinatory parsing). CCG as a linguistic theory. CCG as a computational theory. Radical lexicalization. Models and applications.

CENG 530 Computer Networks and Communications (3-0)3
Basics of data communication, and computer networks, ISO/OSI basic reference model. physical, data-link, network, and transport layers. Routing, flow control, congestion control. Internetworking. TCP/IP suite of protocols. Higher layer protocols. Contemporary network architectures.

CENG 531 Advanced Computer Architecture (3-0)3
Basics of advanced computer architecture. Multi-processing, multi-threading. Instruction level parallelism. High performance interconnection techniques. Memory hierarchy and shared memory models. Advanced caching techniques, cache coherency. Input/output performance issues. System performance parameters and analysis

CENG 532 Distributed Computing Systems (3-0)3
Basics of distributed computing systems. Global state management in distributed computing systems. Communication in distributed systems. Inter Process Communication and remote procedure call. Distribute file systems. Fault tolerance. Synchronization and deadlocks. Load balancing and process migration. Distributed Operating Systems issues. Project(s).

CENG 535 Performance Evaluation of Parallel System (3-0)3
Parallel architectures, parallel languages, communication structures in parallel programs. Characterization of machine performance evaluation

of parallel systems. Benchmarking and modeling. Performance metrics.

CENG 536 Advanced UNIX (3-0)3
UNIX internals, device driver development. Network interfacing, client/server and Daemon applications. Process structure, file system, memory management, terminal I/O, network interface, character and block device drivers, graphic interfaces.

CENG 538 Advanced Graphics and User Interfaces (3-0)3
Review of 2D basics, 3-D models and geometric transformations. Graphics standards (PHIGS, GKS) and user interface standards (XWindows). Solid modeling. Illumination and shading. Fractal models. Animation.

CENG 540 Programming Languages (3-0)3
Analysis of syntactic and semantic properties of programming languages. Operational, denotational and axiomatic approaches to semantics. Typed lambda calculus. Algebraic data types. Case studies include a typed functional language with higher-order functions and an imperative sequential language.

CENG 545 Software Quality Assurance (SQA) and Testing (3-0)3
Software quality. Quality assurance. Quality metrics. Construction of SQA. Quality management and control. SQA planning. Quality standards. Software testing techniques. Black box and white box testing. Test strategies, Unit Test, and Integration Test.

CENG 546 Object-Oriented Programming Languages and Systems (3-0)3
Introduction to object-oriented programming languages, programming with Smalltalk, programming with C++.

CENG 550 Logic and Databases (3-0)3
Logic and logic programming in understanding the semantics of databases. Extension of relational databases to deductive databases. Techniques for the processing of deductive database queries.

CENG 551 System Development with Abstract Design (3-0)3
Design of software systems and hybrid engineering systems. Software Engineering: Classical and modern methods. Comparative analysis of software development paradigms. Abstract design paradigm: Top-down approach starting with abstract entities. Hybrid system design in integration perspective. Application of formal systems to system development. Process models for software development. Design level process modeling.

CENG 553 Database Management Systems (3-0)3
Overview of relational databases, the theory of relational database design, query processing, transaction management. Object-oriented databases, distributed databases, deductive databases. Other recent research topics such as data mining, multimedia databases, spatial databases and internet databases.

CENG 554 Concurrent and Distributed Programming (3-0)
Fundamentals of concurrent and distributed programming. Critical section problem and mutual exclusion. Concurrent programming primitives including semaphores, monitors. Synchronous communication by channels including the ADA rendezvous and remote procedure calls. Linda model. Distributed mutual exclusion and termination. Fault tolerance.

CENG 556 Distributed Database Management Systems (3-0)3
An overview of distributed databases, a review of databases, concurrency control in centralized DBMSs, concurrency control in distributed databases, serializability theory 3, two-phase locking, timestamp ordering serialization, graph checking, time interval technique, optimistic methods, handling replicated data multiversion data, distributed database design, recovery query processing in distributed DBMSs.

CENG 558 Structured Systems Development and CASE Tools (3-0)3
Structured approach and structured methodologies. Formal methodologies. Tools for information systems development. At least one commercially available methodology and relevant CASE tools to be used.

CENG 559 Data Security and Protection (3-0)3
Symmetric ciphers: classical and modern. The Data Encryption Standard (DES). Authentication. Key management. Asymmetric (Public Key) ciphers. Digital signatures.

CENG 561 Artificial Intelligence (3-0)3
Problem solving and search strategies. Game playing. Knowledge Representation. Expert systems and rule chaining. Vision. Natural language

processing. Machine translation. Machine learning. Neural networks.

CENG 562 Machine Learning (3-0)3
Paradigms of machine learning. Inductive, deductive, abductive forms of learning. Cognitive aspects of learning. Connectionist models of learning. Programming environments for learning programs.

CENG 563 Computational Linguistics I (3-0)3
Phrase structures, syntax, parsing. Semantics: Lambda-calculus, logical forms, compositional semantics, writing parsers and interpreters. Context-free grammars for Natural Language Processing. Definite-clause grammars. Basic concepts in morphology. Top-down and bottom-up parsing.

CENG 564 Pattern Recognition (3-0)3
An introduction to the machine recognition of 1, 2 or higher dimensional patterns. Statistical and linguistic approaches. Survey of application areas. Bayes Decision Theory. Decision boundaries, classifiers, and discriminant functions. Estimation of parameters. Clustering. Feature selection. Structural approaches to P.R.. Neural networks recognizers. Applications.

CENG 565 Introduction to Theory of Computation (3-0)3
Turing machines. Church-Turing thesis. Decidability. Reducibility and Recursion Theorem. Complexity theory: Classes P and NP, NP-Completeness. Space Complexity. Intractability.

CENG 566 Image Processing (3-0)3
Discrete time signals, and systems. Sampling, reconstruction, quantization. Digital image representation. Digital image fundamentals. Image transforms. Image enhancement. Image restoration. Image segmentation and description.

CENG 567 Design and Analysis of Algorithms (3-0)3
Introduction to algorithms. The computational complexity of algorithms. Amortized analysis. Lower and upper bound theory. Approaches for designing algorithms: Divide-and-Conquer, Greedy Approach, Dynamic Programming, Backtracking and Branch-and-Bound. NP-Complete and NP-Hard problems. Approximation algorithms.

CENG 568 Knowledge Engineering (3-0)3
Basic concepts and techniques. Knowledge representation. Drawing inferences. Tools and languages for expert systems. Knowledge engineering and expert systems development. Knowledge acquisition. Current expert system applications.

CENG 569 Neurocomputing (3-0)3
Learning and generalization. The basic perceptron and linear separability. Multilayer perceptrons and the back propagation algorithm. The Hopfield model and its dynamics. Bidirectional associative memory. Recurrent networks. Unsupervised learning and self-organizing maps. The counter-propagation network. Boltzman machine and simulated annealing. Recent advances.

CENG 571 Numerical Analysis I (3-0)3
Accuracy in numerical analysis. Survey and critical comparison of numerical methods for matrix inversion. Systems of linear algebraic equations and eigenvalue problems. Systems of nonlinear equations. One and two dimensional interpolation and numerical approximation Numerical differentiation and integration. Selected algorithms will be programmed for solution on computer.

CENG 572 Numerical Analysis II (3-0)3
Difference equations. Numerical solution of initial value problems in ordinary differential equations and stability of methods. Numerical solution of linear, nonlinear boundary value problems in ordinary differential equations. Numerical solution of parabolic, hyperbolic and elliptic partial differential equations. Selected algorithms will be performed for solution on computer.

CENG 574 Statistical Data Analysis (3-0)3
Multivariate statistical analysis with applications especially in the field of Computer Engineering. Review of introductory concepts in statistics. Hypothesis testing. Regression analysis. Discriminant analysis. Principal component analysis. Factor analysis. Applications with the use of existing computer packages.

CENG 575 Simulation Modeling and Analysis (3-0)3
Fundamental theoretical concepts of discrete simulation. A selected simulation language to be taught. Overview of analog computer simulation. Review of basic probability and statistics. Selecting input probability distribution, random number generators, output data analysis for a single system, statistical techniques for comparing alternative systems, simulation languages and GPSS.

CENG 576 Numerical Methods in Optimization (3-0)3
Types of optimization problems in a variety of fields; efficiency of common methods of solution. Definition of optimization, extrema of functions of

n variables, linear programming and the simplex method, nonlinear programming, and application of common methods to optimization problems.

CENG 577 Parallel Computing (3-0)3
Classification of computers and introduction to parallel architectures. Pipelining and vector processing. Organization of data and parallel storage. Design and analysis of parallel algorithms. Performance measures of parallel algorithms. Examples of parallel algorithms. Programming assignments for parallel solution of some problems on the PVM and the Transputer system.

CENG 580 Multi Agent Systems (3-0)3
Concurrency and distribution in AI. Agents: micro and macro views. Rational agency: economic/game theoretic, logical. BDIarchitecture. Multi-agent real-time search. Multi-agent learning. Reinforcement learning. Opponent modeling. Coordination: cooperation, competition, communication and conflict resolution among agents.

CENG 581 Automated Reasoning (3-0)3
Geometric reasoning, temporal reasoning, uncertain reasoning, non-monotonic reasoning, induction, metaknowledge and metareasoning, state and change, planning, intelligent agent.

CENG 582 Advanced Neural Modeling (3-0)3
Mathematical treatment of generalization, information theory in neural modeling, radial-basis function networks, higher-order neural networks, adaptive resonance theory, temporal processing in neural networks, modular networks, neurodynamics, introductory computational neuroscience.

CENG 583 Computational Vision (3-0)3
Edge detection and contour extraction. Region segmentation. Perspective projection and camera calibration. Matching and stereo. Projective geometry. Three dimensional reconstruction. Dynamic scene analysis.

CENG 584 Cognitive Aspects of Natural Language Processing (3-0)3
Computational aspects of linguistic theories. Human sentence processing. Interpretation. Information Structure. Ambiguity resolution. Interactions in multi-component grammars.

CENG 585 Fundamentals Of Autonomous Robotics (3-0)3
History of Autonomous robotics: Braitenberg´s vehicles, Walter Grey Walter´s tortoises. Locomotion and sensing of robots. Robot control paradigms and architectures. Hierarchical paradigm: STRIPS, RCS. Reactive paradigm; Arbib´s schemas, Brooks´ subsumption architecture, behaviors, potential fields. Hybrid paradigm: AuRo, SSS, RAP´s. Mobile robot navigation: Localization, Map-making, SLAM, route planning. Robot vision. Evolution in autonomous robot systems. Sensory-motor coordination and learning. Multi-robot systems: Robot teams, Robocup, swarm robotics.

CENG 591 Graduate Seminar (0-2)NC
This seminar course must be taken by all M.S. students working towards their M.S. thesis. The students taking the course are required to make presentations on their thesis studies and prepare progress reports and final reports.

CENG 600 Ph.D. Dissertation NC
Program of research leading to Ph.D. degree, arranged between a student and the faculty member. Students register to this course in all semesters preferably starting from the beginning of their second semester but not later than the beginning of the third semester while the research program or write-up of the dissertation is in progress.

CENG 7XX Special Topics in Computer Engineering (2-2)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and the instructor in charge. Typical contents include, Virtual reality, High-speed networks, Advanced topics in computational linguistics, Internet Electronic Commerce, etc.

CENG 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member normally their supervisor.

CENG 9XX Advanced Studies (4-0)NC
Ph.D. students choose and study a topic under the guidance of a faculty member normally their supervisor.

CENG2 500 Graduate Project (0-4)NC
This course must be taken by all students in the M.S. without thesis program. Students have to select a project given by faculty and work under her/his supervision.

CENG2 591 Graduate Seminar (0-2)NC
This course must be taken by all students in the M.S. without thesis program. The students taking the course are required to make presentations on their project studies and prepare progress reports and final reports.

SE 541 Multimedia and Web Engineering (3-0)3
Introduction to methodologies, Techniques and Tools used in the analysis, Design, and implementation of multimedia and Web-Based Applications. Hands-on development of commercial Web-based applications. A variety of software technologies relevant to Web Design and Implementation. Including Programming Languages, Scripting Languages, Network Programming and Security. Application development by going through all phases of Web Engineering Life Cycle: Specification, Design, Implementation and Evaluation.

SE 542 Human Computer Interaction (3-0)3
The relationship of user interface design to human-computer interaction. Interface quality and methods of evaluation; interface design examples; dimensions of interface variability; dialogue genre; dialogue tools and techniques; user-centered design and task analysis; prototyping and the iterative design cycle; user interface implementation; prototyping tools and environments. Multimodal interaction with computers. Students will perform the analysis, design and evaluation of a user interface of a software system as class project.

SE 546 Software Architectures (3-0)3
Architectural level of software design. Major architectural styles. Architecture description languages and related tools. Architectural specification and analysis case studies. Relations with Frameworks, Design Patterns and Component Orientation.

SE 547 Formal Specification Techniques (3-0)3
Overview of logical and set theoretic foundations. State of the art specification formalisms, such as Z, VDM, Larch, state charts, algebraic specifications, and related tools. Formal specification case studies.

SE 548 Process Modelling (3-0)3
Introduce students to the concept of software process and software process improvement through the use of software process capability models. Emphasis will be placed on the application of process concepts to industrial situations. Other topics will include software process assessment techniques, software process improvement models and process capability models in related areas.

SE 550 Software Engineering (3-0)3
A review of the breadth knowledge in Software Engineering. Paradigms, Process Models, Methodologies. Traditional, current and developing approaches to software development; their comparison and suitability to problem types. Specification, Analysis, Design, Standards, Quality, Reporting, Estimation, Planning, Management, Acquisition, Complexity, Maintenance, Reverse-engineering, Coding, Testing, Integration, Validation and Verification, and field operations of Software Systems.

SE 554 Software System Analysis and Design (3-0)3
Introduction to Software System Analysis and Design within Process Models and Specification Techniques perspective. Requirements Elicitation and Specification, Analysis Modeling and Reporting, Logical and Detailed Design. Various traditional, Object Oriented, and contemporary medthodology examples.

SE 556 Software Project Management (3-0)3
Management processes, fundamental tasks. Scoping and definition. Preparation of call for proposals. Selection-awarding, contracting and termination of projects. Monitoring and supervising. Task analysis. Management of technology, resource, cost, change, and risk. Total Quality Management. Staffing, and project management methodologies. Related tools and approaches.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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GENERAL INFORMATION: The purpose of the Department of Electrical and Electronic Engineering is to provide professional training, and at the same time to participate actively in applied and theoretical research. It is therefore necessary for students to acquire a sound knowledge of basic sciences, such as mathematics, physics and chemistry together with an understanding of economics, social sciences and humanities before specialization takes place.

The program is designed to encourage the development of individual initiative and resourcefulness with emphasis on responsibility and good judgment.

The undergraduate program is designed for students who may wish to delay their decisions until the end of the fifth semester as to which of the several fields of Electrical and Electronic Engineering they will choose. Successful candidates are awarded the degree of Bachelor of Science (B.S.) in Electrical and Electronic Engineering at the end of the fourth year. During this period of undergraduate study students are expected to spend a minimum of 40 working days in industry over two consecutive summers.

The selection of the fields of specialization in the fourth year must be made under the close supervision of the Department advisors or of the Chair of the Department. Research, on the other hand, is the life blood of an institution of higher education. In the Electrical and Electronics Engineering Department strong academic programs provide a background for the directed research that form a part of the M.S. and Ph.D. and Integrated M.S.-Ph.D. programs. It is the policy of the Department to encourage its members to take part in externally sponsored project works. These activities forming a mutually beneficial link between the university and industry serve not only as a stimulus for a more intensive research environment in the Department but constitute a channel of information about the present and future needs of the industry to help in the improvement of the educational programs.

Some of the major research activities are: Power system analysis and planning, power system control and operation, insulation, breakdown in dielectrics, H.V. measurement techniques, gaseous discharges, design of electrical machines, control of electrical machines, electrical drives, power converters, renewable energy sources, process control and instrumentation, intelligent control, adaptive control, vision, kinematics and trajectory planning of robots, artificial intelligence, pattern recognition, VLSI design, solid-state electronics, optoelectronics, MEMS, signal processing, data transmission, synchronization and equalization, coding techniques, speech processing, switching circuits, microcomputers (software and hardware), computer aided instruction, scattering and diffraction problems, antennas and radar, active and passive microwave devices and systems, biomedical instrumentation, medical imaging, acoustic imaging, pulse shaping filters, broad band matching.

The graduate program gives opportunities to qualified students for further education at an advanced level.

The students may specialize in the fields of circuits and systems, electronics (VLSI, solid-state electronics, optoelectronics and MEMS), biomedical engineering, EMT, communications, signal processing, control systems, robotics, computer engineering, electrical machines and power electronics, power systems and high voltage.

The candidates fulfilling the university requirements are awarded the degree of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) in Electrical and Electronics Engineering. A minimum of seven

courses and a seminar on the thesis topic is required by the department for the M.S. degree. For the Ph.D. and Integrated M.S.-Ph.D. programs, see the Academic Rules and Regulations.

MISSION: Electrical and Electronics Engineering Department was founded with a threefold mission in teaching, research, and public service. Based on that foundation, the mission of the Department, in all major fields of electrical engineering, is to instill in students the attitudes, values, vision, and training that will prepare them for lifetimes of continued learning and leadership, to develop the ability and passion to work wisely, creatively, and effectively for the benefit of society; to generate new knowledge for the betterment of humankind and disseminate it universally; and to generate realistic and innovative solutions for the current and future technological needs and to play a leading role to form the van of social and scientific progress and to provide special services when there are needs that the department is uniquely qualified to meet.

The Electrical and Electronics Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org .

UNDERGRADUATE PROGRAM EDUCATIONAL OBJECTIVES: The following program educational objectives are career and professional accomplishments that our graduates are expected to achieve within a few years after graduation. Our graduates will globally work in leading academic or R&D positions where they
:

1. apply fundamental engineering knowledge towards identifying problems and pursuing realistic and innovative solutions, while remaining sensitive to their professional responsibilities, including ethical, societal and environmental issues.
2. assume leadership roles in the profession by demonstrating technical and scientific competence, communicating clearly and concisely, and functioning effectively on multidisciplinary teams, while continuing to engage in life-long learning.

UNDERGRADUATE PROGRAM STUDENT OUTCOMES: The associated program learning outcomes, and relationship to ABET Criteria 3 (a-k) is:

1. **Foundations:** understanding of and ability to apply fundamental science and engineering of permanent value (ABET Criteria 3a, 3b, 3e and 3k)
2. **Breadth:** familiarity with the diverse areas of Electrical and Electronics Engineering (ABET Criteria 3a, 3b)
3. **Depth:** ability to apply in depth knowledge of one or more specializations within the diverse fields of Electrical and Electronics Engineering (ABET Criteria 3a, 3b, 3c, 3e)
4. **Design:** ability to participate in creative, synthetic, integrative activities of EE design (ABET Criteria 3c and 3e)
5. **Life-long learning:** desire and ability to keep learning throughout life (ABET Criteria 3i)
6. **Communication skills:** ability to express ideas persuasively, in written and oral form (ABET Criteria 3g)
7. **Social skills:** ability to work with others, in professional and social settings (ABET Criteria 3d)
8. **Global view:** appreciation of diversity in the world and in intellectual areas (ABET Criteria 3h and 3j)
9. **Professional ethics:** ability to recognize and appreciate importance of ethical standards in professional work (ABET criteria 3f)

RESEARCH INTERESTS AND LABORATORY FACILITIES: Experimental facilities in the Electrical and Electronics Engineering Department include a number of laboratories for training and research as well as a machine shop. Some of the basic labs can be listed as: Basic Electrical, Basic Electronic, Electrical Machinery, Power Electronics, Microcomputer, Process Control, Biomedical Instrumentation and Research, Telecommunications, Antennas, Microwaves, High Voltage, Power System Analysis, and Robotics Laboratories. The Electrical and Electronic Engineering Department has the following laboratories available for training and research.

1. Basic Electrical Engineering Laboratory: This laboratory is intended to familiarize students with the fundamental procedures of electrical laboratory measurements. Experiments are designed to illustrate

basic electrical circuit theory concepts for linear and non-linear resistive circuits, simple dynamic circuits, and single-phase linear AC circuits.

2. Basic Electronics Laboratory: This laboratory is used for undergraduate electronics, logic design and telecommunications experiments. The laboratory houses state of the art test and measurement setups each including a power supply, a multimeter, a signal generator, a mixed signal oscilloscope and a personal computer. The laboratory is also equipped with the necessary hardware and software for experimenting on field programmable gate arrays.

3. Electrical Machines and Power Electronics Laboratory: The laboratory is sufficiently equipped with instrumentation and experimental setups to support undergraduate and graduate curricula on all types of rotating machinery up to 10 kW. Additionally, facilities are available for research on drive systems, which allow dynamic torque measurement, measurement of power for distorted waveforms etc.

4. Microcomputer Systems Laboratory: This laboratory primarily aims to acquaint the students with the basics of microprocessors and microcontrollers and their relevant interfacing techniques. It is designed for conducting experiments on microcomputer systems and microprocessor/controller based applications in both hardware and software, using mainly machine language and assembly level programming. The laboratory is equipped with development boards and training kits of various microprocessor families such as Motorola and Intel, and personal computers, networking facilities, high level programming tools and other necessary support equipment.

5. Computer Architecture Laboratory: This laboratory is designed to teach computer architecture fundamentals to students and is equipped to make them conduct various experiments on computer hardware organization using suitable training kits, microprocessor development boards and necessary support equipment.

6. Computer Systems and Networking Research Laboratory: This laboratory is mainly for graduate research and training and is equipped with PCs, workstations, logic analyzers, various advanced level computer development platforms, DSP boards, networking simulation software, etc. The research topics are concentrated primarily on computer systems and architecture, computer networking, routing problems, QoS issues, performance modeling, network optimization and fault tolerance.

7. Computer Vision and Intelligent Systems Research Laboratory: This laboratory is designed for graduate and post graduate students studying in the fields of computer vision, pattern recognition, intelligent systems and robotics. It is equipped with computers for researchers, a parallel processing system, a robot base and special instrumentation, which can be used in robot construction.

8. Multimedia Research Laboratory: This laboratory is designed for both graduate and senior students. Currently, the reach is concentrated on video transmission, watermarking, data hiding, image/video indexing, 3DTV, and object tracking. Several national and international projects on these topics are being pursued in the laboratory. The laboratory is equipped with high performance computers; several DSP boards; stereo, video, still and depth cameras, autostereoscopic displays.

9. Robotics Research Laboratories: Robotics Laboratory and Robot Hand Laboratory serve as a platform for conducting experimental studies to support the robotics related courses offered in the graduate program. Available hardware includes one robot arm (PUMA 700 series), a robot hand, a simple educational purpose robot arm, and a programmable mobile robot. Research studies conducted in the same laboratories are mainly concentrated on vision and image understanding (stereo vision, motion vision, model-based vision, image/video transmission and analysis), planning (motion planning and task planning applications on both mobile robots and robot arms), reasoning, machine learning, and navigation.

10. Process Control Laboratory: The laboratory provides facilities for undergraduate and graduate training and research in the field of control and instrumentation of industrial processes.

11. Laboratory of Feedback Control Systems: The laboratory contains various linear and nonlinear electromechanical systems that are monitored and actuated via computer. The feedback laws to control these systems are designed and implemented through Matlab/Simulink

12. Telecommunication Research Laboratory: This laboratory provides facilities for undergraduate and graduate studies in the fields of telecommunication and signal processing. The laboratory is equipped with special purpose telecommunication instruments as well as basic signal generation and analysis facilities.

13. Antenna Laboratory: The antenna laboratory is well-equipped for making measurements of antenna parameters such as gain, pattern, polarization, input VSWR, and impedance at frequencies ranging from 1 to 40 GHz using an anechoic chamber of dimensions 6.73mx2.85mx2.60m. The laboratory is equipped with electromagnetic simulation and circuit design software.

14. Microwave Laboratory: It is equipped for studies in the frequency range of 0.1 to 40 GHz. A network analyzer and a spectrum analyzer are among the basic facilities offered in this laboratory for undergraduate training as well as graduate research. Waveguide, microstrip and stripline circuits and components are studied, including thick-film hybrid circuits and components. The laboratory is equipped with electromagnetic simulation and circuit design software.

15. Photonics Laboratory: This laboratory is intended to familiarize students with the fundamental procedures of photonics laboratory measurements. Experiments are designed to emphasize engineering applications.

16. Power System Laboratory: The laboratory is designed for undergraduate and postgraduate teaching and research.

17. High Voltage Laboratory: This laboratory provides facilities for undergraduate and graduate experiments and research as well as quality control tests of high voltage insulation for industrial equipments. The laboratory consists of medium and high voltage test halls and is equipped with high voltage, A.C., D.C. and impulse test systems, high voltage and current measurement, waveform recording, and discharge detection facilities.

18. Static Power Conversion Laboratory: This laboratory has necessary facilities to carry out experiments on SCR based rectifier/inverter sets for the study of static power conversion and conducting research in the field. It offers a suitable ground for developing high power DC sources and electrical drives. It is furnished with the necessary equipment for harmonic studies related to static power converters.

19. MEMS and Microelectronics Fabrication Laboratory: This clean room houses the necessary equipment for the fabrication of Micro-Electro-Mechanical Systems (MEMS), microelectronics, and optoelectronic solid state devices and circuits. Laboratory facilities include a high resolution lithography system and photoresist spinner, a sputtering system, thermal evaporators, diffusion and oxidation furnaces, a plasma etcher, a surface profiler, chemical hoods, and ovens. Researchers in the laboratory have also access to cleanroom facilities of METU-MEMS Research and Applications Center, which has 1300m^2 cleanroom with 4", 6", and 8" wafer processing capability with 0.35µm lithography resolution.

20. VLSI and MEMS Design Laboratory: The educational part of the laboratory can accommodate 25 concurrent users with 25 state of the art Linux workstations that can run a number of engineering design software mainly geared towards integrated circuit design, VLSI, and MEMS. The software packages available in the lab include 100 seats of full Cadence suite for integrated circuit design education, in addition to 15 licenses for research purposes in another laboratory. Moreover, the students in both laboratories can access many engineering tools such as HFSS for electromagnetic analysis, CoventorWare and ANSYS for FEM analysis and Matlab and Mathemetica for mathematical modeling and analysis, as well as other VLSI CAD design tools like Tanner Tools and Synopsys.

21. Quantum Devices and Nanophotonics Research Laboratory: This research laboratory houses two certified clean rooms for the growth, fabrication and characterization of compound semiconductor devices. The facilities include two molecular beam epitaxy (MBE) reactors for the epitaxial growth of III-V and II-VI compound semiconductors, high capacity liquid nitrogen production system, semiconductor characterization equipment including an XRD system, lithography system, thin film coating systems, reactive ion etcher, two flip-chip aligner/bonders for the hybrid integration of optoelectronic components, high resolution lapping/polishing system and wire bonder. The laboratory also houses the necessary equipment for

the electrical and optical characterization of semiconductor devices and infrared sensor arrays. The current research activities in this laboratory are concentrated on large format single and multi band infrared sensor arrays for thermal imaging applications.

22 Biomedical Engineering Training Laboratory: This laboratory houses experimental set-ups to study various types of sensors and measurement techniques, biopotential amplifiers, a nerve stimulator, a PC-based ECG system, a spirometer and variety of electronic test equipment. The laboratory has been established as a reference biomedical engineering training laboratory in Turkey.

23. Medical Instrumentation and Physiological Measurement Laboratory: This laboratory is equipped with multipurpose transducers, amplifiers for ECG, EEG, EMG, and phonocardiogram, a nerve stimulator, an animal respirator, infusion pumps and surgery tools for graduate research. In this laboratory, animal experiments can be performed on a range of animals from rat to sheep.

24. Medical Imaging Laboratory: Current research in this laboratory is mainly focused on developing numerical methods and hardware for a novel medical imaging method that uses electromagnetic means to image tissue electrical conductivity distribution. For computational and visualization purposes workstations and desktop computers are employed with necessary compilers and a professional visualization software.

25. Magnetic Resonance Imaging Laboratory: This laboratory has a 0.15 Tesla, 800mm clear bore whole body Oxford resistive magnet, Analogic Corporation gradient and RF amplifiers. This laboratory is also equipped with hardware and software tools for MR-current density imaging, MR-Electrical Impedance Tomography.

26. Brain Research Laboratory: The research in this laboratory is on the Electro-magnetic-Source Imaging (EMSI) of the human brain. Currently, the forward and inverse problems of EMSI are studied, and a 256-channel EEG device is being developed. The laboratory is equipped with six interconnected PCs and a PC based computer cluster with eight processors.

27. Student Computer Service Room: This laboratory is designed for the use of undergraduate students. Various compilers, word processors, graphics editors and special mathematical and electrical application programs are available for users.

28. Machine Shop: The Departmental machine shop is equipped to manufacture various parts required for research projects and laboratories. Facilities are available for turning, milling, drilling, punching and welding. A surface-grinding machine is also available for precision machining.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
MATH	119	Calculus with Analytic Geometry	(4-2)5	MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	105	General Physics I	(3-2)4	MATH	260	Basic Linear Algebra	(3-0)3
CHEM	107	General Chemistry	(3-2)4	PHYS	106	General Physics II	(3-2)4
CENG	230	Introduction to Computers and C Programming	(2-2)3	ME	105	Computer Aided Engineering Graphics	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4	EE	100	Introduction to Electrical Engineering	(1-0)NC
IS	100	Introduction to Information Technologies and Applications	NC	ENG	102	English for Academic Purposes II	(4-0)

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
PHYS	207	Concepts of Modern Physics	(3-0)3
EE	201	Circuit Theory I	(4-0)4
EE	213	Electrical Circuit Laboratory	(0-4)2
ENG	211	Academic Oral Presentation Skills	(3-0)3
Restricted Elective*			
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

EE	202	Circuit Theory II	(4-0)4
EE	212	Semiconductor Devices and Modeling	(3-0)3
EE	214	Electronics Circuit Laboratory	(0-4)2
EE	224	Electromagnetic Theory	(4-0)4
EE	230	Probability and Random Variables	(3-0)3
Non-technical Elective			
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

EE	301	Signals and Systems	(3-0)3
EE	303	Electromagnetic Waves	(3-0)3
EE	311	Analog Electronics	(3-0)3
EE	313	Analog Electronics Laboratory	(0-4)2
EE	361	Electromechanical Energy Conversion I	(3-2)4
Non-technical Elective			
EE	300	Summer Practice I	NC
TURK	303	Turkish I	NC

Sixth Semester

EE	302	Feedback Systems	(3-0)3
EE	312	Digital Electronics	(3-0)3
EE	314	Digital Electronics Laboratory	(0-4)2
EE	348	Introduction to Logic Design	(3-0)3
EE	362	Electromechanical Energy Conversion II	(3-2)4
Restricted Elective**			
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

EE	493	Engineering Design I	(1-2)2
Technical Elective***			
Technical Elective***			
Technical Elective***			
Free Elective			

Eighth Semester

EE	494	Engineering Design II	(1-2)2
Technical Elective***			
Technical Elective***			
Technical Elective***			
Technical Elective***			
EE	400	Summer Practice II	NC

All Restricted Elective courses are minimum 3 credits.

Restricted Elective*: One of the following courses: AEE 231, CHE 204, ME 351, ME 203, ME 205, METE 230.

Restricted Elective**: One of the following two courses: EE 306, EE 374

Technical Elective***: Students are requested to satisfy the core and elective requirements in one of the concentration areas given below.For the required 7 Technical Elective courses, total credits must be at least 21 and at least two of them must have laboratory work.

Biomedical Area:
Core courses: EE 415, EE 416, EE 430
Electives (Any four of the following): EE 402, EE 404, EE406 , EE 407, EE 408, EE 412,EE 413, EE 414, EE 419, EE 426, EE 427, EE 428, EE 435, EE 436, EE 441, EE 443, EE 447.

Communications Area:
Core courses: EE 430, EE 435, EE 436
Electives (Any four of the following): EE 402, EE404, EE406, EE407, EE 412, EE 413, EE 414,
EE 415, EE416, EE 419, EE 426, EE 427, EE 428, EE 438, EE 441, EE 442, EE 443, EE 444, EE 445, EE 446, EE 447.

Computers Area:
Core courses: EE 441, EE 445, EE 446, EE 447
Electives (Any three of the following): EE 402, EE 404, EE406, EE 407, EE 408, EE 412, EE 413, EE 414, EE 415, EE 416, EE419, EE 430, EE 435, EE 436, EE 442, EE 443, EE 444, EE 463, EE 464.

Control Area:
Core courses: EE 402, EE 406. EE 407, EE 430
Electives (Any three, fourth year EE Courses except): EE413, EE419, EE 426, EE 427, EE 428, EE438, EE 474,EE 475, EE 476, EE 478.

Energy Conversion and Power Electronics Area:
Core courses: EE 462, EE 463, EE 464,
Electives (Any four, fourth year EE Courses except): EE 413, EE 415, EE 426, EE 427, EE 428, EE 436.

Electronics Area:
Core courses: EE 413, EE 414, EE 419,
Electives (Any four of the following): EE 402, EE 404,EE406, EE 407, EE 408, EE 412, EE 415, EE 416, EE 426, EE 427, EE 428, EE 430, EE 435, EE 436, EE 438, EE 441, EE 442, EE 443, EE 444, EE 445, EE 446, EE 447.

Microwaves and Antennas Area:
Core courses: EE 426, EE 427, EE 428, EE 435
Electives (Any three of the following): EE 412, EE 413, EE 414, EE 415, EE 416, EE 430, EE 436, EE 438, EE 443, EE 444, EE 445, EE 447.

Power Systems Area:
Core courses: EE 471, EE 472, EE 474,
Electives (Any four of the following): EE 402, EE 404, EE 430, EE 441, EE 443, EE 447, EE 462, EE 463, EE 464, EE 475, EE 476, EE 478

DOUBLE MAJOR PROGRAM IN ELECTRICAL AND ELECTRONIC ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the Department.

MINOR PROGRAM IN TELECOMMUNICATIONS

The program's objective is to teach students fundamental aspects of telecommunication techniques and systems. Following courses on basic circuit analysis, electronics, signals and systems; basic communication techniques and their applications at system level will be given. It is expected that the program will provide an inter-disciplinary atmosphere that will help non-EE students to understand the basic aspects of telecommunications on which the whole information technologies are based.

Compulsory courses:

EE	281	Electrical Circuits	(2-2)3
EE	282	Introduction to Digital Electronics	(3-0)3
EE	230	Probability an Random Variables	(3-0)3
EE	301	Signals and Systems I	(3-0)3
EE	306	Signals and Systems II	(3-0)3
EE	435	Telecommunications I	(3-0)3
EE	436	Telecommunications II	(3-0)3

One of the following courses:

EE	430	Digital Signal Processing	(3-0)3

or

A relevant fourth year EE course approved by the department.

DESCRIPTION OF UNDERGRADUATE COURSES

EE 100 Introduction to Electrical and Electronics Engineering (1-0)NC

An orientation course introducing the students to the engineering in general and electrical and electronics engineering in particular with a discussion of the past, present and future of major areas. Course emphasizes the ethical issues in electrical engineering.

EE 201 Circuit Theory I (4-0)4

Lumped circuits: Kirchoff's laws, basic lumped elements, circuit graphs, circuit equations, linear and nonlinear resistive circuits, first and second order dynamic circuits. Introduction to operational amplifier circuits.

Prerequisite: MATH 119. Co requisite: EE 213.

EE 202 Circuit Theory II (4-0)4

Sinusoidal steady-state analysis. Three-phase circuits. Coupled inductors. Frequency response. Linear time-invariant dynamic circuits: state equations, natural frequencies, complex frequency domain analysis. Time-varying and nonlinear circuits.

Prerequisites: EE 201 and MATH 219.

EE 209 Fundamentals of Electrical and Electronics Engineering (3-0)3

Fundamental circuit laws. Resistive circuit analysis. Sinusoidal steady-state response of circuits. Three-phase circuits. Magnetic circuits and transformers. Electromechanical energy conversion. Semiconductor elements, transistor biasing and amplifiers. Operational amplifiers.

(Offered to non-EE students only)

Prerequisite: PHYS 106.

EE 212 Semiconductor Devices and Modeling (3-0)3

Basic semiconductor concepts. Physical electronics. Physics of p-n junction diodes, bipolar junction transistors (BJTs) and field effect transistors (FETs). Transistor biasing and small-signal models. Secondary effects in transistors. Dynamic models for diodes and transistors p-n-p-n switching devices. Modeling concepts for computer-aided design and introduction to circuit analysis with computer software.

Prerequisite: MATH 119.

EE 213 Electrical Circuits Laboratory (0-4)2

Safety Issues. Voltage, current, resistance and power measuring instruments; signal generators; oscilloscopes. Terminal characteristics of linear and nonlinear resistors, capacitors and inductors. Experiments on resistive operational amplifier, RC RL and RLC circuits, transformers, impedance measurement.

Corequisite: EE 201.

EE 214 Electronic Circuits Laboratory (0-4)2

Practical usage of basic instruments for measurements and analysis of electronic circuits. Experiments on rectifier diodes, Zener diodes, transistors (BJT and FET) and on circuits composed of these devices: AC and DC analyses, biasing, thermal effects.

Corequisite: EE 202.

EE 224 Electromagnetic Theory (4-0)4

Review of vector analysis. Electrostatic fields in vacuum and material bodies. Dielectric properties of materials. Electrostatic energy and forces. Steady electric current and conductors. Static magnetic fields in vacuum and in materials. Magnetic energy

and forces. Quasistatic fields and electromagnetic induction.
Prerequisites: MATH 120 and PHYS 106.

EE 230 Probability and Random Variables (3-0)3
Axiomatic definition of probability spaces. Combinatorial methods. Conditional probability; product spaces. Random variables; distribution and density functions; multivariate distribution; conditional distributions and densities; independent random variables. Functions of random variables; expected value, moments and characteristic functions.
Prerequisite: MATH 120.

EE 281 Electrical Circuits (2-2)3
Circuit laws and basic elements. Resistive circuits, analysis methods. Network theorems.
First and second order circuits. Sinusoidal steady-state analysis and power. Basic diode and transistor circuits.
(Offered to non-EE students only).
Prerequisite: MATH 120.

EE 282 Introduction to Digital Electronics (3-0)3
Semiconductor diodes. Diode characteristics. Diode circuits. Transistors, BJT, FET and integrated circuits. Inverters. TTL, MOS, ECL structures. Logic Gates. Flip-flops. Bistable, astable and monostable multivibrators. Semiconductor memories. ROM, RAM structures. Programmable logic arrays.
(Offered to non-EE students only)
Prerequisite: EE 281.

EE 300 Summer Practice I NC
Minimum four weeks (20 working days) of practical work in an organization with a sizable electrical or electronics operation. Special attention should be given to most but not necessarily all of the following subjects: production, operation, maintenance, management and safety. A formal report as described in the Summer Practice Guide is to be submitted.

EE 301 Signals and Systems I (3-0)3
Memory, causality, stability, invertibility, linearity and time-invariance Linear time-invariant systems: impulse response, convolution. Functions of a complex variable, complex series and integrals. Transform methods: Continuous time Fourier series and transform, discrete-time Fourier series and transform, Frequency response. Sampling theory. Laplace and z-transforms, system functions.
Prerequisite: MATH 219.

EE 302 Feedback Systems (3-0)3
Mathematical modeling: Transfer functions, state equations, block diagrams. System response; performance specifications. Stability of feedback systems: Routh-Hurwitz criterion, principle of argument, Nyquist stability criterion, gain margin and phase margin. Design of dynamic compensators. Analysis and design techniques using root-locus. State-space techniques: Controllability, observability, pole placement and estimator design. Discrete-time control systems.
Prerequisite: EE 301.

EE 303 Electromagnetic Waves (3-0)3
Maxwell's equations in time and frequency domains. Electromagnetic energy and power. Wave equation. Uniform plane electromagnetic waves; reflection and refraction. Introduction to transmission lines, waveguides, antennas and radiation.
Prerequisite: EE 224.

EE 306 Signals and Systems II (3-0)3
Correlation of signals. Energy and power spectral densities. Hilbert transform. Principles of modulation. Stochastic processes: Characterization, correlation functions, stationarity, ergodicity, power spectral density, transmission of random signals through linear systems. Special stochastic processes. Noise.
Prerequisites: EE 230 and EE 301.

EE 309 Fundamentals of Electrical Engineering (3-0)3
Basic electrical quantities. Fundamental circuit laws. Sinusoidal steady-state analysis and transformers. Three phase circuits. Principles of electromechanical energy conversion. DC and AC machines. Electrical safety.
(Offered to non-EE students only).
Prerequisite: PHYS 106.

EE 310 Fundamentals of Electronics Engineering (3-0)3
Operation of electronic devices. BJT and FET small signal amplifiers; power amplifiers; operational amplifiers. Silicon controlled rectifiers. Digital circuits and systems. Selected electronic systems. Electronic instruments.
(Offered to non-EE students only).
Prerequisite: EE 309.

EE 311 Analog Electronics (3-0)3
Basic single-stage transistor amplifiers and frequency responses. Multi-stage amplifiers. Feedback in amplifiers. Differential pair stages.

Current mirrors. Operational amplifiers. Power amplifiers. Power supplies and regulators.
Prerequisites: EE 201
Corequisite: EE 313.

EE 312 Digital Electronics (3-0)3
Large signal transistor models. TTL, MOS and CMOS logic gates: Inverters, input and output circuits, NAND and NOR gates; static and dynamic analyses. Regenerative circuits: Astable, monostable, bistable multivibrators and Schmitt triggers. Introduction to VLSI. Static and dynamic memories: RAM, ROM, EPROM, 5670PROM, etc. A/D and D/A converters.
Prerequisite: EE 201
Corequisite: EE 314.

EE 313 Analog Electronics Laboratory (0-4)2
Regulated DC Power Supplies, Multistage Amplifiers. High Frequency Effects. Differential Amplifiers. Feedback Amplifiers. Tuned Circuits. Power Amplifiers. Operational Amplifiers. Optoelectronic Circuits.
Corequisite: EE 311.

EE 314 Digital Electronics Laboratory (0-4)2
Diode waveshaping and compensated attenuator circuits. Transistor (BJT) switching circuits. Introduction to logic circuits. TTL, and CMOS NAND gates. Parallel adders, subtractors, and complementers. 430 Comparators with hysteresis. Multivibrator circuits using CMOS gates. Flip flop. Counters.
Corequisites: EE 312 and EE 348.

EE 348 Introduction to Logic Design (3-0)3
Binary systems and Boolean algebra. Boolean function simplification. Combinational logic. Sequential synchronous logic. Registers and counters.
Corequisite: EE 314.

EE 361 Electromechanical Energy Conversion I (3-2)4
Electrical safety. Electromagnetic circuits. Properties of ferromagnetic materials. Single-phase and three phase transformers. Per Unit System. Principles of electromechanical energy conversion: Linear and nonlinear systems; singly and multiply excited translational and rotational systems. DC machines: Theory, generators, motors, speed control.
Prerequisites: EE 202 and EE 224.

EE 362 Electromechanical Energy Conversion II (3-2)4
Electromagnetic fields created by AC electric machine windings: pulsating and rotating magnetic fields, emf induced in a winding. Induction machines: equivalent circuit, steady-state analysis, speed control. Synchronous machines: equivalent circuit, steady-state analysis, stability. Single-phase induction machines. Special electrical machines.
Prerequisite: EE 361.

EE 374 Electrical Equipment and Applications (3-0)3
Introduction to power supplies and systems. Short circuit phenomena and analysis in low voltage systems. Protection concept, devices and applications in electrical systems. Characteristics and applications of circuit breakers, relays and fuses. Power and installation cables and applications. Power and energy measurement techniques and devices. Reactive power compensation. Battery plants and UPS systems. Lighting sources and installations. Electrical safety and earthing systems.
Prerequisite: EE 202.

EE 381 Systems and Control (3-0)3
Modeling dynamic systems in engineering, industry and economics. Time domain analysis. Controllability and observability. Fourier series, Fourier and Laplace transforms, transfer function. Relationship between time and frequency domain representations.
Offered to non-EE students only.
Prerequisite: MATH 219.

EE 400 Summer Practice II NC
Minimum four weeks (20 working days) of practical work in an organization with a sizable electrical or electronics operation. Special attention should be given to most but not necessarily all of the following subjects: maintenance, production planning, management, quality control and design. A formal report as described in the Summer Practice Guide is to be submitted.

EE 402 Discrete Time Systems (3-0)3
Importance and advantages of discrete time system models in control. Time domain analysis of discrete-time systems. Sampled data systems. Stability; translation of analog design. State space design methods: observer theory, introduction to optimal design methods. Quantization effects.
Prerequisite: EE 302.
Corequisite: EE 406.

EE 404 Nonlinear Control Systems (3-0)3
State-space analysis methods. Isocline Lienard's methods, classification of singularities. Analytic

techniques of periodic phenomena: Perturbation method. Stability definitions. Lyapunov's second method; Popov stability criterion. The method of harmonic realization: Describing functions. Dual-input describing functions. Equivalent linearization and oscillations in nonlinear feedback systems.
Prerequisite: EE 302.

EE 406 Laboratory of Feedback Control Systems (0-4)2
Digital control of linear and nonlinear electromechanical systems; components of a digital control system; simulation models; Proportional-Derivative (PD) position control; lead-compensator speed control; pole-placement based state-space control of nonlinear cart-pendulum system; Optimal Linear Quadratic Regulator (LQR) based state-space control of flexible-joint and inverted pendulum systems; more advanced electromechanical control examples.
Prerequisite: EE 302.
Corequisite: EE 402.

EE 407 Process Control (3-2)4
Control of industrial processes: Mathematical modeling of fundamental distributed parameter processes. Lumped parameter approximation. Disturbance filtering characteristics of control loops. Proportional, integral, derivative, on-off, floating modes of controls, feedforward and cascade types of loops. Minimization of integral square error. Characteristics of flow, pressure and level control loops and final control elements. Fundamentals of control of basic processes such as heat exchange, distillation, combustion, drying. Organization of direct digital control loops.
Prerequisite: EE 302.

EE 408 Process Instrumentation and Control (3-2)4
Identification, measurement and instrumentation for the control of industrial processes. Review of stochastic processes. Minimization of the integral square error for stochastic inputs. Fundamental identification techniques, sine, step, pulse inputs, pseudo-random binary sequences and correlation methods. Continuous cycling and reaction curve methods for the adjustment of controller parameters. Fundamentals of sensors and instrumentation for temperature, pressure, level, flow, gas composition and pH. Pneumatic and electronic transmitters, converters, controllers. Selection A/D, D/A converters.
Prerequisite: EE 302.

EE 412 Nonlinear Electronics for Communications (3-2)4
Nonlinear controlled sources: piecewise linear, square-law, exponential and differential pair characteristics. Low level amplitude modulation and analog multiplication. Narrowband transformer like coupling networks. Nonlinear loading of tuned circuits. Tuned large signal transistor amplifiers and frequency multipliers. Sinusoidal oscillators. Frequency mixers and converters.
Prerequisite: EE 311.

EE 413 Introduction to VLSI Design (3-0)3
Design techniques for rapid implementations of very large-scale integrated (VLSI) circuits, metal oxide semiconductor (MOS) technology and logic. Structured design. Design rules, layout procedures. Design aids: layout, design rule checking, logic, and circuit simulation. Timing. Testability. Projects to develop and lay out circuits.
Prerequisites: EE 312 and EE 348.

EE 414 Introduction to Analog Integrated Circuits (3-0)3
Analysis and design of bipolar junction transistor (BJT) and metal oxide semiconductor field-effect transistor (MOSFET): multi- stage amplifiers. Analog integrated circuit (IC) building blocks/sub-circuits. Biasing circuits. Differential pairs. Complementary Metal Oxide Semiconductor (CMOS) operational amplifier topologies. Stability analysis and pole-zero cancellation in operational amplifiers. Differential and regenerative comparators.
Prerequisites: EE 311.

EE 419 Solid State Devices (3-0)3
Introduction to quantum theory of solids, semiconductor fundamentals and carrier transport, p-n and metal-semiconductor junctions, bipolar junction transistors (BJTs) and metal oxide semiconductor field-effect transistors (MOSFETs): principles, modeling and advanced issues, heterojunctions and advanced electron devices, optical properties of semiconductors, optical devices: photodetectors, solar cells, light emitting diodes and lasers.
Prerequisites: EE 212.

EE 415 Introduction to Medical Imaging (3-0)3
Fundamentals of X-ray, generation and detection of X-rays, X-ray diagnostic methods, X-ray image characteristics, biological effects of ionizing radiation. Fundamentals of acoustic propagation, generation and detection of ultrasound, ultrasonic diagnostic methods, biological effects of ultrasound. Fundamentals of radionuclide imaging, generation and detection of nuclear emission, radionuclide

imaging methods, radiation dosimetry and biological effects. Fundamentals of magnetic resonance imaging, generation and detection of NMR signal, imaging methods, biological effects of magnetic fields.
Prerequisite: EE 301.

EE 416 Fundamentals of Biomedical Engineering (3-2)4
Fundamentals of biomedical signals, measurement and instrumentation; biomedical transducers; membrane biophysics, electrophysiology of excitable cells, membrane models; theory of bioelectrical signals, electrocardiography (ECG), electroencephalography (EEG), electromyography (EMG); biopotential electrodes; biopotential amplifiers and instrumentation techniques, electrical and patient safety; examples of monitoring, therapeutic and prosthetic devices..
Prerequisite: EE 311.

EE 426 Antennas and Propagation (3-2)4
Antenna parameters. Linear antennas. Influence of earth on antenna radiation pattern and impedance. Radiation from slot and aperture antennas. Antenna arrays and the general array formula. Baluns. Receiving antenna theory. Elements of groundwave, tropospheric and ionospheric propagation.
Prerequisite: EE 303.

EE 427 Microwaves I (3-2)4
TEM mode transmission lines. Field and distributed circuit analysis. Frequency and time domain analysis. Waveguiding structures. Rectangular and circular waveguides. Impedance transformations and matching techniques. Scattering matrix of microwave junctions.
Prerequisite: EE 303.

EE 428 Microwaves II (3-2)4
Passive reciprocal and nonreciprocal devices. Electromagnetic resonators. Periodic structures and microwave filters. Microstripline structures and coupled lines. Solid state microwave devices.
Prerequisite: EE 427.

EE 430 Digital Signal Processing (3-0)3
Discrete-time signals and systems. Discrete Fourier transform. Sampling and reconstruction. Linear time-invariant systems. Structures for discrete-time systems. Filter design techniques. Fast Fourier Transform methods. Fourier analysis of signals using discrete Fourier transform. Optimal filtering and linear prediction.
Prerequisite: EE 301.

EE 435 Telecommunications I (3-0)3
Amplitude and angle modulation techniques: Amplitude Modulation, Double Side Band, Single Side Band, Vestigial Side Band, Quadrature Amplitude Modulation, Frequency Modulation, Pulse Modulation. Phase-locked loops. Superheterodyne receivers. Frequency division multiplexing. Television. Noise in CW systems.
Prerequisite: EE 306.

EE 436 Telecommunications II (3-0)3
Pulse modulation: Sampling process, pulse-amplitude modulation, time-division multiplexing, quantization, pulse-code modulation. Line codes. Baseband pulse transmission. Digital passband transmission. Introduction to information theory and error control coding.
Prerequisite: EE 435.

EE 438 Optical Communication Systems (3-2)4
Fiber optics, guiding of light waves, dispersion, attenuation, and nonlinear properties of fibers. Optical modulation schemes. Resonator optics, photonic components, optical interconnects and amplifiers. Photonic switching and fiber optic telecommunication links.
Prerequisite: EE 303.

EE 441 Data Structures (3-0)3
Arrays, stacks, queues, linked lists, trees, hash tables, graphs: Algorithms and efficiency of access. Searching and sorting algorithms.
Prerequisite: CENG 230.

EE 442 Operating Systems (3-0)3
Introduction to operating systems, concurrent processes, process scheduling, memory management, virtual memory, deadlocks, distributed systems, introduction to Unix, the file system, using the shell, filters, shell programming.
Prerequisite: CENG 230.

EE 443 Computational Methods in Electrical Engineering (3-0)3
Numerical errors and their estimation. Approximation and interpolation. Roots of equations. Solutions of linear and nonlinear simultaneous equations. Numerical differentiation and integration. Solution of ordinary and partial differential equations. Introduction to statistical methods.
Prerequisites: CENG 230 and MATH 219.

EE 444 Introduction to Computer Networks (3-0)3
Seven layered ISO-OSI model, the medium access sublayer, ALOHA and local area network protocols, IEEE 802.2 and ethernet, the data link layer, error

detection and correction, data link protocols, the network layer, routing, congestion control, internetworking, the transport layer, Internet and Internet tools.
Prerequisite: EE 230.

EE 445 Computer Architecture I (3-0)3
Asynchronous logic system. Algorithmic state machines. CPU organization. Construction of arithmetic logic unit. Process control architectures. Instruction modalities. Microprogramming. Bit slicing.
Prerequisite: EE 348.

EE 446 Computer Architecture II (3-2)4
Arithmetic processor design, arithmetic algorithms. Memory organization, parallel processing, multiprocessors systems. Peripheral organization. I/O processing. I/O controllers.
Prerequisite: EE 445.

EE 447 Introduction to Microprocessors (3-2)4
Microprocessor architecture; a particular microprocessor software. I/O interfacing. Interrupt processed I/O. Direct memory access. Microprocessor based communications.
Prerequisites: EE 314 and EE 348 or consent of the department .

EE 462 Utilization of Electrical Energy (3-2)4
Basic operating characteristics and classification of electrical drives. Solid state DC motor control. Solid state AC motor control. Dynamic behavior of electrical machines. Electric braking. Starting of electrical machines. Intermittent loads. Drive applications. Modern methods of reactive power compensation. Electrical energy saving.
Prerequisites: EE 362 and EE 463.

EE 463 Static Power Conversion I (3-2)4
Power switches and their characteristics. Power converter definitions, classification. VTA method. Midpoint and bridge rectifiers: non-ideal commutation, harmonics, input power factor, utility-factor, winding utilization and unbalances in rectifier transformers. Applications.
Prerequisites: EE 212 and EE 361.

EE 464 Static Power Conversion II (3-0)3
Introduction to forced commutated circuits, analysis, classification of techniques. Centretap inverter. Voltage-fed inverters; waveshaping; PWM, stepped and square-waveforms, voltage regulation, harmonics. Current-fed inverters; analysis, effect of SCR turn-off time on voltage waveform, overlap. DC-DC switching converters; time-ratio control, effect of loading, parameter optimization. Device failure mechanisms. Thermal considerations, maximum ratings, protection of switching elements. Series and parallel operation of switching elements.
Prerequisite: EE 463.

EE 471 Power System Analysis I (3-0)3
Basic structure of electrical power systems. Electrical characteristics of transmission lines, transformers and generators. Representation of power systems. Per Unit System. Symmetrical three-phase faults. Symmetrical components. Unsymmetrical faults.
Prerequisite: EE 361.

EE 472 Power System Analysis II (3-2)4
Matrix analysis of power systems networks and methods of solution. Load flow and short circuit analysis. Economic operation of power systems. Transient stability analysis.
Prerequisite: EE 471.

EE 474 Distribution Systems (3-0)3
Basic considerations. Load characteristics and forecasting methods. Distribution substations. Subtransmission, primary and secondary distribution. Choice of voltage levels. Operational characteristics of cables, aerial lines and transformers. System voltage regulation. Power factor correction. Fusegear, switchgear, current and voltage transformers. Overcurrent and thermal protection. Earthing methods. Economics of distribution systems.

EE 475 High Voltage Techniques I (3-2)4
Field analysis: experimental and numerical (finite difference, finite element and charge simulation) methods and applications. Electrical breakdown in gases: ionization processes. Townsend's breakdown criterion, Paschen's Law, bread-down in electronegative gases, time lags. Streamer-Kanal mechanism, breakdown in non-uniform field and corona. Electrical break-down of liquids: breakdown mechanism of pure and commercial liquids. Electrical breakdown of solids: Intrinsic, electromechanical, thermal and erosion mechanism. Insulating materials: dielectric gases; insulating oils and solid dielectrics.
Prerequisite: EE 224.

EE 476 High Voltage Techniques II (3-2)4
Generation and measurement of high AC, DC and impulse voltages and impulse currents: AC to DC conversion and electrostatic generators. Testing transformers and series resonant circuits. Impulse

voltage generator circuits. Operation, design and construction of impulse generators. Impulse current generator circuits. Sphere and uniform fieldgaps. Electrostatic, generating and peak voltage measuring voltmeters. Voltage dividers. Measurement of impulse voltages and currents. Dielectric measurements.
Prerequisite: EE 361.

EE 478 Power System Protection (3-0)3
Current and voltage transformers. Overcurrent protection. Comparators and static relay circuits. Differential protection and its application to generators, transformers and bus bars. Motor protection. Pilot wire protection of feeders. Introduction to distance and other protection systems.
Prerequisite: EE 471.

EE 493 Engineering Design I (1-2)2
Fundamentals of design, project management, design tools, simulation, standards and safety, quality concepts, ethics, design experience through a team project.
Prerequisite: EE313 and two courses among EE 302, EE 314 and EE 361.

EE 494 Engineering Design II (1-2)2
Continuation of Engineering Design I with topics covering statistics, reliability, engineering economics, ethics and completion of a team project with a final report and presentation.
Prerequisite: EE 493.

EE 495-499 Special Topics in Electrical and Electronics Engineering (3-0)3
These code numbers will be used for courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

GRADUATE CURRICULUM

M.S. in Electrical and Electronics Engineering

EE	500	M.S. Research and Thesis	NC
EE	590	Seminar	(0-2)NC

7 elective courses

Total Minimum Credit 21
Number of courses with credit (min): 7

Ph.D. in Electrical and Electronics Engineering

If admitted by M.S. degree:

EE	600	Ph.D. Research and Thesis	NC

8 elective courses

Total Minimum Credit 24
Number of courses with credit (min): 8

If admitted by B.S. degree:

EE	600	Ph.D. Research and Thesis	NC
EE	590	Seminar	(0-2)NC

15 elective courses

Total Minimum Credit 45
Number of courses with credit (min): 15

M.S. in Biomedical Engineering

EE	500	M.S. Research and Thesis	NC
EE	515	Bioelectricity and Biomagnetism	(3-0)3
EE	519	Medical Imaging	(3-0)3
EE	590	Seminar	(0-2) NC

5 Elective courses

Total Minimum Credit: 21
No of the Courses with credit(min): 7

Ph.D. in Biomedical Engineering

If admitted by M.S. degree:

EE	600	Ph.D. Research and Thesis	NC

8 Elective courses
Total minimum credit: 24
No of courses with credit (min): 8

If admitted by B.S. degree:

EE	600	Ph.D. Research and Thesis	NC
EE	515	Bioelectricity and Biomagnetism	(3-0)3
EE	519	Medical Imaging	(3-0)3
EE	590	Seminar	(0-2)NC

13 elective courses

Total Minimum Credit 45
Number of courses with credit (min): 15

GRADUATE COURSES

First Semester

EE	500	M.S. Research and Thesis	NC
EE	501	Linear Systems Theory I	(3-0)3
EE	503	Signal Analysis and Processing	(3-0)3
EE	505	Multiresolution Signal Processing	(3-0)3
EE	507	Analog Filters	(3-0)3
EE	509	High Frequency Filter Design	(2-2)3
EE	510	Analog Integrated Circuits	(3-0)3
EE	511	Communication Electronics	(3-0)3
EE	513	Transport Phenomena in Semiconductor Devices	(3-0)3
EE	514	Infrared Devices and Systems	(3-0)3
EE	515	Bioelectricity and Biomagnetism	(3-0)3
EE	517	Therapeutic and Prosthetic Devices in Biomedical Engineering	(3-0)3

EE	519	Medical Imaging	(3-0)3	EE	577	Advanced Power System Protection	(3-0)3
EE	521	Analytical Methods for Electromagnetics	(3-0)3	EE	579	Economic Operation of Power Systems	(3-0)3
EE	523	Electromagnetic Wave Theory	(3-0)3	EE	583	Pattern Recognition	(3-0)3
EE	525	Antenna Engineering	(3-0)3	EE	587	Introduction to Robotics	(3-0)3
EE	527	Microwave Engineering	(3-0)3	EE	590	Seminar	(0-2)NC
EE	531	Probability and Stochastic Processes	(3-0)3	EE	600	Ph.D. Research and Thesis	NC
EE	533	Information Theory	(3-0)3	EE	601	Functional Analysis and Operator Theory with Applications	(3-0)3
EE	535	Communication Theory	(3-0)3	EE	603	Spectral Estimation	(3-0)3
EE	543	Neurocomputers	(3-0)3	EE	611	Plasma Engineering	(3-0)3
EE	545	Switching and Automata Theory I	(3-0)3	EE	613	Beam Electronics	(3-0)3
EE	547	Parallel Computer Architectures	(3-0)3	EE	615	Optoelectronics	(3-0)3
EE	549	Parallel and Distributed Computing	(3-0)3	EE	617	Principles of Analog VLSI Design	(3-0)3
EE	551	Multivariable Control Systems I	(3-0)3	EE	621	Theory of Acoustic Wave	(3-0)3
EE	553	Optimization	(3-0)3	EE	625	Fundamentals of Radar Systems I	(3-0)3
EE	555	Stability Theory of Dynamical Systems	(3-0)3	EE	627	Principles of Modern Optical Systems	(3-0)3
EE	557	Estimation Theory	(3-0)3	EE	633	Digital Speech Processing	(3-0)3
EE	559	Intelligent Control	(3-0)3	EE	635	Fourier Optics	(3-0)3
EE	561	Advanced Static Power Conversion	(3-0)3	EE	637	Digital Radio Communications	(3-0)3
EE	563	Generalized Electrical Machine Theory	(3-0)3	EE	647	Microprocessor Systems Engineering	(3-0)3
EE	565	Vector Control of Electrical Drives	(3-0)3	EE	655	Chaotic Dynamics	(3-0)3
EE	569	Special Topics in Power Electronics	(3-0)3	EE	671	Modern Power System Operation and Control Techniques	(3-0)3
EE	571	Wave Propagation in Power Systems	(3-0)3	EE	5410	High-speed and Embedded Computer Networking	(3-0)3
EE	573	Power System Stability and Dynamics	(3-0)3	EE	7XX	Special Topics in Electrical and Electronics Eng.	(3-0)3
EE	575	Advanced High Voltage Techniques	(3-0)3	EE	8XX	Special Studies	(4-2)NC
				EE	9XX	Advanced Studies	(4-0)NC

Second Semester

EE	500	M.S. Research and Thesis	NC	EE	528	Microwave Theory	(3-0)3
EE	502	Linear Systems Theory II	(3-0)3	EE	534	Coding Theory	(3-0)3
EE	504	Adaptive Signal Processing	(3-0)3	EE	536	Digital Communication Systems	(3-0)3
EE	508	Digital Filters	(3-0)3	EE	538	Telecommunication Networks	(3-0)3
EE	512	Introduction to Optical Fiber Communications	(3-0)3	EE	542	Computer Networks	(3-0)3
EE	516	BioMEMS and Biosensors	(3-0)3	EE	544	Algorithms and Computational Complexity	(3-0)3
EE	518	Physiological Control Systems Analysis	(3-0)3	EE	546	Switching and Automata Theory II	(3-0)3
EE	522	Numerical Methods for Electromagnetics	(3-0)3	EE	548	Microprocessors and Applications	(3-0)3
EE	524	Electromagnetic Wave Propagation	(3-0)3	EE	552	Multivariable Control Systems II	(3-0)3
EE	526	Antenna Theory	(3-0)3				

EE	554	Optimal Control Theory	(3-0)3
EE	558	System Identification and Adaptive Control	(3-0)3
EE	564	Design of Electrical Machines	(3-0)3
EE	566	Electrical Heating and Applications	(3-0)3
EE	568	Selected Topics on Electrical Machines	(3-0)3
EE	572	Insulation Coordination	(3-0)3
EE	574	Power System Real-Time Monitoring and Control	(3-0)3
EE	576	High Voltage Measurement Techniques	(3-0)3
EE	578	Power System Planning	(3-0)3
EE	584	Machine Vision	(3-0)3
EE	586	Artificial Intelligence	(3-0)3
EE	588	Robot Hand: Dynamics of Manipulation	(3-0)3
EE	590	Seminar	(0-2)NC
EE	600	Ph.D. Research and Thesis	NC
EE	604	Sensor Array Signal Processing	(3-0)**3**
EE	610	Integrated Sensors and Sensor Systems	(3-0)3
EE	612	Fundamentals of Fusion Plasma Systems	(3-0)3
EE	614	Principles of Laser Engineering	(3-0)3
EE	616	Nuclear Electronics and Instrumentation	(3-0)3
EE	618	Principles of Digital CMOS VLSI Design	(3-0)3
EE	619	High Speed Semiconductor Devices and Circuits	(3-0)3
EE	624	High Frequency Methods in Electromagnetics	(3-0)3
EE	626	Fundamentals of Radar Systems II	(3-0)3
EE	634	Digital Image Processing	(3-0)3
EE	636	Digital Video Processing	(3-0)3
EE	642	Introduction to Mathematical Bases of Computer Graphics	(3-0)3
EE	644	Multimedia and Wireless Data Networks	(3-0)3
EE	674	Computational Tech. in Power Sys. Analysis	(3-0)3
EE	5290	Microwave Circuit Design	(3-0)3
EE	7XX	Special Topics in Electrical and Electronics Eng.	(3-0)3
EE	8XX	Special Studies	(4-2)NC
EE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

EE 500 M.S. Research and Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters while the research program or write up of thesis is in progress. Student must start registering to this course no later than the second semester of his/her M.S. study.

EE 501 Linear Systems Theory I (3-0)3
Linear spaces: fields, linear independence, basis, direct sum decomposition, normed linear spaces, convergence concepts, Banach spaces. Linear transformations: null and range spaces, matrix representation, block diagonal form. Linear transformations defined by a square matrix characteristic and minimal polynomials, direct sum decomposition of Cn, Jordan canonical form, functions of a square matrix. Hilbert spaces: inner product, concept of orthogonality, Hermitian matrices, projection theorem, systems of linear algebraic equations, general Fourier series

EE 502 Linear Systems Theory II (3-0)3
Differential equations: existence and uniqueness, linear differential equations, stability of solutions, variational equation, periodically time-varying differential equations. Difference equations. Dynamical system representations: equivalence, linearity, time-invariance. Differential system representations: impulse response, system function, stability, algebraic equivalence, duality, controllability, observability, realizations. Transform techniques.

EE 503 Signal Analysis and Processing (3-0)3
Signal representation and classification.
Deterministic signals. Random signals. Noise. Analytic signal and complex envelope. Signal processing systems. Signal sampling. Modulation and frequency translation. Spectrum analysis. Detection and estimation.

EE 504 Adaptive Signal Processing (3-0)3
Overview of discrete-time stochastic processes. Wiener filter theory. Linear prediction. LMS algorithm and its variants. Frequency domain adaptive filtering; RLS, QR-RLS algorithms and their connection to Kalman Filtering. Order recursive adaptive filters; QRD-LSL algorithm and

its variants. Analysis and discussion of adaptation algorithms and their convergence properties. Computational complexity considerations. Filter structures and algorithms for fast adaptation and real-time processing. Numerical stability of fast algorithms. IIR adaptive filters. Applications of adaptive filtering.

EE 505 Multiresolution Signal Processing (3-0)3
Fundamentals of signal decompositions. Time-frequency representations. Filter banks. Wavelets. Efficient algorithms. Signal compression and subband coding.

EE 507 Analog Filters (3-0)3
Review of continuous-time signals and systems. Concept of filtering. Butterworth, Chebyshev, elliptic, filters., etc. Frequency transformations. Phase and loss equalizers. Synthesis of passive filter networks. Active filters. Switched capacitor filters.

EE 508 Digital Filters (3-0)3
Review of discrete-time signals and systems. Infinite impulse response and finite impulse response digital filter design techniques. Wave digital filters. Finite word-length effects.

EE 509 High Frequency Filter Design (2-2)3
Synthesis of lumped element filters. Lumped element filter design using prototypes. Circuit transformation for realization of lumped element filters. Synthesis of distributed element filters. Distributed element filter design using prototypes. Circuit transformation for realization of distributed element filters.

EE 510 Analog Integrated Circuits (3-0)3
Review of bipolar transistor operation, small signal model, and single stage amplifiers. Power supply rejection and voltage references. Noise models and calculations with noise. Equivalent noise generators for bipolar and MOS transistors. Harmonic distortion and inter-modulation. Application of noise and distortion analysis to RF circuit components (Low noise amplifiers, mixers and voltage controlled oscillators, oscillators).

EE 511 Communication Electronics (3-0)3
Small and large signal HF amplifier design. HF oscillators. Noise considerations in RF amplifiers. RF amplifiers. Microstrip and stripline techniques. Transistor and amplifier measurement techniques. Computer aided design of amplifiers.
Prerequisite : EE 412

EE 512 Introduction to Optical Fiber Communications (3-0)3
Optical propagation in fibers, attenuation, scattering, dispersion, polarization and non-linear phenomena in transmission. Optical sources and optical detectors. Coupling of sources and detectors to optical fibers, splicing and optical connectors. Non-coherent receivers and their performance, non-coherent optical fiber communication systems. Coherent optical fiber communication systems with heterodyne and homodyne demodulation. Optical fiber amplifiers, frequency division multiplexing and time division multiplexing.

EE 513 Transport Phenomena in Semiconductor Devices (3-0)3
Crystal structure and band theory of electronic conduction, carrier scattering, the Boltzmann Transport Equation, low and high field transport in GaAs, InP and other III-V compounds, properties of interest for device applications, semi-classical non-stationary charge transport models, submicron device modeling and simulation techniques, Monte Carlo simulations.

EE 514 Infrared Devices and Systems (3-0)3
Infrared radiation fundamentals, basics of thermal imaging, characteristics of infrared detectors, photon sensors and uncooled thermal detectors, characterization of infrared systems, industrial and other applications of thermal imaging.

EE 515 Bioelectricity and Biomagnetism (3-0)3
Vector analysis. Electrical sources and fields. Introduction to membrane biophysics. Action potentials. Volume conductor fields. Electrophysiology of the heart. Electrocardiography (ECG). Electric and magnetic lead fields. Electroencephalography (EEG).
Magnetoencephalography (MEG).

EE 516 BioMEMS and Biosensors (3-0)3
BioMEMS introduction. Microfabrication process review. Microfluidic control with electrostatic and electromagnetic techniques. Micro total analysis systems. Lab-on-a-chip devices. Biosensor arrays and implantable devices. Electronic interface for biosensors. Rare cell detection. Microsurgical tools, microneedles and drug delivery.

EE 517 Therapeutic and Prosthetic Devices in Biomedical Engineering (3-0)3

Cardiovascular instrumentation, prosthesis and assist devices. Neuromuscular prosthetics and orthotics. Respiratory therapy equipment and instrumentation. Anesthesia delivery apparatus and applications. Sensory communication aids. Internal prosthetic and orthotics. Electrosurgery and related equipment. Instrumentation related to metabolic systems. Medical imaging systems. Radiation therapy.

EE 518 Physiological Control Systems Analysis (3-0)3

Definition of and examples on homeostasis. Body fluid compartments and compartmental analysis. Models of the cardiovascular and respiratory systems. Hormonal control mechanisms. Neutral control mechanisms. Regulation of body fluid volumes and electrolytes. Mathematical modeling, simulation and identification of physiological systems; associated numerical methods.

EE 519 Medical Imaging (3-0)3

Physical principles of x-Ray NMR, ultrasound and nuclear imaging as applied to medicine. Mathematical formulation of the imaging problem for these modalities. Backprojection, convolution, Fourier and Algebraic techniques of image reconstruction. Data acquisition techniques and hardware considerations. New imaging modalities and application areas.

EE 521 Analytical Methods for Electromagnetics (3-0)3

Sturm-Liouville problems, one dimensional Green's functions in closed form and in eigenfunction series, separation of variables, higher dimensional Green's function in rectangular, cylindrical and spherical coordinates, relation with the solution of EM related inhomogeneous partial differential equations, Watson transformation, plane-wave spectrum representations, the T-Matrix method, vector wave functions, dyadic Green's functions in closed form and wave function expansions.

EE 522 Numerical Methods for Electromagnetics (3-0)3

Numerical solution of matrix equations and matrix eigenvalue problems. Method of moments. Finite difference and finite element methods. Variational methods. Spectral domain approach. The use of above methods in the solution of various antenna and scattering problems, and in the analysis of passive microwave components.

EE 523 Electromagnetic Wave Theory (3-0)3

Fundamental concepts and theorems. Plane wave functions; modal expansion. Cylindrical wave functions. Spherical wave functions. Wave transformations.

EE 524 Electromagnetic Wave Propagation (3-0)3

Wave propagation fundamentals. Ground wave propagation; spherical earth problem. Tropospheric propagation; troposcatter systems, iono-spheric propagation. Measurement and modeling of environmental noise. Antenna noise temperature.

EE 525 Antenna Engineering (3-0)3

Review of field equivalence principles, surface wave antennas, microstrip antenna elements and arrays, broadband antennas, introduction to reflector antenna systems, smooth walled and corrugated horns.

EE 526 Antenna Theory (3-0)3

Induced current and aperture integration formulations, the Huygens-Fresnel principle, geometrical optics, the plane wave spectrum representation, fast analysis of aperture type antennas, fast and slow wave structures, array analysis and synthesis techniques.

EE 527 Microwave Engineering (3-0)3

Matrix representation of microwave networks. Properties of scattering parameters. Generalized scattering parameters. Microwave transistor amplifier design; gain stability, noise. Microwave transistor oscillator and mixer design. Simplified signal flow graph analysis. Coupled lines, directional coupler, Schiffman's differential phase shifter. Hybrids and power dividers. Richard's frequency: transformation, Richards' theorem. Kuroda's identifies.

EE 528 Microwave Theory (3-0)3

Microwave classic filter design. Generalized coupled line analysis. Coupled line equivalent circuits. Exact microwave filter synthesis. Analysis of arbitrary connected microwave networks. Sensitivity analysis of microwave circuits. Theory of broad-band matching.

EE 531 Probability and Stochastic Processes (3-0)3

Review of probability theory and random variables. Sequence of random variables, convergence concepts. Stochastic processes: correlation and power spectra, stationarity, linear systems with random inputs, second order processes; stochastic continuity, differentiation and integration in quadratic mean; Gaussian processes; Poisson

processes, shot noise; Markov processes; orthogonal expansions, least mean square error estimation.

EE 533 Information Theory (3-0)3
Mathematical analysis of discrete and continuous information sources and communication channels. Concepts of mutual information and entropy as mathematical measures for sources and channels. Introduction to rate distortion theory. Channel capacity, source and channel coding theorems.

EE 534 Coding Theory (3-0)3
The arithmetic of Galois fields. Linear block codes with particular emphasis on cyclic codes, such as BCH and RS codes. Convolutional codes. Efficient decoding algorithms for block and convolutional codes. Concatenation and interleaving of codes.

EE 535 Communication Theory (3-0)3
Detection theory: binary M-ary hypothesis testing. Estimation theory. Representation of stochastic processes: Karhunen-Loeve expansion. Detection and estimation of signal parameters in white and colored noise. Estimation of continuous waveforms. Optimum linear realizable processor: Wiener-Hopf equation and its solution.

EE 536 Digital Communication Systems (3-0)3
Baseband pulse transmission. Modulation of digital signals: ASK, FSK, PSK, OAM, OPSK, MSK systems. Equalizers. Carrier and bit synchronization.

EE 538 Telecommunication Networks (3-0)3
Overview of existing analog and digital telephone networks. Review of voice digitization, digital transmission and multiplexing. Digital Switching. Network synchronization. Control and Management. Fundamentals of fiber optic transmission systems. Data and Integrated services digital networks (ISDN). Traffic analysis.

EE 542 Computer Networks (3-0)3
The layered architecture, Local Area Networks, data link protocols, error correction with FEC and ARQ, routing, flow control, transport protocols, application layer protocols, recent subjects in networking.

EE 543 Neurocomputers (3-0)3
Introduction, computer models of neuron. Supervised and unsupervised learning, Hopfield nets, Perceptrons. Backprogation learning algorithms. Self organization and memories. Neurocomputing for pattern recognition, expert systems, and optimization problems. Analogy between Neurocomputers and computation in Cerebral Cortex. Characteristic differences between Digital and Neurocomputers.

EE 544 Algorithms and Computational Complexity (3-0)3
Introduction to algorithms and computational complexity. Growth of functions. Recursion. Polynomial time algorithms and the class P. Turing machines. Intractable problems and the class NP. Reducability. NP completeness. Cook's theorem. Backtracking. Approximate algorithms for hard problems.

EE 545 Switching and Automata Theory I (3-0)3
Synchronous sequential circuits. State equivalence and machine minimization. State identification and fault detection experiments. Memory-span aspects of finite automata. Information losslessness and unique decipherability.

EE 546 Switching and Automata Theory II (3-0)3
Introduction to formal languages. Regular languages and finite automata. Context-free languages and pushdown automata. Turing Machines. Church's Thesis. Unsolvability and computable functions.

EE 547 Parallel Computer Architectures (3-0)3
Multiprocessors, interconnection schemes, shared memory vs. distributed systems, granularity, cache coherence, synchronization, pipelined processors, process creation and switching problems, load balancing, automatic detection of parallelism.

EE 548 Microprocessors and Applications (3-0)3
Intel 8086 microprocessor, 8087 and 8089 coprocessors, Intel 80286 microprocessor, pipelined execution, Motorola 68020 microprocessor, coprocessors of 68020, architecture of Intel 80386, 80486 and 860 microprocessor, transputer.

EE 549 Parallel and Distributed Computing (3-0)3
Parallel and distributed architectures: models and complexity measures, communication aspects, synchronization issues. Synchronous algorithms: algorithms for systems of linear equations, direct and iterative methods, nonlinear problems, shortest paths and dynamic programming. Totally and partially asynchronous algorithms. Organization of asynchronous network of processors: termination detection, snap-shots, synchronization using

rollback, asynchronous simulation, maintaining communication with a center.

EE 551 Multivariable Control Systems I (3-0)3

State space characterization of linear multivariable systems. Concepts of controllability, observability and stability. Structural equivalence. Luenberger canonical forms. State feedback and pole placement. Design of observers. Dynamic output feedback. Strong observability. A survey of current research topics in control science.

EE 552 Multivariable Control Systems II (3-0)3

System models; system matrices; decoupling zeros; standard forms of system matrices. Stability and design of multivariable control systems using frequency domain methods: Inverse Nyquist array and characteristic loci design techniques, and their applications to industrial plants. A survey of current research topics in multivariable control systems.

EE 553 Optimization (3-0)3

Mathematical preliminaries on functions of several variables. Convexity and convex functions. Unconstrained minimization problems. Computational algorithms such as steepest descent, Newton and quasi-Newton methods. Constrained minimization problems and Kuhn-Tucker theory. Fundamental theorems of linear optimization and the simplexs algorithm.

EE 554 Optimal Control Theory (3-0)3

Examples of optimal control problems. Calculus of variations and necessary conditions of optimality. Pontryagin's maximum principle. Minimum time and minimum energy problems. Linear-quadratic optimal control problems. Computational algorithms such as steepest descent, variation of extremals, quasilinearization.

EE 555 Stability Theory of Dynamical Systems (3-0)3

Review of dynamical system models, classification of equilibrium solution. Results on 2-dimensional systems; Poincare-Bendixon theory for limit cycles. Liapunov theory; definitions of stability and applications to linear and nonlinear feedback systems. Input/output stability; definitions and derivation of frequency response criteria for stability.

EE 557 Estimation Theory (3-0)3

Gauss-Markov process and stochastic differential equations. Bayesian estimation theory. Maximum likelihood, linear minimum variance and least-square estimations. Properties of estimators; error analysis. State estimation for linear systems, Kalman-Bucy and Wiener filters. Smoothing and prediction. Nonlinear estimation. Filter implementation. Applications to communication, control, system identification and biomedical engineering.

EE 558 System Identification and Adaptive Control (3-0)3

System models: internal and external representations. Volterra and Wiener characterizations for nonlinear systems. Explicit and implicit system identification. Use of periodic test signals, binary m-sequences. On-line parameter identification; stochastic approximation, random search algorithm and the extended Kalman filter. The linear quadratic Gaussian optimal control problem. Various adaptive control strategies. Stability considerations. Learning and hierarchical intelligent control systems, bionic systems, man-machine control systems.

EE 559 Intelligent Control (3-0)3

Uncertainty models and information representation: types of uncertainties and uncertainty measures. Intelligent control methodologies: learning control, fuzzy control, neurocontrol.

EE 561 Advanced Static Power Conversion (3-0)3

Overloaded modes of operation of rectifiers, characteristics. Reactive power and harmonics in ac-dc converters, cascade use of converters. Commutation techniques in inverters; McMurray circuit and its modified forms, voltage control and harmonic elimination. ASCII inverters. Chopper structures; improving the performance, optimization of circuit elements.

EE 563 Generalized Electrical Machine Theory (3-0)3

Some basic concepts of electrical machines. Generalized machine concept. Transformation in circuits and machines. Matrix equation of electrical machines. Measurement of machine parameters. Methods of solution and computation. Steady state, transient, balanced and unbalanced operations. Approximate models of electrical machines. Small oscillations. Applications.

EE 564 Design of Electrical Machines (3-0)3

Induction machine: Classification, design principles, electric and magnetic loading, determination of dimensions, selection of slot numbers, reduction of parasitic torques, windings, calculation of parameters. Synchronous machine design: determination of dimensions and winding details, determination of characteristic curves and terminal

voltage. Optimum design of induction and synchronous machines. Transformer design.

EE 565 Vector Control of Electrical Drives (3-0)3
Drives in industry, drive types. Modelling of induction machines. Complex vector analysis of induction machines. Principles of vector control and field orientation. Vector control types. Parameter identification. Parameter sensitivity.

EE 566 Electrical Heating and Applications (3-0)3
Review of heat transfer theory. Electrical phenomena related to furnaces. Types and classification of electric furnaces and applications. Arc furnaces: basic structures, cooperational principles, the arc furnace as a load on the network. The theory of induction heating. Induction melting, through heating and hardening installations. Static power sources for induction furnaces. Economics of induction heating.

EE 568 Selected Topics on Electrical Machines (3-0)3
Varying subjects in line with modern practice. Stepping motors; types, excitation schemes, characteristics, definitions and terminology. Static torque characteristics. Position error under load, single step response, damping, determination of pull-out torque characteristics. Stepping motor drive circuits. Open and closed loop control. Stepping motor selection. DC servo motors, types, characteristics, drivers, applications.

EE 569 Special Topics in Power Electronics (3-0)3
Modern power semiconductors characteristics, trends. Power integrated circuits. AC-to DC converters; unity power factor converters. DC- to DC converters; switch mode power converters, resonant converters, DC-to AC converters; configurations, soft switching, resonant types, pulse width modulation techniques. A review of selected applications.

EE 571 Wave Propagation in Power Systems (3-0)3
Wave equations. Modeling of aerial lines and cables. Modal analysis of transmission lines. Power line carrier communications. Mode coupling. Solution of transmission line transients using lattice, Fourier transform and time domain methods.

EE 572 Insulation Coordination (3-0)3
Lightning, switching and temporary overvoltages. Disruptive discharges and withstand voltages. Lightning performance of transmission lines. Switching surge design. Insulation coordination of HV substations.

EE 573 Power System Stability and Dynamics (3-0)3
Power system transient and dynamic stability, stability analysis with classical model, synchronous machine modeling using Park's equations, multi-machine transient stability analysis, automatic voltage regulators, speed governors and stabilizers.

EE 574 Power System Real-Time Monitoring and Control (3-0)3
Power system real time monitoring and control problem, Power system computer control centers, Supervisory Data Acquisition and Control System (SCADA), System control strategies, Control levels. System security concept, Contingency analysis, Configuration analysis, State estimation, Decoupled state estimation methods, Detection, identification and correction of gross measurement errors, Real-time observability analysis.

EE 575 Advanced High Voltage Techniques (3-0)3
Insulation principles in HV equipment. lightning discharges and overvoltages generated in HV systems. Corona discharges and corona loss calculations. Electromagnetics interference generated by HV systems. Pollution flashover problem of HV insulators. Overvoltage limiting devices, high voltage insulators, bushings and circuit breakers. Insulation design of high voltage transformers, cables and capacitors. Testing of HV equipment.

EE 576 High Voltage Measurement Techniques (3-0)3
High voltage cathode-ray-oscillography, interference problems. Resistive, capacitive and mixed high voltage dividers, high frequency characteristics. Generating voltmeters. High-ohmic series resistors. Electrostatic voltmeters. Resonance capacitor transformers and voltage transformers. Sphere gaps. Peak value and impulse current measurements. Bridge circuits for dielectric measurements. Detection and measurement of partial discharges.

EE 577 Advanced Power System Protection (3-0)3
Investigation of current and voltage waveforms during faults and other conditions. Distance and carrier-aided distance protection. New protection schemes applicable to high-speed protection. Digital relaying. Developments in integrated protection, control and measurement systems.

EE 578 Power System Planning (3-0)3
Power system planning concepts. Load forecasting. Generation system planning. Electric power generation resources of Turkey. Transmission planning. Engineering, economics and feasibility studies.

EE 579 Economic Operation of Power Systems (3-0)3
Modern power system operation, economic dispatch, transmission losses, linear and nonlinear programming techniques, unit commitment, hydrothermal coordination, interchange evaluation, power system security and rescheduling.

EE 583 Pattern Recognition (3-0)3
Introduction to machine perception, Bayes decision theory. Parameter estimation and supervised learning; nonparametric techniques. Linear discriminant functions, unsupervised learning and clustering. Scene analysis, applications of pattern recognition.

EE 584 Machine Vision (3-0)3
Image Formation and Image Sensing, Binary Images and their Geometrical and Topological Properties, Region and Image Segmentation, Edge and Corner Detection, Photometric Stereo, Shape from Shading, Motion Field and Optical Flow, Photogrammetry and Stereo.

EE 586 Artificial Intelligence (3-0)3
Exploiting natural constraints. Problem solving; Description matching and goal reduction, finding solution paths, games. Logic. Knowledge representation. Natural Language understanding. Applications of AI.

EE 587 Introduction to Robotics (3-0)3
Evolution of robots, elements of robotic systems, mathematics of manipulators, homogeneous transformations, end effector position and orientation, kinematics, inverse kinematics, differential changes, task planning and path planning. Manipulator dynamics.

EE 588 Robot Hand: Dynamics of Manipulation (3-0)3
Tree-structured manipulators. Multiple manipulators. Leading robot hands. Hand gross motion control. Obstacle avoidance techniques. Collision free wrist path planning. Hand preshape analysis. Grasp planning. Contact analysis. Hand fine motion control. Manipulability; Stability; Compliance.

EE 590 Seminar (0-2)NC
M.S. students working on a common area of Electrical Engineering choose, study and present a topic to a group under the guidance of a faculty member. Presentation must reflect the preliminary results of student's research work or a literature survey on a topic assigned by the instructor. Student performance is evaluated according to the style of presentation and depth of understanding. Student must be registered to the course EE 500 M.S. Thesis.

EE 600 Ph. D. Research and Thesis NC
Program of research leading to Ph. D. degree arranged between the student and a faculty member. Students register to this course in all semesters while the research program or write up of thesis is in progress. Student must start registering to this course no later than the third semester of his/her Ph. D. study.

EE 601 Functional Analysis and Operator Theory with Applications (3-0)3
Metric spaces, separability and completeness. Banach's fixed point theorem and its applications. Normed spaces, linear operators on normed spaces. Inner product spaces and projections. Approximation theory in normed and inner product spaces.

EE 603 Spectral Estimation (3-0)3
Review of basic concepts. Nonparametric methods (periodogram and correlogram based methods). Parametric methods for rational spectra (AR, MA, and ARMA modeling). Parametric methods for line spectra (models of sinusoidal signals in noise). Spatial methods (MUSIC, Min-norm, ESPRIT, etc.). Description of the cases that can be handled via the following approaches: Higher-order statistical analysis, adaptive estimation, time-frequency analysis.

EE 604 Sensor Array Signal Processing (3-0)3
Array geometry, definitions, assumptions and mathematical models for narrowband and wideband processing. Classical methods of direction-of-arrival estimation. Optimum and close to optimum methods of direction-of-arrival estimation. Performance limits. Beamforming and beamspace processing. Virtual array processing. Source localization methods. Array imperfections and array calibration.

EE 610 Integrated Sensors and Sensor Systems (3-0)3
Fundamental principles, operation and design of integrated solid-state sensors and sensing systems.

Sensor technology, including micromachining and wafer bonding. Microstructures for the measurement of visible and infrared radiation, pressure, acceleration, temperature, gas purity and ion concentrations. Merged process technologies for sensors and circuits. Data acquisition circuits and advanced sensing systems. Microactuators and integrated microsystems.

EE 611 Plasma Engineering (3-0)3
Basic concepts in plasma physics and gaseous electronics. Formation and heating of the plasma. Possible approaches to controlled fusion. Introduction to laboratory systems of controlled fusion. Problems of confinement. Plasma oscillations and diagnostics.

EE 612 Fundamentals of Fusion Plasma Systems (3-0)3
Review of controlled thermonuclear fusion. Magnetic confinement systems: Tokamak, stellerators, mirror machines, prinches and plasma focus. Alternative magnetic confinement systems: Compact torus, FRC and RFP. Inertial confinement: laser fusion systems, electron and ion beam systems. Concept of fusion reactors.

EE 613 Beam Electronics (3-0)3
Lens theory; electron motion. Electronic space charge. Analytical determination of electrostatic fields. General properties of electrostatic lenses. Magnetic electron lenses. Electron guns. Design consideration for selected beam systems.

EE 614 Principles of Laser Engineering (3-0)3
An introduction to quantum electronics. Laser plasmas. Laser optics. Principal lasers. Laser systems and applications. Safety problems.

EE 615 Optoelectronics (3-0)3
Review of electromagnetic theory relevant to optoelectronics. Propagation of rays, spherical waves and Gaussian beams. Optical resonators. Modulation and detection of optical radiation. Noise in optical detection and generation. Interaction of light and sound. Lasers and laser applications. Fiber optics and applications.

EE 616 Nuclear Electronics and Instrumentation (3-0)3
An introduction to nuclear physics. Particle accelerators. Review of radiation and detection. Principles of system architecture. Pulse amplifiers and single channel analyzers. Multichannel pulse height analyzers. Typical nuclear and electronic instruments. Selected topics in experimental nucleonics.

EE 617 Principles of Analog VLSI Design (3-0)3
NMOS and CMOS processes. Transistor circuit modeling. Current Mirror. Operational Amplifiers Pseudo analog techniques. Continuous time and switched capacitor filters. A/D and D/A conversion. Oscillator and phase locked loop design.

EE 618 Principles of Digital CMOS VLSI Design (3-0)3
Introduction to CMOS circuits. MOS transistor theory. CMOS processing technology. Circuit characterization and performance estimation. CMOS circuit and logic design. Structured design and testing. Symbolic layout systems. CMOS subsystem design. System case studies.

EE 619 High Speed Semiconductor Devices and Circuits (3-0)3
Band structure and transport properties of III-V compound semiconductors. III-V semiconductor technology, crystal growth, material characterization and device fabrication techniques, physics, modeling and integrated circuit applications of III-V metal semiconductor field-effect transistors (MESFETs), modulation doped field-effect transistors (MODFETs), and heterojunction bipolar transistors (HBTs).

EE 621 Theory of Acoustic Wave (3-0)3
Wave propagation and interaction in media; acoustic waves in isotropic and unisotropic solids. Acoustics and electromagnetism. Reflection and refraction of acoustic waves. Acoustic transducers. Surface acoustic waves. Applications of acoustic waves.

EE 624 High Frequency Methods in Electromagnetics (3-0)3
Asymptotic series, asymptotic evaluation of integrals, Kirchoff and Physical Optics approximations, Luneberg-Kleine expansion, the eikonal and transport equations, Geometrical optics, WKBJ approximation, Geometrical Theory of Diffraction and uniform versions (UTD, UAT) for edge and convex surface diffraction. Physical Theory of Diffraction, GTD and PTD equivalent edge currents, applications: open ended waveguides, horn antennas, reflector antennas.

EE 625 Fundamentals of Radar Systems I (3-0)3
General design principles and performance evaluation of pulsed radars. Statistical detection theory and radar cross-section of targets. CW, FM and Doppler radars. Target tracking radars.

EE 626 Fundamentals of Radar Systems II (3-0)3

Radar receiver design. High power microwave generation and amplification; Radar antennas. Detection of radar signals in noise and waveform design. Propagation of radar wave and radar clutter. Electronic counter measure systems in radar.
Prerequisite : EE 625

EE 627 Principles of Modern Optical System (3-0)3

A general review of ray optics, wave optics, beam optics, Fourier optics and photon optics. Electromagnetic theory of optics and polarization; optical waveguides; fiber optics; optical resonators optical fiber sensors; theory, applications and system considerations. An overview of the other principal application of optics.

EE 633 Digital Speech Processing (3-0)3

Digital models for the speech signal. Time domain models for speech processing. Digital representations of the speech waveform. Short time Fourier analysis of speech. Sub-Band coding. Transform coding. Linear Predictive coding of speech. Homomorphic speech processing. Delayed decision coding. Performance measurement in digital speech processing systems. Introduction to speech recognition. Digital signal processors.

EE 634 Digital Image Processing (3-0)3

Two-dimensional signals and systems. Image sampling and quantization. Image Transforms: 2-D Discrete Fourier Transform, 2-D Discrete Cosine Transform. 2-D filter design. Image perception. Image enhancement. Image restoration. Image coding.

EE 635 Fourier Optics (3-0)3

Application of Fourier theory to the analysis and synthesis of optical imaging and optical data processing systems. Propagation and diffraction of light. Fresnel and Fraunhofer approximations. Fourier transforming properties of lenses. Image formation with coherent and incoherent light. Transfer function of imaging systems. Optical data processing and holography.

EE 636 Digital Video Processing (3-0)3

Fundamentals of Digital Video Processing. Digital video representation. Video enhancement and filtering. 2-D motion estimation and tracking. De-interlacing. Video coding basics. Emerging international standards and for image and video compression. Digital TV. Video communication**.**
Prerequisite: Consent of department.

EE 637 Digital Radio Communications (3-0)3

Characterization of fading multipath channels. Digital signaling over frequency selective and nonselective fading channels. Diversity techniques. Coded waveforms for fading channels. Direct sequence spread spectrum signals. Frequency hopping spread spectrum signals. Synchronization of spread spectrum signals. Some applications.
Prerequisite: Consent of department.

EE 642 Introduction to Mathematical Bases of Computer Graphics (3-0)3

Transformations of points and lines. Two and three dimensional transformations; translation, rotation, scaling and sheving. Projections and perspective transformations., Plane curves; Nonparametric and parametric curves and representations. Space curves; representation, splines and B-splines. Surface description and generation; bilinear, bicubic, coons, Bezier and B-spline surfaces.

EE 644 Multimedia and Wireless Data Networks (3-0) 3

Source and Traffic Models in networks; Simulation of discrete event systems; Quality of Service (QoS) parameters of multimedia traffic; Package Scheduling; Queue management; QoS in IP and ATM; Label Switching Techniques; QoS routing; Wireless network architectures; Mobile TCP/IP; Wireless ATM; Mobile Multimedia; Mobility management, Current and future architectures; MPLS, GPRS, IMT-2000, UMTS, 4^{th} GW.
Prerequisite: Consent of department.

EE 647 Microprocessor Systems Engineering (3-0)3

Microprocessor-based hardware and software systems. Software engineering methods. Software quality. Cohesion, coupling, span of control. Recent approaches to software design. Software testing and implementation. Software maintainability. Hardware-software integration. Software project management. Recent topics in software engineering.

EE 655 Chaotic Dynamics (3-0)3

Nonlinear dynamics: Review of linear and nonlinear vibration theory. Maps, flow and the local geometric theory of dynamics. Point attractors; multiple and nested cyclic attractors; strange attractors. Identification of chaotic oscillations: Poincare maps. Nonlinear resonance. Competing attractors. Basins of attractions. Julia Sets, Fourier Spectrum. Stability and bifurcation of attractors. Horseshoe maps. Measuring chaos (Lyapunov exponents). Fractal set theory. Information loss and

entropy. Fractal dimensions and entropies of strange attractors.

EE 671 Modern Power Systems Operation and Control Techniques (3-0)3
Modern control center application software system, Dynamic modeling of power system; speed governors, turbines, generator and load. The generation control problem (AGC), System governing, Supplementary regulation (LFC), Area regulation, Regulation as a function of bias setting, Economic dispatch, Control execution, Automatic voltage control loop (AVR).
Prerequisite: EE 472.

EE 674 Computational Techniques in Power System Analysis II (3-0)3
Power system modeling; sparse data structures; computational issues for various power system problems; solution of large sparse linear systems: factorization, ordering, inverse factors, sparse vector methods, compensation, partial matrix refactorization, applications; vector processing and parallel processing: implementation issues and applications in power.

EE 5290 Microwave Circuit Design (3-0)3
Microwave circuit design concerns of attenuators, phase shifters, power amplifiers, mixers, oscillators, technologies of microwave circuits; microwave circuit measurement and calibration; passive and active component modeling; layout and production concerns, yield analysis; packaging of microwave circuits; system aspects of microwave circuits.

EE 5410 High-speed and Embedded Computer Networking (3-0)3
Review of core and edge network architectures. Introduction to in-vehicle and industrial communication networks. Quality of Service and real-time operation concepts. Basic router architectures. Fabric scheduling. Quality of Service schedulers. Packet processing and lookup. Switch fabric architectures. IPv6 and Next Generation Networks. In-vehicle networking system requirements and architectures. CAN Bus, LIN, Byteflight, FlexRay. Scheduling for CAN Bus and FlexRay. Industrial Communication
Networks. Real time Ethernet.

EE 7XX Special Topics in Electrical and Electronics Engineering (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge.

EE 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

EE 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

DEPARTMENT OF ENGINEERING SCIENCES

PROFESSORS

AŞIK, Mehmet Zülfü: B.S., M.S., METU; Ph.D., Texas Tech. University.
DİCLELİ, Murat ***(Department Chair)***: B.S., M.S., METU; Ph.D., University of Ottawa.
ERASLAN, Ahmet Nedim: B.S., Gazi University; M.S., METU; Ph.D., Iowa State University.
TARMAN, Işık Hakan: B.S., M.S., Boğaziçi University; Ph.D., Brown University.

ASSOCIATE PROFESSORS

AKGÜL, Ferhat: B.S., M.S., University of New Mexico; Ph.D., University of Colorado at Boulder.
EVİS, Zafer: B.S., METU; M.S., Ph.D., Rensselaer Polytechnic Institute.
GÜRSES, Senih: M.D., Hacettepe University; M.S., Boğaziçi University; Ph.D., METU.
KANOĞLU, Utku: B.S., M.S., ITU; M.B.A., İstanbul University; Ph.D., University of Southern California.
KESKİN, Dilek ***(Vice Chair)***: B.S., M.S., Ph.D., METU.
TEZCANER, Ayşen: B.S., M.S., Ph.D., METU.

ASSISTANT PROFESSOR

YILMAZ Mustafa Tolga ***(Vice Chair)***: B.S., M.S., Ph.D., METU.

GENERAL INFORMATION: The Department of Engineering Sciences was established in 1969 within the Faculty of Engineering to encourage interdisciplinary education and research. The Department offers Computational Mechanics and Biomechanics programs leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Engineering Sciences. The Department also offers basic and advanced courses in mechanics, mathematics and biomechanics to a large number of students in the Faculty of Engineering as well as other faculties.

MISSION STATEMENT: The mission of the Department of Engineering Sciences is to teach undergraduate service courses on mechanics, applied mathematics, and numerical analysis to the students of the Faculty of Engineering; to offer undergraduate and graduate level elective courses; to make necessary preparation for a modern, prospective undergraduate program that makes use of mechanics and mathematics knowledge and meets the needs of our country; to conduct and to spread research work of interdisciplinary nature that will raise the level of contemporary knowledge; to become partner in multinational research projects; to work on research projects that will contribute to the nation's industry; to bridge the gap between basic sciences and engineering applications; to conduct M.S. and Ph.D. programs aiming at the needs of our industry for researchers and universities for academicians.

DESCRIPTION OF RESEARCH LABORATORIES AND EQUIPMENT: The department has a constantly expanding microcomputer laboratory which contains personal computers, printers, and plotters. Our gradually expanding experimental mechanics laboratory consists of 30 kN and 50 kN microprocessor controlled digital electronic universal testing machines with standard accessories located in a temperature and humidity controlled isolated room; three general purpose 100 MHz 2 channel oscilloscopes, Bruel and Kjaer 3550 type dual channel analysis system capable of frequency response measurements, experimental model analysis, vibration analysis and acoustic measurements in time and frequency (0-100 kHz) domains; ultrasonic testing equipment for non-destructive testing and linear wave velocity measurements of concrete, wood and bone at discrete frequencies of 54 kHz, 200 kHz, 1 MHz; a torsion testing machine working with a maximum loading of 30 Nm for specimens up to 0.75 m in length; a rotating beam fatigue testing machine for measuring fatigue performance of small circular specimens under variable loading conditions and OMEGA data acquisition system interfaced to a PC capable of collecting data from a wide variety of data sources like strain gages, pressure transducers, thermocouples, LVDT's, RTD's, analog and digital inputs. The laboratory also has two ovens having relative humidity adjustment capability. Minicomputers and scanners are available in the experimental mechanics laboratory. Recently a loading frame is also added to the laboratory to carry out mechanical tests on the real size specimens. This frame is equipped with two actuators one of which has the capacity of 1000kN for vertical loading only and the other has the capacity of 500kN for lateral loading that can be in compression and in tension.

AIMS AND OBJECTIVES OF GRADUATE PROGRAM: The Department offers graduate programs in Computational Mechanics (CM) and Biomechanics (BM) leading to M.S. and Ph.D. degrees in Engineering Sciences. The graduate program in CM is offered to students who are graduates of mechanics, aeronautics, mathematics, physics, civil engineering, mechanical engineering or other similar engineering and science programs. The graduate program in BM is designed for the graduates of the schools of life sciences (biology, medicine, dentistry) and also for the graduates of science and engineering fields. The course requirements in the BM program are tailored according to the needs of the students. Because of the flexibility of the curriculum, candidates may combine the study of engineering mechanics with that of other fields into interdisciplinary programs that will prepare them for further work in specific areas. The Department offers also graduate level courses in mechanics, applied mathematics, numerical analysis and biomechanics to students from other engineering and science departments. The graduate program is supported by the course offerings of the Department of Engineering Sciences as well as by other engineering and science departments. A dynamic list of elective courses is announced every semester.

Mechanics is the branch of applied science concerned with the study of mechanical phenomena: The behavior of solids, fluids, and complex materials under the action of forces. Computational Mechanics is the fundamentally important part of the computational science and engineering concerned with the use of computational approaches to characterize, predict, and simulate physical events and engineering systems governed by the laws of mechanics. Computational Mechanics has had a profound impact on science and technology over the past three decades. It has transformed much of classical Newtonian theory into practical tools for prediction and understanding of complex systems. These are used in the simulation and design of current and future advances in technology throughout the world and they have had a pervasive impact on manufacturing, communication, transportation, medicine, defense and many other areas central to modern civilization. By incorporating new models of physical and biological systems based upon quantum, molecular and biological mechanics, computational mechanics has an enormous potential for future growth and applicability. Successful research in Computational Mechanics is usually interdisciplinary in nature, reflecting a combination of concepts, methods, and principles that often span several areas of mechanics, mathematics, computer sciences, and other scientific disciplines as well. The success of Computational Mechanics will ultimately be judged by effectiveness in solving problems of interest to society and on providing deeper understanding of natural phenomena and engineering systems. The field has been successful to date because of its unprecedented predictive powers, making possible the simulation of complex physical events and the use of these simulations to design engineering systems. This is done through so-called ‘computer modeling’: The development of discretized versions of the theories of mechanics which are amenable to digital computation, together with the complex process of manipulating these digital representations to produce abstractions of the way real systems behave.

Some of the applications of Computational Mechanics are well known; others are not. One well-known area in which Computational Mechanics has had dramatic success is with the simulation of crash worthiness of automobiles. Computer-generated simulations of the collision of a vehicle with walls or obstacles, based on fundamental scientific principles on the dynamics of deformable bodies, have replaced hundreds of full-scale tests and countless lives have been saved and injuries diminished by improved safety features developed through computer modeling and simulation. An exciting Computational Mechanics application area under development is predictive surgery. The geometry and properties of the living tissue are deduced from MRI imaging and other tests and go directly into computer subroutines that generate models, several different options are calculated and presented to the surgical team so that the best procedure for the particular patient under treatment can be obtained. Many different surgical strategies can be simulated and the results predicted by Computational Mechanics software before a single step in the actual surgery is taken. Computational Mechanics has been used in military applications too. One example is in the analysis and design of weapons and armor. Applications of Computational Mechanics are not limited to the engineering design of products and systems. Many are concerned with the basic understanding of natural phenomena or with the prediction of natural physical events, examples of which include the use of Computational Mechanics methods to study atmospheric changes, ocean currents, surface flow in rivers, subsurface flows in oil reservoirs, or geological phenomena such as the movement and evolution of polar ice caps or the tectonic plates.

Computational mechanics has three aspects: The first one is engineering application; this is mainly in the fields of classical and recently developing new engineering disciplines. The second one, the backbone of the field, is the theoretical mechanics which uses continuum approach. The third one is the numerical solution of the analytical equations. Here, the solution is based on methods such as finite element, boundary element and

volume element. Therefore, the structure of computational mechanics necessitates an interdisciplinary organization involving the Department of Engineering Sciences and other related engineering departments.

Biomechanics is the study of the effects and control of forces that act on or are produced by living tissue. Biomechanics also involves understanding the generation of internal forces within the human body. It examines the loading, posture and movements generated by these internal and external forces. Researchers in this area are involved in basic, clinical and occupational problems. Biomechanics draws from a wide range of the sciences, e.g., mechanics, materials, physics, chemistry, physiology, morphology, medicine, pathology, dentistry, molecular biology, etc. Biomechanics basically applies engineering principles to the understanding of biological systems at the macro and microscopic levels. So it is a field of specialization that integrates the mechanical and biological aspects of living systems.

Although modern biomechanics is a relatively young and dynamic field, its history can be traced back to the fifteenth century, when Leonardo Da Vinci (1452-1519) noted the significance of mechanics in his biology studies. As a result of contributions from researchers in the fields of biology, medicine, basic sciences, and engineering, the inter- and multi-disciplinary field of biomechanics has been growing steadily in the last decades. As academic and industrial interests in human movement have expanded, many professional organizations recognize and support biomechanics as an integral part of exercise science, sports medicine, orthopedics, ergonomics, and physical therapy.

The development of the field of biomechanics has improved our understanding of many concepts, including: The clarification of the definition and meaning of the terms normal and pathological, the mechanics of neuromuscular control, bone formation, the mechanism of the response to injury of the musculoskeletal system, the mechanics of blood flow in the microcirculation, the mechanics of air flow in the lung, and the mechanics of growth and form. Biomechanics has contributed to the development of medical diagnostics and treatment procedures. It has provided the means for designing and manufacturing medical instruments, devices for the handicapped, artificial replacement limbs and implants. Biomechanics has wide range of application fields as: Physical therapy, occupational therapy, medicine (orthopedics, sports medicine, rehabilitation medicine, occupational medicine, forensic medicine), ergonomics (industrial medicine), bioengineering, kinesiology (movement science) , arts (performance arts, fine arts). Following specific topics can be involved in the research areas of biomechanics: Factors contributing to falls following a perturbation, motor adaptations to repeated perturbation exposure, kinematic and kinetic analyses of sports techniques, strength assessment for clinical settings, mathematical models of balance recovery, mathematical and *in-vitro* models of the spine.

The Biomechanics graduate curriculum is designed to be a well-balanced blend of theoretical coursework with some practice and research skills. The primary objectives of this program is to gain ability in the design and analysis of solid structures and systems to use the methods of engineering for quantifying and understanding how the body moves, how movement is controlled, and the forces acting on biological tissues during movement, to enhance the understanding of human anatomy and function with specific analytical models of the musculoskeletal system, to assess mobility problems in various neuro-musculoskeletal situations, to assess and reduce the risks in occupational settings that involve understanding the mechanisms and reducing acute and repetitive strain injuries in the workplace environments and improve employee safety.

The aim of the graduate program of the Department of Engineering Sciences is to provide a qualification to the graduates in such a way that they can bring solutions to the problems those have interdisciplinary nature and also falls outside the domain of the classical engineering branches. There is an increasing demand in industry and public services for graduates with a broad training in the fundamentals of engineering rather than in very specialized fields. These graduates will have an interdisciplinary flavor so that they can communicate and cooperate with colleagues from many classical engineering fields. The graduate program of the Department of Engineering Sciences emphasizes the fundamental principles of engineering sciences and provides a strong foundation in applied mathematics and mechanics coupled with an appreciation of the most recent developments in engineering sciences. Graduates of this program will thus have the adequate qualification to find solutions to interdisciplinary problems of industry and to conduct research of similar nature cooperating with researchers from other disciplines of the broad engineering field. The Department of Engineering Sciences promotes fundamental multidisciplinary research programs in engineering and sciences. This Department may provide a means for researchers from various faculties and departments in the University to collaborate on multidisciplinary research projects.

Objective of the Department of Engineering Sciences is to develop the graduate Biomechanics Option which is a typical example for contemporary applications of mechanics; to conduct research work of interdisciplinary nature that will raise the level of contemporary knowledge and to publish the results; to participate in multinational research projects; to work on research projects that will contribute to the nation's industry; to develop existing service courses in a way to please the students and their departments; to prepare new, modern courses; to become a more dynamic and more successful department.

ADMISSION REQUIREMENTS: Candidates fulfilling the general requirements for admission to graduate status apply to the Department of Engineering Sciences. Those who have insufficient background in mechanics and/or applied mathematics will be required to complete a deficiency program.

DEGREE REQUIREMENTS: A candidate for the M.S. degree in Engineering Sciences is expected to possess a thorough knowledge of undergraduate mathematics and mechanics. In case of deficiency, the candidate may be required to take necessary undergraduate courses from this department to complete or strengthen the lacking background. Ph.D. candidates with non-CM M.S. degree are required to complete the compulsory courses of the M.S. program of CM and Ph.D. candidates with non-BM degree are required to complete the compulsory courses of the M.S. program of BM also. M.S. program consists of a minimum of seven courses, a seminar on the thesis topic and a thesis. Ph.D. program consists of a minimum of seven courses, qualifying examination, thesis proposal, a seminar on the thesis topic and a thesis. The candidates fulfilling the university requirements are awarded the degree of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) in Engineering Sciences.

DESCRIPTION OF UNDERGRADUATE COURSES

ES 202 Mathematics for Engineers (3-0)3
Vector spaces, matrices, systems of linear equations, linear transformations, change of basis, eigenvalue problems, quadratic forms and diagonalization. Vector calculus, line, surface, and volume integrals. Gradient, divergence, curl. Green, Gauss and Stokes´ theorems. Complex Numbers.
Prerequisite: MATH 120.

ES 204 Engineering Mathematics (4-0)4
Introduction to vector spaces and linear algebra. Vector differential calculus. Line, surface, volume integrals and integral theorems. Algebra of matrices. System equations and Gauss elimination. Linear transformations, change of basis. Characteristic value problems, diagonalization and quadratic forms. Concept of probability, random variables, some useful distributions, estimation of parameters, confidence intervals and tests of hypothesis, linear regression.
Prerequisite: MATH 119.

ES 221 Engineering Mechanics I (3-0)3
Principles of mechanics. Elements of statics in two and three dimensions, centroids, analysis of structures and machines, friction.
Internal force diagrams. Moment of inertia.
Prerequisite: MATH 119.

ES 223 Statics and Strength of Materials (4-0)4
Principles of mechanics. Elements of statics in two dimensions. Centroids and moments of inertia. Analysis of simple plane structures. Internal force diagrams. Concepts of stress and strain. Axially loaded members. Torsion. Laterally loaded members.
Prerequisite: MATH 119.

ES 224 Strength of Materials (3-0)3
State of stress and strain. Idealizations and principles in solving engineering problems. Axially loaded members. Torsion. Laterally loaded members. Thermal stress and strain. Indeterminate problems. Deflections. Failure theories
Prerequisite: ES 221 or ES 225.

ES 225 Engineering Mechanics (4-0)4
Application of principles of mechanics. Elements of statics in two and three dimensions, equivalent systems of forces. Equilibrium of rigid bodies, distributed forces, analysis of structures, forces in beams. Friction. Kinematics of particles, kinetics of particles, energy and momentum methods, kinematics of rigid bodies, plane motion of rigid bodies.
Prerequisite: PHYS 105 and MATH 119.

ES 303 Statistical Methods for Engineers (3-0)3
Descriptive statistics, histograms, central tendency, dispersion and correlation measures. Basic probability concepts, random variables, probability

density and mass function. Hypothesis testing, confidence intervals. Law of large numbers and central limit theorem. Regression analysis. Applications in engineering.
Prerequisite: MATH 119.

ES 361 Computing Methods in Engineering (3-0)3
Mathematical modeling of engineering problems, Numerical solution of nonlinear single variable equation and system of linear and nonlinear equations. Curve fitting and interpolating polynomials. Numerical differentiation and integration. Numerical solution of ordinary differential equations. Optimization.
Prerequisite: MATH 119 and (CENG200 or 230)

ES 401 Numerical Analysis in Engineering (3-0)3
Analysis of error in numerical computations. Solution of linear algebraic system of equations. Eigenvalues. Roots of nonlinear equations. Interpolation and approximations. Numerical differentiation and integration. Difference equations. Solution of system of ordinary differential equations.

ES 403 Finite Element Method (3-0)3
Introduction to calculus of variations, weighted residuals method. Properties of finite elements. Ritz and Galerkin methods. Applications in boundary value problems. Two dimensional and time dependent problems.

ES 404 Advanced Engineering Mathematics (3-0)3
Mathematical modeling and reduction of engineering problems to ordinary or partial differential systems. Applications of Fourier series, separation of variables, Fourier and Laplace transforms, Bessel functions, Legendre polynomials to basic equations in engineering such as wave, continuity, heat conduction, beam and Navier equations.

ES 406 Reliability (3-0)3
Brief review of applied probability. Distributions of sum and quotient of two random variables. Topics in risk-based engineering design. Methods available, advantages, disadvantages. System reliability concepts. Statistical decision theory and its application in engineering.

ES 412 Experimental Analysis (2-2)3
General concepts. Measuring devices. Manipulation, transmission and recording of data.

ES 421 Elasticity (3-0)3
Stress and strain tensors. Strain-displacement relations. Compatibility equations. Constitutive equations. Plane strain, plane stress. Biharmonic equations, polynomial solutions, Fourier series solutions. Axisymmetric problems. Torsion, bending.

ES 424 Introduction to Continuum Mechanics (3-0)3
Geometrical foundations. Analysis of stress and deformation. Balance laws. Constitutive equations. Finite and infinitesimal theories of elasticity. Application in fluid mechanics and viscoelasticity.

ES 425 Intermediate Mechanics (3-0)3
Vibration and stability of systems with finite degrees of freedom. Rotation of rigid bodies about fixed and moving axes. Gyroscope. Impulsive motion. Nonholonomic systems. Selected problems of pursuit and orbital flight.

ES 426 Engineering Rheology (3-0)3
Fundamental concepts of rheology. A classification of material behavior. Linear viscoelasticity, creep, relaxation and complex modulus. Relaxation and retardation spectra, correspondence principle. Nonlinear viscoelasticity. Elasto-plastic and viscoplastic substances. Engineering application.

ES 427 Fracture Mechanics (3-0)3
Mechanisms of failure for brittle and ductile materials. Stress concentration. Elastic stress fields around cracks. Plasticity effect. Fracture criteria. Crack propagation and methods of crack arrest. Fatigue. Fracture testing.

ES 434 Elastic Stability (3-0)3
Various stability methods. Buckling of beams, columns, beams on elastic foundation. Bifurcation and snap through buckling. Plate and shell buckling. Introduction to dynamic buckling.

ES 441 Introduction to Biomechanics (3-0)3
Structural and physical properties of bone, muscle, tendon and cartilage. Mechanics of joint and muscle action. Body equilibrium. Mechanics of the spinal column, of the pelvis and of the hip joint. Panhomechanics.

ES 442 Advanced Biomechanics (3-0)3
The knee joint, foot and ankle, shoulder-arm complex, the elbow joint. Pathomechanics. Gait analysis..

ES 443 Human Physiology for Engineers (3-0)3
Engineering anthropometry. Fundamentals of cell and tissue physiology. Gross anatomy and physiology of human skeletal, muscular, nervous, cardiovascular, respiratory, and urinary systems. Energy metabolism and requirements of human body. Body interactions with environment. Sleep and body rhythms.

ES 444 Fundamentals of Tissue Engineering (3-0)3
Structure and organization of tissues. Mechanics of Tissues. Cell-matrix interactions. Introduction to basic concepts of tissue engineering: Cell source, cellular therapy, scaffold guided tissue engineering, tissue dynamics and microenvironment. Design principles of bio mimetic environments. Cartilage, skin, and bone tissue engineering. Standards and regulatory considerations of tissue engineered products.

ES 450 Human Factors in Engineering Design (3-0)3
Perceptual, central and motor processes in man-machine systems. Human capabilities and limitations. Use of anthropometric data. Body mechanics and posture. Man-machine interface design. Physical work capacity. Thermal stress and comfort. Vision and illumination. Noise, vibrations. Fatigue, vigilance and accidents. Technological skills and training.

ES 464 Instrumentation for Engineering Measurements (2-2)3
Measurement systems. Error analysis. Operational amplifiers. Force, pressure, temperature, flow, strain and other relevant measurements. Microprocessor applications in measurement and control. Manipulation, transmission and recording of data.

ES 471 Fluid Mechanics (3-0)3
Fluid statics. Transport mechanisms. Compressible flow. Boundary layer. Introduction to unsteady flows.

ES 481 Dynamics of Engineering Systems (3-0)3
Review of rigid body dynamics. Generalized coordinates and forces. Lagrangian and Hamiltonian formulations. Small oscillations. Natural modes. Response of multi-degree-of-freedom systems. Vibration of continuous elastic systems. Introduction to nonlinear vibrations.

ES 490-498 Special Topics in Engineering Sciences (3-0)3
These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF ENGINEERING SCIENCES

GRADUATE CURRICULUM

M.S. in Engineering Sciences

Computational Mechanics Option

ES 500	M.S. Thesis	NC
ES 591	Seminar	(0-2)NC

1 course from Mathematics course list*
1 course from Mechanics course list**
5 elective courses
Total minimum credit: 21
No of courses with credit (min): 7

Biomechanics Option

ES 500	M.S. Thesis	NC
ES 591	Seminar	(0-2)NC

1 course from Mathematics course list*
1 course from Biomechanics course list***
5 elective courses

Total minimum credit: 21
No of courses with credit (min): 7

Ph.D. Engineering Sciences

Computational Mechanics Option

If admitted by B.S. degree:

ES 500	M.S. Thesis	NC
ES 591	Seminar	(0-2)NC
ES 600	Ph.D. Thesis	NC
ES 691	Seminar	(0-2)NC

1 course from Mathematics course list*
1 course from Mechanics course list**
12 elective courses

Total minimum credit: 42
No of courses with credit (min): 14

Computational Mechanics Option

If admitted by M.S. degree

ES 600	Ph.D. Thesis	NC
ES 691	Seminar	(0-2)NC

7 elective courses

If admitted by M.S. degree from another Program or different Option in ES

ES 600	Ph.D. Thesis	NC
ES 691	Seminar	(0-2)NC

1 course from Mathematics course list*
1 course from Mechanics course list**
5 elective courses

Total minimum credit: 21
No of courses with credit (min): 7

Mathematics Course List:

ES 501	Analytical Methods in Engineering	(3-0)3
ES 504	Numerical Solution of Partial Differential Equations	(3-0)3
ES 510	Numerical Solution of ODE	(3-0)3

****Biomechanics Course List:***

ES 541	Introduction to Biomechanics	(3-0)3
ES 542	Advanced Biomechanics	(3-0)3

Biomechanics Option

If admitted by B.S. degree:

ES 500	M.S. Thesis	NC
ES 591	Seminar	(0-2)NC
ES 600	Ph.D. Thesis	NC
ES 691	Seminar	(0-2)NC

1 course from Mathematics course list*
1 course from Biomechanics course list***
12 elective courses

Total minimum credit: 42
No of courses with credit (min): 14

Biomechanics Option

If admitted by M.S. degree

ES 600	Ph.D. Thesis	NC
ES 691	Seminar	(0-2)NC

7 elective courses

If admitted by M.S. degree from another Program or different Option in ES

ES 600	Ph.D. Thesis	NC
ES 691	Seminar	(0-2)NC

1 course from Mathematics course list*
1 course from Biomechanics course list***
5 elective courses

Total minimum credit: 21
No of courses with credit (min): 7

****Mechanics Course List:***

ES 503	Finite Element Method	(3-0)3
ES 525	Theory of Continuous Media I	(3-0)3
ES 527	Fracture Mechanics	(3-0)3
ES 532	Theory of Plasticity	(3-0)3
ES 534	Elastic Stability	(3-0)3
ES 538	Soil-Structure Interaction Analysis	(3-0)3

GRADUATE COURSES

ES	500	M.S. Thesis	NC
ES	501	Analytical Methods in Engineering I	(3-0)3
ES	502	Analytical Methods in Engineering II	(3-0)3
ES	503	Finite Element Method	(3-0)3
ES	504	Numerical Solution of Partial Differential Equations	(3-0)3
ES	505	Variational Methods in Engineering	(3-0)3
ES	506	Reliability	(3-0)3
ES	507	Boundary Element Method	(3-0)3
ES	508	Statistical Methods for Engineering Sciences	(3-0)3
ES	509	Partial Differential Equations in Computer Vision / Image Processing	(3-0)3
ES	510	Numerical Solution of Ordinary Differential Equations	(3-0)3
ES	511	Basic Principles of Mechanics	(3-0)3
ES	512	Experimental Analysis	(3-0)3
ES	514	Mechanical Behavior of Deformable Bodies	(3-0)3
ES	516	Spectral Methods	(3-0)3
ES	521	Theory of Elasticity	(3-0)3
ES	522	Advanced Theory of Elasticity	(3-0)3
ES	523	Advanced Mechanics	(3-0)3
ES	524	Thermal Stress Analysis	(3-0)3
ES	525	Theory of Continuous Media I	(3-0)3
ES	526	Theory of Continuous Media II	(3-0)3
ES	527	Fracture Mechanics	(3-0)3
ES	528	Wave Propagation in Solids	(3-0)3
ES	531	Mechanics of Composite Materials	(3-0)3
ES	532	Theory of Plasticity	(3-0)3
ES	534	Elastic Stability	(3-0)3
ES	536	Energy Methods	(3-0)3
ES	538	Soil-Structure Interaction Analysis	(3-0)3
ES	541	Introduction to Biomechanics	(3-0)3
ES	542	Advanced Biomechanics	(3-0)3
ES	551	Stochastic Methods in Engineering Mechanics I	(3-0)3
ES	552	Stochastic Methods in Engineering Mechanics II	(3-0)3
ES	554	Nonlinear Dynamics	(3-0)3
ES	571	Basic Principles of Fluid Mechanics	(3-0)3
ES	572	Advanced Fluid Mechanics	(3-0)3
ES	591	Seminar	(0-2)NC
ES	600	Ph.D. Thesis	NC
ES	691	Seminar	(0-2)NC
ES	7XX	Special Topics in Engineering Sciences	(3-0)3
ES	8XX	Special Studies	(4-2)NC
ES	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

(Common prerequisite for all following courses: Graduate standing and departmental consent)

ES 500 M.S.Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester.

ES 501 Analytical Methods in Engineering I (3-0)3
Ordinary differential equations. Series solutions of ordinary differential equations. Fourier series and Fourier integral. Partial differential equations. Separation of variables. Gamma, Bessel, Laguerre functions, Legendre, Chebyshev polynomials.

ES 502 Analytical Methods in Engineering II (3-0)3
Formulation of basic engineering problems. Sturm-Liouville theory. Fourier series. Complex calculus; Cauchy-Riemann equations, power series, Cauchy's integral formula, residue theorem, improper integrals. Laplace, Fourier, Hankel, Mellin transforms. Green's function method. Integral equations. *Prerequisite: ES 501.*

ES 503 Finite Element Method (3-0)3
Introduction to calculus of variations, weighted residuals method. Properties of finite elements. Ritz and Galerkin methods. Applications in boundary value problems. Two dimensional and time dependent problems.

ES 504 Numerical Solution of Partial Differential Equations (3-0)3

Solution of systems of equations. Initial and boundary-value problems. Parabolic, elliptic and hyperbolic equations. Selected topics from solid and fluid mechanics.

ES 505 Variational Methods in Engineering (3-0)3

Problems of minimization and maximization. Functionals. Classical problems in calculus of variations, Euler equations, Variational notation, Natural boundary conditions, Hamilton's principle, Lagrange equations. Transformation of boundary value problems into the problem of calculus of variation. Direct methods; Ritz method, Galerkin method, Kantorovich method, Weighted residual method.

ES 506 Reliability (3-0)3

Brief review of applied probability. Distributions of sum and quotient of two random variables. Topics in risk-based engineering design. Methods available, advantages and disadvantages. System reliability concepts. Statistical decision theory and its application in engineering.

ES 507 Boundary Element Method (3-0)3

Gradient and directional derivative of position vector. Numerical evaluation of surface and line integrals, review of the equations of elasto dynamics, acoustics and heat conduction. Formulation of boundary element method: basic integral equation, fundamental solutions. Boundary element equation. Numerical implementation of boundary element method. Codes based on boundary element method. Numerical applications.

ES 508 Statistical Methods for Engineers (3-0)3

Advanced statistical techniques in the solutions of real life engineering problems. Analysis of experimental data, Analysis of Variance, k-variable analysis, statistical modeling, regression analysis, experimental design, topics in time series, Bayesian analysis, discriminant analysis and clustering and their application to engineering problems.

ES 509 Partial Differential Equations in Computer Vision / Image Processing (3-0)3

Axiomatic Approach in Computer Vision, Nonlinear Evolution equations, Representation of generic shape, Energy functionals and associated Euler equations, Heat equation, multi resolution, stochastic connection.

Prerequisite: Engineering Mathematics and working knowledge of a programming tool.

ES 510 Numerical Solution of Ordinary Differential Equations (3-0)3

Numerical solution of initial value problems: multi-step methods and Runge-Kutta methods, stability and convergence. Numerical solution of boundary value problems: shooting methods, finite difference and collocation methods, Green's function methods, transform methods, introduction to the finite element method. Nonlinear boundary problems.
Prerequisite: ES 305 or equivalent.

ES 511 Basic Principles of Mechanics (3-0)3

Fundamentals of mechanics. Equivalent force systems. Equations of equilibrium. Internal forces. Introduction to continuum mechanics. Mechanical behavior of Hookean materials. Stress-strain transformations. Strain energy. Introduction to viscoelastic materials.

ES 512 Experimental Analysis (3-0)3

General concepts. Measuring devices. Manipulation, transmission and recording of data.

ES 514 Mechanical Behavior of Deformable Bodies (3-0)3

Materials properties; structure of materials; stress and strain concepts; stress and strain tensors; elastic behavior; three dimensional analysis; plastic behavior; fracture; viscoelastic behavior.
Prerequisite: Consent of the department.

ES 516 Spectral Methods (3-0)3

Introduction to the concept of spectral methods. Fourier-collocation spectral methods. Chebyshev-collocation spectral methods. Smoothness and accuracy. Boundary value problems. Polar coordinates. Time stepping. Initial value problems. Introduction to spectral element method.

ES 521 Theory of Elasticity (3-0)3

Stress and strain tensors. Strain-displacement relations. Compatibility equations. Constitutive equations. Plane strain, plane stress. Biharmonic equation, polynomial solutions, Fourier series solutions. Axisymmetric problems. Torsion, bending.

ES 522 Advanced Theory of Elasticity (3-0)3

Indicial notation, Cartesian tensors and field equations of elasticity theory. Integral transform solutions. Complex variable formulation. Nonlinear elasticity.

Prerequisite: ES 521 or equivalent.

ES 523 Advanced Mechanics (3-0)3
Axioms of mechanics. Mechanics of a particle. Mechanics of a system of particles. The virtual work principle. General survey of further variational principles of mechanics. Conservation theorems. Hamilton's equations of motion. Canonical transformations.The Hamilton-Jacobi theory.

ES 524 Thermal Stress Analysis (3-0)3
Theory of heat conduction in solids and review of basic principles in thermal stress analysis. Various formulations of thermo-elastic problems, uncoupled and coupled theories. Some three-and two-dimensional problems in thermoelasticity. Formulation of thermal stresses in thermo-viscoelastic and thermo-elastoplastic media. Some illustrative examples.

ES 525 Theory of Continuous Media I (3-0)3
Review of tensor analysis and integral theorems. Kinematics of deformation, strain tensor, compatibility condition. Material derivative of tensors, deformation rate, spin and vorticity. External and internal loads, Cauchy principle and stress tensor. Balance laws of momenta and energy, entropy principle. Constitutive theory and its axioms, thermomechanical materials. Some illustrative applications.

ES 526 Theory of Continuous Media II (3-0)3
Theory of elasticity: General approach, linear constitutive equations, material symmetries, isotropic materials. Wave propagation in isotropic elastic solids. Thermo-elasticity: General approach, linear constitutive equations, isotropic materials. Thermo-elastic waves. Fluid dynamics: Incompressible and compressible fluids, propagation of shock waves. Viscoelasticity: Mechanical models, linear theories.
Prerequisite: ES 525 or equivalent.

ES 527 Fracture Mechanics (3-0)3
Mechanisms of failure for brittle and ductile materials. Stress concentration. Elastic stress fields around cracks. Plasticity effect. Fracture criteria. Crack propagation and methods of crack arrest. Fatigue. Fracture testing.

ES 528 Wave Propagation in Solids (3-0)3
Elements of wave motion. Wave propagation in unbounded elastic media. Plane, cylindrical and spherical waves. Harmonic and transient waves in half-space. Surface waves. Waves in layered media. Waves in rods. Method of characteristics.

ES 531 Mechanics of Composite Materials (3-0)3
The nature and scope of composite materials. Fundamental aspects of the theory of the linear anisotropic elasticity. Prediction of macroscopic mechanical properties of composite materials. Analysis of internal fields in heterogeneous medium. Wave propagation and dynamic effects in composites. Effective stiffness theory considerations, lattice model representations.

ES 532 Theory of Plasticity (3-0)3
Physical background. Idealizations, yield criteria. Plastic-stress strain relations. Two measures of work-hardening. Extremum principles, the plastic potential and uniqueness. Elasto-plastic problems. Plane stress and plane strain (theory of slip-line field with some applications). Geometric effects. Plastic anisotropy.

ES 534 Elastic Stability (3-0)3
Various stability methods. Buckling of beams, columns, beams on elastic foundation. Bifurcation and snap through buckling. Plate and shell buckling. Introduction to dynamic buckling.

ES 536 Energy Methods (3-0)3
Force Fields. Work. Principles of dynamics. Elements of calculus of variations, variational principles for discrete systems. Elements of the mechanics of continua. Hellinger, Reissner and Hamilton principles, Castigliano's theorem, theorems of work and reciprocity.Application to elastic rods, structural systems, elastic plates and shells. Stability.

ES 538 Soil-Structure Interaction Analysis (3-0)3
Discrete Fourier transform. Soil-structure interaction analysis: direct and substructure methods, free field system, impedance relation, scattering analysis. Artificial boundary conditions: viscous boundary conditions in the absence and presence of free field. Description of seismic environment: types of control points, free displacements and forces in terms of control point motion.

ES 541 Introduction to Biomechanics (3-0)3
Structural and physical properties of bone, muscle, tendon and cartilage. Mechanics of joint and muscle action. Body equilibrium. Mechanics of the spinal column, of the pelvis and of the hip joint. Pathomechanics.

ES 542 Advanced Biomechanics (3-0)3

The knee joint, foot and ankle, shoulder-arm complex, the elbow joint. Pathomechanics. Gait analysis.

ES 551 Stochastic Methods in Engineering Mechanics I (3-0)3
Brief review of probability theory. Random processes. Random vibrations of linear single degree of freedom systems. Analysis of random response in the time and frequency domains. Statistical analysis of failure mechanisms.

ES 552 Stochastic Methods in Engineering Mechanics II (3-0)3
Review of the deterministic multi-degree-of-freedom vibratory systems. Random vibration of multi-degree-of-freedom and continuous systems. Markov processes, random walk problems, Fokker-Planck equation. Introduction to random vibration of nonlinear systems, stability of systems subjected to stochastic excitations and introduction to chaotic dynamics.
Prerequisite : ES 551 or equivalent.

ES 554 Nonlinear Dynamics (3-0)3
Fundamentals of nonlinear dynamics and brief review of random vibrations. Periodic and chaotic attractors, stability and bifurcations of equilibria and cycles. Iterated maps as dynamical systems. Criteria for the onset of chaos. Applications and current literature.

ES 571 Basic Principles of Fluid Mechanics (3-0)3
Fluid statics. Transport mechanisms. Compressible flow. Boundary layer. Introduction to unsteady flows.

ES 572 Advanced Fluid Mechanics (3-0)3
Development of the governing equations. Grid generation. Inviscid flows. Boundary layer type equations. Parabolized Navier-Stokes equations. Incompressible and compressible Navier-Stokes equations.
Prerequisite: ES 571 or equivalent.

ES 591 Seminar (0-2)NC
Students prepare and pesent a progress report or literature review on their thesis topic. The course is normally taken by students in their third semester.

ES 600 Ph.D. Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester.

ES 691 Seminar (0-2)NC
Similar to ES 591 but open to doctoral students only.

ES 7XX Special Topics in Engineering Sciences (3-0)3
Courses not listed in the catalogue. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include waves in viscoelastic media, mathematical simulation of engineering problems, cell biomechanics.

ES 8XX Special Studies (4-2) NC
M.S. Students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

ES 9XX Advanced Studies (4-0) NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her advisor.

DEPARTMENT OF ENVIRONMENTAL ENGINEERING

PROFESSORS

DEMİRER, N. Göksel: B.S., M.S., METU, Ph.D. Vanderbilt University.
DİLEK, B. Filiz: B.S., M.S., Ph.D., METU.
GÖKÇAY, F. Celal: B.S., Istanbul University; Ph.D., University of Wales, U.C. Cardiff.
SANİN, F. Dilek ***(Department Chair)***: B.S., M.S., METU; Ph.D., Duke University.
TUNCEL, Gürdal: B.S., M.S., METU; Ph.D., University of Maryland.
ÜNLÜ, Kahraman***:*** M.S., Ankara University; M.S., Iowa State University;
Ph.D., University of California Davis.
YETİŞ, Ülkü: B.S., METU; M.S., University of Pittsburgh; Ph.D., METU.

ASSOCIATE PROFESSORS

AKSOY, Ayşegül ***(Vice Chair)***: B.S., M.S., METU; Ph. D. University of Virginia.
ALP, Emre ***(Vice Chair)***: B.S., M.S., METU; M.S., Ph. D., Marquette University.
İÇGEN, Bülent: B.S., Hacettepe University; M.S., Ph.D., METU.
İMAMOĞLU, İpek ***(Associate Dean - Faculty of Engineering)***: B.S., METU;
M.S.,University of Newcastle upon Tyne; Ph. D. University of Wisconsin-Milwaukee.

ASSISTANT PROFESSORS

ERGÜDER, Tuba Hande: B.S., M.S., Ph.D., METU.
KAYMAK, Barış: B.S., METU; Ph.D. Drexel University.

INSTRUCTOR

MURDOCH, Robert W.: B.S., University of Texas at Austin; Ph.D., Cornell University

GENERAL INFORMATION: The Department of Environmental Engineering was established in January 1973 in response to the growing concern over the environment and the need for fully qualified engineers capable of undertaking professional responsibilities for optimum development and prudent management of water, air and land resources. This department evolved from the Sanitary Engineering division of the Civil Engineering Department, which had been offering graduate courses in this field since 1967.

The Department of Environmental Engineering offers the degrees of Bachelor of Science (B.S.), Master of Science (M.S.) and Doctor of Philosophy (Ph.D.). The programs are designed with consideration of the modern concepts of environmental engineering education, as well as to encourage the development of individual initiative and resourcefulness with emphasis on responsibility and good judgment.

The environmental engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

MISSION: The mission of the Environmental Engineering Department is to provide the high quality environmental engineering education as required by the industry and the public; to advance the understanding and application of the principles of environmental science and engineering; to enhance and maintain sustainable economic development efforts and to improve the well-being of the society in general through teaching, research and community outreach programs.

PROGRAM OBJECTIVES: The graduates of the B.S. program of Department of Environmental Engineering, after few years following graduation, are environmental engineering professionals who meet the following program educational objectives:

1. Graduates will identify and contribute to the solution of current and emerging environmental problems in a creative and independent manner.

2. Graduates will participate in research and technology development programs.
3. Graduates will function in diverse areas of environmental engineering practice at national and international levels.
4. Graduates will pursue leadership positions in both public and private organizations.

STUDENT OUTCOMES: The students of the B.S. program of Department of Environmental Engineering, at the time of graduation are expected to meet the following student outcomes:

a) Graduates will have an ability to apply knowledge of mathematics, science, and engineering.
b) Graduates will have an ability to design and conduct experiments as well as to analyze and interpret data.
c) Graduates will have an ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
d) Graduates will have an ability to function on multi-disciplinary teams.
e) Graduates will have an ability to identify, formulate, and solve engineering problems.
f) Graduates will have an understanding of professional and ethical responsibility.
g) Graduates will have an ability to communicate effectively.
h) Graduates will have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
i) Graduates will have recognition of the need for, and an ability to engage in life-long learning
j) Graduates will have knowledge of contemporary issues.
k) Graduates will have an ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

RESEARCH INTERESTS AND FACILITIES: Some of the research interests are: Analysis and characterization of domestic and industrial wastewaters; wastewater treatability; physical, biological, and chemical treatment methods for water and wastewater treatment; application of contemporary treatment techniques; drinking water quality analysis and assessment; local and regional surface and groundwater quality assessment and pollution control; lake and reservoir management; pollution source identification, characterization and control; characterization, handling and disposal of water and wastewater treatment sludge; analysis and control of the sludge and solid waste produced by different industrial activities; hazardous waste management and disposal; investigation of the fate of pollutants in environment; environmental risk assessment; determination of atmospheric pollutants, their sources and impacts, air pollution and control; mathematical modeling of environmental systems and processes; environmental systems engineering; modeling of pollutant transport in surface waters and groundwater; modeling of atmospheric pollutant transport; soil pollution and control; development of watershed management plans; investigation of diffuse pollution sources and control strategies; environmental management and policy development; resource efficient and sustainable production; eco-efficiency; industrial symbiosis; life cycle assessment; biorefining; waste valorization; renewable energy; environmental remote sensing.

The Department has the following research facilities and laboratories:

UNIT OPERATIONS LABORATORY: Facilities for controlled experimentation exist in this laboratory for various unit operations involved in environmental engineering such as filtration, sedimentation, aeration, etc. The units are equipped with measuring and control instrumentation for performance evaluation and flexible operation.

CHEMISTRY LABORATORY: Basic facilities are available for undertaking chemical, instrumental and other routine analysis of environmental engineering and sciences. This laboratory is also used for teaching purposes of related courses.

MICROBIOLOGY LABORATORY: Basic facilities are present for undertaking routine microbiological analysis in this laboratory. The laboratory is also equipped with research equipment including respirometers, biological reactors and AOX instrument. Laboratory is used for teaching purposes in the related courses as well.

AIR POLLUTION CONTROL LABORATORY: In this laboratory facilities for sampling and analysis of various air pollutants are present. Emission, immision and meteorological measurements can be done with the equipment available in the laboratory.

INSTRUMENTAL ANALYSIS LABORATORY: This laboratory is in operation using equipment including Atomic Absorption Spectrophotometer, U.V. Visible Spectrophotometer, Elemental Analyzer, Ion Chromatograph, Flame Photometer, Gas Chromatographs, Total Organic Carbon Analyzer.

CONTAMINANT HYDROLOGY LABORATORY: This laboratory, which is mainly used for research purposes, is equipped with microwave equipment that extracts solvents in soil, sediment, solid and hazardous wastes; and other equipments such as hydraulic conductivity measuring devices.

ANAEROBIC BIOTECHNOLOGY LABORATORY: This laboratory is in operation mainly for research purposes and equipped with basic facilities for chemical analyses as well as instrumental devices such as Gas Chromatographs.

ACCREDITED ANALYSES (TÜRKAK) LABORATORY: Through this laboratory, accredited analytical work and service are provided for public institutions and private companies. Accreditation is granted by the Turkish Accreditation Agency (TÜRKAK) under the quality standard TS EN ISO/IEC 17025 "Standard for General Requirements for the Competence of Calibration and Testing Laboratories".

LINUX COMPUTER LABORATORY: This laboratory is mainly used for research purposes. The laboratory is equipped with computers running Linux and other open source software. Computers are designed to handle high computational demand for modeling applications in Environmental Engineering.

STUDENT COMPUTER LABORATORY: This laboratory is designed to meet the computer use requirements of undergraduate and graduate students. There are many computers that are connected to a server and to the campus computer network in this laboratory. Also many software packages are present in the department, that are to be used for research and teaching in applications related to water supply engineering, wastewater engineering, air pollution, soil and groundwater pollution, waste remediation and river pollution subjects.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MATH	119	Calculus with Analytic Geometry	(4-2)5
PHYS	105	General Physics I	(3-2)4
CHEM	107	General Chemistry	(3-2)4
ENVE	101	Introduction to Environmental Engineering	(2-0)2
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	106	General Physics I	(3-2)4
CE	101	Civil Engineering Drawing	(2-2)3
ENVE	102	Environmental Chemistry I	(3-0)3
CENG	230	Introduction to Computers and C Programming	(2-2)3
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

ENVE	201	Fundamentals of Environmental Engineering Processes	(3-0)3
MATH	219	Introduction to Differential Equations	(4-0)4
ES	223	Statics and Strength of Materials	(4-0)4
CHEM	229	Organic Chemistry for Engineers	(3-2)4
ENVE	208	Environmental Chemistry Laboratory	(1-4)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

ENVE	206	Physicochemical Principles of Environmental Engineering	(3-0)3
ES	303	Statistical Methods for Engineers	(3-0)3
CHE	204	Thermodynamics I	(4-0)4
ENVE	202	Environmental Microbiology	(3-2)4
ENVE	307	Air Pollution	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

ENVE	303	Unit Operations and Processes of Water Treatment	(3-0)3
ENVE	309	Fundamentals of Biological Treatment	(3-0)3
CE	375	Environmental Engineering Hydrology	(3-0)3
CE	374	Fluid Mechanics	(3-0)3
Non-technical Elective			
ENVE	300	Summer Practice I	NC
TURK	303	Turkish III	NC

Sixth Semester

ES	361	Computing Methods in Engineering	(3-0)3
ENVE	322	Transport Processes in Environmental Engineering	(3-0)3
ENVE	304	Unit Operations and Processes of Wastewater Treatment	(3-0)3
ENVE	312	Water Supply and Urban Drainage	(3-0)3
ENVE	322	Transport Processes in Environmental Engineering	(3-0)3
Restricted Elective*			
Non-technical Elective			
TURK	304	Turkish IV	NC

FOURTH YEAR

Seventh Semester

ENVE	404	Environmental Modeling	(3-0)3
ENVE	407	Environmental Engineering Design I	(2-2)3
ENVE	412	Solid Waste Management	(3-0)3
Technical Elective			
Technical Elective			
ENVE	400	Summer Practice II	NC

Eighth Semester

ENVE	408	Environmental Engineering Design II	(2-2)3
Technical Elective			
Technical Elective			
Technical Elective			
Free Elective			

All elective courses are minimum 3 credits.
* CE 364 or CE 241

DOUBLE MAJOR PROGRAM IN ENVIRONMENTAL ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses is determined by the Department.

MINOR PROGRAM IN ENVIRONMENTAL CHEMISTRY

This program aims to provide an opportunity to the students to qualify in one of the sub-areas of the Environmental Sciences, namely Environmental Chemistry. This program is designed with the consideration of the modern concepts of Environmental Chemistry and laboratory training related to the environmental sampling and analysis.

Compulsory courses

ENVE	102	Environmental Chemistry I	(3-0)3
ENVE	206	Physico-Chemical Principles of Environmental Engineering	(3-0)3
ENVE	208	Environmental Chemistry Laboratory	(1-4)3
ENVE	424	Instrumental Analysis in Environmental Engineering	(2-2)3

Two of the following courses

ENVE	201	Fundamentals of Environmental Engineering Processes	(3-0)3
ENVE	301	Environmental Pollution and Ecology	(3-0)3
ENVE	310	Public Health	(3-0)3
ENVE	308	Environmental Chemistry II	(3-0)3
CHEM	229	Organic Chemistry	(3-0)3
ENVE	330	Principles of Environmental Engineering	(3-0)3

MINOR PROGRAM IN ENVIRONMENTAL MICROBIOLOGY

This program aims to provide an opportunity to the students to have more expertise in one of the sub-areas of the Environmental Sciences, namely Environmental Microbiology. This program is designed with the consideration of the modern concepts of Environmental Microbiology and laboratory training.

Compulsory courses

ENVE	202	Environmental Microbiology	(3-2)4
ENVE	301	Environmental Pollution and Ecology	(3-0)3
ENVE	309	Fundamentals of Biological Treatment	(3-0)3
CHEM	229	Organic Chemistry	(3-0)3

Two of the following courses

ENVE	201	Fundamentals of Environmental Engineering Processes	(3-0)3
ENVE	310	Public Health	(3-0)3
ENVE	314	Chemical Microbiology Laboratory	(1-4)3
ENVE	424	Instrumental Analysis in Environmental Engineering	(2-2)3
ENVE	330	Principles of Environmental Engineering	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

ENVE 101 Introduction to Environmental Engineering (2-0)2

Scope, definition and historical development of Environmental Engineering. Overall and coherent view of environmental engineering concepts and environmental engineering education. Technical, economical and organizational considerations of environmental quality management. Environmental ethics.

ENVE 102 Environmental Chemistry I(3-0)3

Scope of environmental chemistry. Discussion of important relevant concepts of chemistry, and introduction of basic environmental chemical concepts including pH, alkalinity, hardness, dissolved oxygen, Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). Acid-base chemistry and its significance in environmental engineering. Dissolution and precipitation chemistry, and chemical precipitation reactions in water and wastewater treatment. Coordination chemistry, oxidation and reduction

chemistry and its environmental chemical applications.

ENVE 201 Fundamentals of Environmental Engineering Processes (3-0)3
Introduction to environmental engineering calculations; analysis of pollution control processes: chemical and biochemical kinetics, mass balances, reactor analysis, energy balances, mass-transport processes with particular emphasis on examples of environmental pollution control processes.

ENVE 202 Environmental Microbiology (3-2)4
Introduction to general microbiology. Water and wastewater microbiology. Degradation metabolism of compounds by microorganisms. Enzyme kinetics. Batch growth kinetics. Recycling of minerals and nutrients. Epidemiology and control of diseases. Biological safety.

ENVE 206 Physico - Chemical Principles of Environmental Engineering (3-0)3
Colloidal systems. Analysis of Brownian motion and diffusion. Behavior of particles under gravitational force. Electrical properties of particles. Mechanisms for coagulation. Mechanisms of flocculation. Behavior of gases. Phase equilibria. Transport properties.

ENVE 208 Environmental Chemistry Laboratory (1-4)3
Laboratory experience for various areas of environmental chemistry. Laboratory rules and safety regulations, including chemical and fire hazards. Selected experiments; instrument calibration, volumetric analysis, gravimetric analysis, optical methods of analysis.
Prerequisite: ENVE 102.

ENVE 300 Summer Practice I NC
The third-year undergraduate students of the Environmental Engineering Department are required to make a summer practice for 20 working days and submit reports which are evaluated as part of their academic performance.

ENVE 301 Environmental Pollution and Ecology (3-0)3
Freshwater ecology, marine ecology, estuarine ecology, terrestrial ecology, eutrophication, natural resources and their management. Functional parts of ecosystem, energy flows, nutrient cycles. Significance of pollution in the ecosystem. Radiation ecology. Air pollution ecology. Toxicology and water quality criteria. Microbial ecology.

ENVE 303 Unit Operations and Processes of Water Treatment (3-0)3
Screening, coagulation and flocculation, sedimentation and flotation, filtration, ion removal by chemical precipitation, disinfection, ion exchange, adsorption, membrane processes and solids handling.
Prerequisites: ENVE 201 and ENVE 206

ENVE 304 Unit Operations and Processes of Wastewater Treatment (3-0)3
Types and characteristics of wastewaters; screening-shredding; grit removal; equalization; sedimentation; floatation; gas transfer (aeration, stripping); principles of biological treatment; biological treatment processes (activated sludge and modifications, biological nutrient removal systems, membrane bioreactors, anaerobic treatment units, attached growth systems, oxidation ponds); chemical precipitation; membrane processes; advanced oxidation processes; adsorption; sludge processing and disposal.
Prerequisite: ENVE 201.

ENVE 307 Air Pollution (3-0)3
Atmosphere and its composition. Sources and scales of air pollution. Effects of air pollution on human, animals, plants and structures. Atmospheric chemistry and photochemical smog. Ambient air sampling, measurement and analysis. Air pollution monitoring. Role of meteorology on air pollution. Air quality criteria. Emission and emission standards. Stack gas sampling and analysis. Dispersion of air pollutants. Emission inventory. Introduction to air pollution modeling.

ENVE 308 Environmental Chemistry II (3-0)3
Surface and colloidal chemistry, spectrometry, photochemistry, electrochemistry, applications of graphical methods to chemical problems in environmental engineering, reaction kinetics, introduction to biogeochemical cycle, chemical speciation, important pollutants and contaminants.
Prerequisite: ENVE 102.

ENVE 309 Fundamentals of Biological Treatment (3-0)3
Introduction to continous culture kinetics, inhibited growth kinetics. Chemostat cultures, deviation from ideal, chemostat cultures with biomass recycle. Plug-flow cultures. Fed-batch and repeated batch cultures. Introduction to activated sludge process kinetics.

Nitrification and denitrification systems. Basics of anaerobic suspended culture systems. Microbiology of wastewater treatment.
Prerequisite: ENVE 202.

ENVE 310 Public Health (3-0)3
Environment and diseases. Transmission of disease. Vectors, parasites and their control. Principles of toxicology. Epidemiological studies. Development of health criteria. Application to home, work and community environment. Comprehensive planning. Health administration.

ENVE 312 Water Supply and Urban Drainage (3-0)3
Water management. Sources of water. Population estimation. Water demand/use and wastewater generation. Water transmission. Water distribution components. Pumps. Design of water distribution systems. Components and characteristics of sewage. Sewer appurtenances and special structures. Design principles of sanitary, storm and combined sewers. Hydraulics and design of sewers. Stormwater management.
Prerequisites: CE 374 and CE 375.

ENVE 314 Chemical Microbiology Laboratory (1-4)3
Introduction to experimentation and data analysis in microbiology. Experiments will involve chromatographic O2 electrode, manometric and AAS techniques, as applied to microbiology, and aerobic and/or anaerobic chemostat kinetics.

ENVE 316 Air Pollution Laboratory (1-4)3
Laboratory applications related to air pollution. SO_2, NO_x and particulate matter analysis in the ambient air. Isokinetic sampling and stack gas analysis. Applications of sampling techniques and data analysis. Technical report writing.
Prerequisite: ENVE 307

ENVE 322 Transport Processes in Environmental Engineering (3-0)3
Reactive and nonreactive environmental processes. Mass transport processes in environmental media−air, water and soil. Heat transport. Mass transfer and transformation processes. Development of governing equations for combinations of transport, transfer and transformation processes in environmental systems. Computational aspects of environmental mass and heat transport processes.
Prerequisites:ENVE 201 and MATH 219

ENVE 330 Principles of Environmental Engineering (3-0)3
Humans and environment. Sources of environmental pollution. Environmental impact of urban and industrial development. Hydrologic cycle. Water pollution and its control. Water supply and wastewater collection. Principles of water and wastewater treatment. Air pollution and its control. Solid waste disposal. Noise problem. Environmental criteria for city planner. Environmental Impact Assessment.
(Offered to non-ENVE students only).

ENVE 332 Fundamentals of Environmental Engineering (3-0)3
Sources of environmental pollution. Environmental effects of engineering structures, urban and industrial development. Water pollution and its control. Characteristics of water and wastewater. Principles of water and wastewater treatment. Air pollution and its control. Solid waste. Noise problem. Environmental management. Miscellaneous environmental problems involving engineering solutions.
(Offered to non -ENVE students only).

ENVE 400 Summer Practice II NC
The fourth-year undergraduate students of the Environmental Engineering Department are required to make a summer practice for 20 working days on an environmental engineering project and submit reports which are evaluated as part of their academic performance.

ENVE 401 Soil and Groundwater Pollution (3-0)3
Sources and composition of subsurface contaminants. Principles of fluid flow and contaminant transport in soil and groundwater systems. Applications for predicting the behavior of subsurface contaminants due to landfills, chemical spills, agrochemical leaching and other sources. Regulatory issues in soil and groundwater pollution. Soil and groundwater monitoring. Soil and groundwater pollution control and remediation technologies. Case studies related to water quality management, waste disposal, and contaminated site remediation.

ENVE 402 Wastewater Reuse (3-0)3
Significance of wastewater reclamation, recycling and reuse in agriculture and industry. Factors of importance in planning and economic analysis of water reuse projects. Importance of water reuse for the future. Role and importance of physicochemical mechanisms in tertiary or advanced wastewater treatment systems. Disinfection in water reuse.

Principles of reclaimed water distribution and storage. Microbiological considerations in wastewater reclamation and reuse criteria. Some wastewater reclamation and reuse projects.

ENVE 404 Environmental Modeling (3-0)3
Scope of environmental modeling. Fundamentals of mathematical modeling. System analysis and modeling. Modeling engineered and natural environmental systems. Development and application of mathematical models for selected engineered and natural environmental systems. Computer applications related to analytical and numerical solutions of model equations using various software packages. Model development and application.
Prerequisites: *ENVE 322 and ES 361*

ENVE 406 Environmental Management (3-0)3
Principles of developing national environmental quality standards and compliance measures. Concept of environmental loading and prevention of significant deterioration in ecological balances. Current national and international standards. Principles of developing risk-based land-use planning. Needs analysis for new industrial facilities. Baseline assessment.

ENVE 407 Environmental Engineering Design I (2-2)3
Concepts in engineering design, engineering ethics, principles of project management, environmental legal infrastructure, treatment plant processes, plant hydraulics and sludge handling, application of environmental engineering principles on open ended design problem software applications in process selection and design.
Prerequisites: ENVE 303 and ENVE 304

ENVE 408 Environmental Engineering Design II (2-2)3
Continuation of ENVE 407, tender management, safety and economical considerations in engineering design, cost analysis and project evaluation, detailed design applicable to the problem, completion of a design project in teams with a final report and presentation.
Prerequisite: ENVE 407.

ENVE 410 Marine Outfall Design (3-0)3
Quality criteria for sea water stratification and circulations in sea environment. Microbiological concepts related to marine disposal of wastewater. Pretreatment and data collection in sea environment. Jet and lateral dispersions and the resulting dilutions. Design, construction and maintenance of marine outfalls.

ENVE 412 Solid Waste Management (3-0)3
Generation of solid wastes. On-site handling, storage and processing. Collection, transfer and transport of solid wastes. Processing techniques and equipment. Recovery of resources, conversion products and energy. Disposal methods for solid wastes and residual matter: Sanitary landfill, incineration, composting and other techniques.

ENVE 413 Air Pollution Control (3-0)3
Introduction to air pollution control. Types of air pollution control equipment. Aerodynamics and fluid resistance to particle motion. Particle and gas separation techniques (Gravity, momentum, centrifugal separators, filters, scrubbers, electrostatic precipitators, absorbers, etc.). Design principles of air pollution control equipment. Industrial applications. Air pollution control in urban environment.

ENVE 414 Water Quality Management (3-0)3
Sources and use of water. Characteristics of water and wastewater. Water quality standards. Management of waste loads and assimilative capacity of receiving waters. Water quality management planning. Fate of pollutants in water environment. Modeling of water quality in natural systems. Computer applications.

ENVE 417 Unit Operations and Process Laboratory (1-4)3
Introduction to experimentation and report writing. Selected experiments: coagulation and flocculation, sedimentation, filtration, chemical precipitation, aeration, carbon adsorption and ion exchange.
Prerequisites: ENVE 303.

ENVE 420 Environmental Impact Assessment (3-0)3
Concepts of environmental impact assessment. Applications of mathematical models to environmental impact assessment cases involving soil, water and air quality problems. Preparation of environmental impact statement. Case studies.

ENVE 422 Treatment and Disposal of Water and Wastewater Sludges (3-0)3
Sources and quantities of sludge produced from water and wastewater treatment plants. Sludge characteristics. Sludge stabilization, pumping, conditioning, thickening, dewatering and drying. Sludge combustion and ultimate disposal.
Prerequisites: ENVE 303 and ENVE 304

ENVE 424 Instrumental Analysis for Environmental Engineering (1-4)3

The course intends to acquaint students with theory, principle and application of instruments and equipment used in environmental research. Projects will be assigned to groups of students which will include sampling, sample preparation and analysis of metals, organics, major ions, and other important physical and chemical parameters. Students will also be asked to interpret, present and report their data in a scientifically acceptable format.

ENVE 426 Air Pollution Meteorology and Atmospheric Dispersion (3-0)3

Vertical structure and composition of the atmosphere. Fundamentals of atmospheric boundary layer flow. Energy balance in the atmosphere. Atmospheric stability and inversion mechanisms. Turbulence and vertical mixing in the boundary layer. Air pollution potential. Atmospheric turbulence and dispersion. Plume rise. Transport and dispersion in local, regional and global scale. Large scale motion, convergence and divergence.

ENVE 428 Pollution Prevention (3-0)3

Fundamental concepts and application of eco-efficiency, pollution prevention and cleaner production. Traditional end-of-pipe versus preventive environmental management approaches. Cleaner production tools, environmental performance indicators, environmental management systems.

ENVE 430 Solid Waste Landfill Design (3-0)3

Introduction; landfill leachate generation, characteristics and volume estimation; contaminant transport in waste ecosystems and landfill liner systems; landfill leachate collection system design; landfill liner system design (clay and geomembrane liners); leachate management methods; landfill cover system design; landfill gas generation, characteristics and volume estimation; landfill gas collection and control systems; computer software applications to design of the major landfill components and landfill process computations.
Prerequisite: ENVE 412.

ENVE 432 Hazardous Waste Management (3-0)3

Hazardous waste classification, generation rates, regulations on hazardous wastes, waste minimization, recycling and recovery of hazardous wastes, treatment of hazardous wastes using physicochemical processes, biological processes, and thermal methods. Land storage and disposal of hazardous wastes, site remediation and case studies.

ENVE 447 Marine Pollution (3-0)3

Present health of the oceans. The need for control of pollution. Definition of potentially harmful substances; inorganic, organic, radioactive and solid waste. Marine environment as a waste receiving body; environmental capacity. Potential impairment of marine ecosystems and water uses. Case studies.

ENVE 490 Topics in Environmental Engineering (1-4)3

Graduation research project carried out under the guidance of an advisor assigned to each student. Research topic includes a literature survey or a laboratory study or participation in an ongoing project. A final report and a seminar are required at the end of the semester.

ENVE 491-498 Special Topics in ENVE (3-0)3

These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF ENVIRONMENTAL ENGINEERING

GRADUATE CURRICULUM

M.S. in Environmental Engineering

ENVE	500	M.S. Thesis	NC
ENVE	598	Graduate Seminar	(0-2)NC
ENVE	599	Graduate Seminar	(0-2)NC

7 elective courses

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. in Environmental Engineering

If admitted by M.S. degree:

ENVE	600	Ph.D. Thesis	NC

7 elective courses

Total minimum credit: 21
Number of courses with credit (min): 7

If admitted by B.S. degree:

ENVE	598	Graduate Seminar	(0-2)NC
ENVE	599	Graduate Seminar	(0-2)NC
ENVE	600	Ph.D. Thesis	NC

14 Elective Courses

Total minimum credit: 42
Number of courses with credit (min): 14

GRADUATE COURSES

ENVE	500	M.S. Thesis	NC
ENVE	501	Pollution Control in Sea Environment I	(3-0)3
ENVE	502	Modeling Soil and Groundwater Pollution	(3-0)3
ENVE	503	Industrial Water and Wastewater Treatment	(3-0)3
ENVE	504	Pollution Transport in River Systems	(3-0)3
ENVE	505	Industrial Air Pollution Control	(3-0)3
ENVE	506	Advances in Water Supply Engineering	(3-0)3
ENVE	507	Advanced Water and Wastewater Treatment	(3-0)3
ENVE	508	Advanced Atmospheric Dispersion	(3-0)3
ENVE	509	Contaminated Site Remediation	(3-0)3
ENVE	510	Principles of Risk Assessment and Management	(3-0)3
ENVE	513	Atmospheric Chemistry	(3-0)3
ENVE	532	Environmental Biotechnology	(3-0)3
ENVE	535	Advanced Biological Treatment	(3-0)3
ENVE	538	Advanced Environmental Chemistry	(3-0)3
ENVE	539	Environmental Systems Engineering	(3-0)3
ENVE	541	Anaerobic Treatment of Wastes	(3-0)3
ENVE	547	Marine Pollution	(3-0)3
ENVE	573	Fate of Pollutants in the Environment	(3-0)3
ENVE	598	Graduate Seminar	(0-2)NC
ENVE	599	Graduate Seminar	(0-2)NC
ENVE	600	Ph.D. Thesis	NC
ENVE	7XX	Special Topics in Environmental Engineering	(3-0)3
ENVE	8XX	Special Studies	(4-2)NC
ENVE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

ENVE 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between student and a faculty member. Students register to this course in all semesters while the research program or write-up of thesis is in progress.

ENVE 501 Pollution Control in Sea Environment I (3-0)3
Hydrodynamic/oceanographic characteristics (current, turbulent mixing, density, structure, etc.). Waste dispersion characteristics. Turbulent diffusion/dispersion theories. Turbulent diffusion/dispersion measurements. Dilution and mixing of pollutants and heated discharges from sea outfalls. Jet and plume mixing, turbulent buoyant jets in uniform and stratified environments.

ENVE 502 Modeling Soil and Groundwater Pollution (3-0)3
Mathematical models for flow and transport of contaminants in soil and groundwater systems. Analytical and numerical solutions of mathematical models. Stochastic aspects of subsurface flow and contaminants. Case studies and applications of selected computer programs to investigate problems of various complexity. Current research topics and directions.

ENVE 503 Industrial Water and Wastewater Treatment (3-0)3
Industrial wastewater and sludge treatment with special reference to hazardous wastes. Case studies for various industries; characteristics and composition of the wastes and availability of waste treatment technology. Radioactive and thermal pollution control.

ENVE 504 Pollution Transport in River Systems (3-0)3
Introduction to advanced river water quality models. General model formulation structures. Constituent reactions and interrelationships. Computer applications to selected cases. Uncertainty analysis.

ENVE 505 Industrial Air Pollution Control (3-0)3
Air pollution indices. Planning industrial air pollution survey; sources, inventories, emission factors, other factors, stack sampling; isokinetic sampling, sampling trains. Area sampling for industrial pollutants. Air quality monitoring design for industrial areas. Various strategies for industrial air pollution control.

ENVE 506 Advances in Water Supply Engineering (3-0)3
Use of computer models for pipe sizing of distribution network design. Computer analysis of pipe networks (Lopp and Node Methods; Optimization of Networks with Discrete Methods; Extended Period Simulation). Treatment of waters which requires non-standard (special techniques) approaches.

ENVE 507 Advanced Water and Wastewater Treatment (3-0)3
Purpose and benefits of advanced treatment; processes for solids removal. Processes for nutrient removal. Membrane processes, biological-chemical treatment, physical- chemical treatment. Selecting and combining unit processes to obtain the desired water quality.

ENVE 508 Advanced Atmospheric Dispersion (3-0)3
Review of dispersion characteristics of the atmospheric boundary layer. Complex models of dispersion. Numerical modeling techniques. Heavy gas dispersion. Effects of clouds in dispersion. Deposition of pollutants on soil and water. Complex terrain dispersion. Effects of buildings on dispersion. Dispersion in buildings. Design of monitoring programs for atmospheric air quality.

ENVE 509 Contaminated Site Remediation (3-0)3
Properties of the contaminants, phase distribution, source control; site characterization and monitoring (vadose zone and aquifer characteristics, extent of contamination); in situ soil and groundwater remediation technologies e.g., pump and treat, capture zone analysis, permeable reactive barriers, air sparging, soil vapor extraction, bioventing, land treatment, monitored natural attenuation; design, operation and performance assessment of the remedial systems; remedial goal and risk assessment; assessment of remedial alternatives, cost analyses; case studies and computer applications on remedial systems.

ENVE 510 Principles of Risk Assessment and Management (3-0)3
Assessment of acute hazards of toxic and flammable materials used in chemical industries. Hazard identification using fault trees, and consequence assessment using mathematical models. Physical principles of consequence modeling. Estimation of industrial risks and comparison with other commonly understood risks. Risk management

decision making in design of chemical industries and land use planning.

ENVE 513 Atmospheric Chemistry (3-0)3
Description of the atmosphere. Greenhouse effect. Stratospheric ozone. Photochemical smog. Acid rain. Brief introduction to atmospheric aerosols.

ENVE 532 Environmental Biotechnology (3-0)3
Advanced biological reactors, enzyme reactors, treatment with immobilized cells and enzymes, biodegradation of unusual compounds and tests for biodegradability, effect of metals on biological kinetics, biological recycling of mineral wastes and residues, thermophilic microorganisms and their application to waste treatment.

ENVE 535 Advanced Biological Treatment (3-0)3
Review of biological treatment processes. Mechanism, kinetics and microbiology of nutrient removing activated sludge. IAWQ Task group models for nutrient removing activated sludge. Calibration techniques for the Task group models. Hands-on practice with SSSP and ASIM computer models. Microbiology of bulking and population dynamics of activated sludge. Sequencing batch, GAC and PAC activated sludge.

ENVE 538 Advanced Environmental Chemistry (3-0)3
Nature and properties of environmental chemistry. Ingredients of environmental chemical work, sampling and sample storage, analysis method adoption and standard methods of analysis, chemicals for environmental analysis, their grades and purification techniques. Primary standards in environmental chemical work. Case studies.

ENVE 539 Environmental Systems Engineering (3-0)3
Handling and treatment of engineering data. Experimental design. Systems approach to problem solving. Formulation of management models. Linear and non linear programming. Selected applications in water, air, and soil quality management, solid and hazardous waste management.

ENVE 541 Anaerobic Treatment of Wastes (3-0)3
Chemistry, microbiology. Environmental requirements and control conditions for anaerobic treatment. Toxic materials and their control. Process design. Anaerobic treatment of organic wastes. Advances in anaerobic pond system design. Anaerobic treatment modeling. Energy recovery, effluent treatment of wastes. Anaerobic sludge treatment, utilization of digested sludge. Biogas recovery from anaerobic treatment plants.

ENVE 547 Marine Pollution (3-0)3
Present health of the oceans. The need of control of pollution due to potentially harmful substances in the ocean. Definition of potentially harmful substances; inorganics, organics, radioactive matter, solid waste. Marine environment as a waste receiving body. Environmental capacity. Potential impairment of marine ecosystems and water uses. Case studies.

ENVE 573 Fate of Pollutants in the Environment (3-0)3
Fundamental concepts regarding the fate of a pollutant once released into the environment. Classification of pollutants, equilibrium partitioning between gaseous, liquid and solid phases: vapor pressure, solubility in water, air-organic solvent, air-water partitioning, organic liquid-water partitioning, sorption, solid-water distribution, partitioning to living media. Abiotic and biotic transformation processes: hydrolysis, redox and photochemical reactions, biodegradation. Transport of pollutants and modeling concepts. Case studies.

ENVE 598 Graduate Seminar (0-2)NC
It is a proposal seminar given by the M.S. candidate either in the second or third term of the graduate study. If available, the candidate may present the initial findings of his/her thesis. Credits will be given upon the completion of the seminar.

ENVE 599 Graduate Seminar (0-2)NC
This is a second graduate seminar course in the M.S. program. Students register to this course in all semesters except the semester that they register to ENVE 598 to give their proposal seminar. Attendance is required in this course.

ENVE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters while the research program or write-up of thesis is in progress.

ENVE 7XX Special Topics in Environmental Engineering (3-0)3
Courses not listed in the catalogue are given as Special Topics courses. Contents vary from year to year according to interest of students and instructor

in charge. Courses include various environmental engineering topics.

ENVE 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her supervisor.

ENVE 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

DEPARTMENT OF FOOD ENGINEERING

PROFESSORS

ALPAS, Hami ***(Acting Secretary General)***: B.S., M.S., M.B.A., Ph.D., METU.
BAYINDIRLI, Alev ***(Department Chair)***: B.S., M.S., Ph.D., METU.
BOZOĞLU, Faruk: B.S., M.S., METU; Ph.D., North Carolina University.
GÜRAKAN (GÜLTEKİN), Candan: B.S., M.S., Ph.D., METU.
HAMAMCI, Haluk: B.S., M.S., METU; Ph.D., University of California at Davis.
ŞAHİN, Serpil : B.S., M.S., Ph.D., METU.
ŞUMNU, S. Gülüm : B.S., M.S., Ph.D., METU.
YENER, M. Esra: B.S., M.S., METU; Ph.D., Cornell University.

ASSOCIATE PROFESSORS

ÇEKMECELİOĞLU, Deniz: B.S., M.S., University of Gaziantep; Ph.D., Pennsylvania State University.
MERT, Behiç ***(Vice Chair)***: B.S., METU; M.S., Michigan State University; Ph.D., Purdue University.

ASSISTANT PROFESSORS

ÖZTOP, H. Mecit : B.S., M.S. METU ; Ph.D.,University of California, Davis
SOYER, Yeşim ***(Vice Chair***): B.S., Ankara University; M.S., Ankara University; Ph.D., Cornell University.
ŞENSOY, İlkay: B.S., METU; M.S., Ph.D., Ohio State University.
Yücel Umut : B.S., M.S. METU ; Ph.D. Pennsylvania State University.

GENERAL INFORMATION: Food Engineering applies modern science and engineering concepts to the manufacture and distribution of foods. To accomplish this objective, an understanding of the basic principles of many disciplines, including chemistry, mathematics, physics, economics, engineering, microbiology, management, nutrition and public health, must be coupled with the ability to apply this knowledge to food processing and preservation as well as to marketing. Food engineers are concerned with the theoretical and practical aspects of the food industry that involve the food chain from the production of raw materials to the ultimate utilization of products by consumers. Food engineers should be prepared to meet challenges of work in such areas as: cereals, dairy products, fruits and vegetables, meat, poultry and fish products or fabricated foods of the future.

MISSION STATEMENT: METU- Food Engineering program aims to provide graduates with the knowledge and skills that can be applied to design, develop and manufacture safe, high quality, value added food products and production and distribution systems for the benefit of mankind.

UNDERGRADUATE PROGRAM EDUCATIONAL OBJECTIVES

Within a few years after graduation, our graduates are expected to

1- take pioneering, entrepreneurial, and innovative roles in private sector or public enterprises and institutions for food processing, design and development of new food products and processes.
2- continue their career development through professional training or graduate studies as engineers having life-long learning ability.
3- be engineers complying with food safety and ethical rules for public welfare and health.

UNDERGRADUATE PROGRAM STUDENT OUTCOMES

a. the ability to apply knowledge of mathematics, science and engineering
b. the ability to design and conduct experiments, as well as to analyze and interpret data
c. the ability to design a system, component, or process to meet desired needs
d. the ability to function on multi-disciplinary teams
e. the ability to identify, formulate and solve engineering problems
f. the understanding of professional and ethical responsibility
g. the ability to communicate effectively

h. the education necessary to understand the impact of engineering solutions in a global and societal context
i. a recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. the ability to use the techniques, skills and modern engineering tools necessary for engineering practice

GRADUATE PROGRAM EDUCATIONAL OBJECTIVES: The graduate program aims to provide more depth and breadth to the undergraduate background of the students both through theoretical and applied studies in food engineering and processing, food safety and security, food biotechnology, food microbiology, and food chemistry. Graduate studies in Food Engineering are intended to provide opportunities to qualified food engineers for further education and research to meet the demands of food industry

The program is continuously updated for rapid adaptation of the graduates to dynamically growing food industry. The graduates are employed especially by the private sector to design, control, operate the existing equipment and processes as well as to perform research, development, marketing and management work. Further, for those students interested in academic life, the graduates are welcomed by the outstanding universities in the USA and Europe for graduate study.

The Food Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

RESEARCH INTEREST AND FACILITIES: Program aims to provide more depth to the undergraduate background of the students both through theoretical and applied studies in different areas of food engineering.

Major Research Activities:

- Food Safety
- Design of new equipment for food processing
- Extraction (Microwave extraction, Supercritical fluid extraction, Ultrasound extraction)
- Frying
- Microwave processing of foods (Baking, Drying, Extraction, Frying and Thawing)
- Physical properties of food materials
- Non-thermal processing of foods (High hydrostatic pressure, Pulsed electric field, Ultrasound)
- Industrial biotechnology
- Food pathogens
- Molecular Typing (i.e., DNA Fingerprinting)
- Characterization of probiotic microorganisms
- Microbial strain improvement by genetic engineering
- Value added products from organic waste materials.
- Food rheology and texture
- Plant fibers
- Food extrusion process
- Micro and nanoencapsulation

Research Laboratories: The Department of Food Engineering has research facilities in the following laboratories:

1. Food Microbiology Laboratory: The laboratory is equipped with incubator, microscope, stomacher etc.
2. Instrumental Analysis Laboratory: The laboratory is equipped with DSC, FTIR spectrometer, rheometer, particle size analyzer, GC-MS.
3. Food Analysis Laboratory: The main function of this laboratory is to provide standard tests related to the analysis and determination of food ingredients, additives and contaminants by LC, GC, UV-VIS spectrophotometer, AAS, FTIR, GC-MS, QTRAP LC-MS-MS, flow cytometer.

4. Food Engineering Operations Laboratory-1: This laboratory is used for undergraduate laboratory courses for experiments on heat transfer, fluid flow, size reduction, pasteurization, filtration, drying, evaporation and extraction. Each unit is equipped with manual and/or automatic control and measurement instruments.
5. Food Engineering Operations Laboratory -2: The laboratory is equipped with twin screw extruder, cross beater mill, HHP system, microfluidizer and fermentors
6. Food Product Development Laboratory: The laboratory is equipped with facility and processors to develop food products from new formulations.
7. Non-thermal Food Processing Laboratory: The laboratory is designed for studies on non-thermal food processing technologies such a high hydrostatic pressure system and ultrasound.
8. Microwave Processing Laboratory: The laboratory contains the necessary ovens to study microwave baking, drying frying and thawing, texture analyzer, colorimeter, water activity instrument and thermal properties analyzer are available for measurement of physical properties.
9. Encapsulation Laboratory: The laboratory contains ultrasonic homogenizer, water bath, spectrophotometer and GC-MS for the encapsulation applications for food industry.
10. Biotechnology Laboratory: The laboratory is equipped with a number of fermentors and necessary equipments for demonstrative and industrial studies and experiments.
11. Development of Starter Cultures Laboratory
12. Food Imaging Laboratory: The laboratory is equipped with magnetic resonance imaging (MRI), NMR relaxometry.
13. Pathogen Laboratory: The laboratory is equipped with inoculation cabinet and necessary equipments for the examination of pathogens.
14. Food Safety and Molecular Biology Laboratory: The laboratory is equipped with UV-spectrophotometer, shaker incubators, centrifuges, PCR equipment, microwave oven, water-baths, agarose gel electrophoresis system, hybridization oven and imaging systems
15. Bioprocess Laboratory: The laboratory is equipped with in vessel composting system, extraction, distillation and filtration systems
16. Supercritical Fluid Processing Laboratory: The laboratory is equipped with analytical scale supercritical fluid extractor with two high pressure pumps and circulatory cooler.
17. Food Rheology Laboratory: The laboratory is equipped with rheometer, texture analyzer, microscope and microfluidizer.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MATH	119	Calculus with Analytic Geometry	(4-2)5
PHYS	105	General Physics I	(3-2)4
CENG	230	Introduction to C Programming	(2-2)3
BIO	107	Concepts in Biology	(3-0)3
FDE	101	Introduction to Food Engineering	(1-0)1
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	106	General Physics II	(3-2)4
CHEM	107	General Chemistry	(3-2)4
ME	105	Computer Aided Engineering Graphics	(2-2)3
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
CHEM	229	Organic Chemistry for Engineers	(3-2)4
FDE	201	Material and Energy Balances	(4-0)4
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC
Free Elective			(3-0)3

Fourth Semester

CHEM	230	Analytical Chemistry for Engineers	(3-2)4
ECON	210	Principles of Economics	(3-0)3
CHE	204	Thermodynamics I	(4-0)4
FDE	224	Food Engineering Operations I	(4-0)4
Restricted Elective*			
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

ES	303	Statistical Methods for Engineers	(3-0)3
FDE	305	Food Microbiology Laboratory	(0-2)1
FDE	311	Food Microbiology	(3-0)3
FDE	313	Food Chemistry	(3-0)3
FDE	321	Food Engineering Operations II	(4-0)4
TURK	303	Turkish I	NC
FDE	300	Summer Practice I	NC
Technical Elective			

Sixth Semester

Technical elective			
FDE	310	Food Materials Laboratory	(0-2)1
FDE	314	Physical Properties of Food Materials	(3-0)3
FDE	320	Applied Kinetics	(3-0)3
FDE	324	Food Engineering Operations III	(4-0)4
CHE	423	Chemical Engineering Economics	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

FDE	407	Process Control Applications In Food Engineering	(3-0)3
FDE	413	Food Technology	(3-0)3
FDE	425	Food Engineering Design	(2-2)3
Technical Elective			
Non-technical Elective			
FDE	400	Summer Practice II	NC

Eighth Semester

FDE	416	Food Engineering Operations Laboratory	(1-4)3
FDE	426	Food Product and Plant Design	(2-2)3
Technical Elective			
Technical Elective			
Non-technical Elective			

All elective courses are minimum 3 credits.
* One of the following courses: METE 230, EE 209, CENG 301, CENG 302, CENG 303.

DOUBLE MAJOR PROGRAM IN FOOD ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the Department.

MINOR PROGRAM IN FOOD SCIENCE

The main objective of this program is to provide information on the basics of food microbiology, food chemistry, and food processing especially for those majoring in Chemical Engineering, Environmental

Engineering, Biology and Chemistry who are planning to be involved in the design of or employment in food plants and food quality control laboratories as well as those having a special interest to the subject.

Compulsory courses

BIO	107	Concepts in Biology	(3-0)3
CHEM	229	Organic Chemistry	(3-2)4
FDE	305	Food Microbiology Laboratory	(0-2)1
FDE	311	Food Microbiology	(3-0)3
FDE	313	Food Chemistry	(3-0)3

Minor Program Elective Courses: (Students will take 4 courses from this list)

FDE	318	Biochemical Changes in Raw Foods	(3-0)3
FDE	320	Applied Kinetics	(3-0)3
FDE	322	Applied Food Microbiology	(3-0)3
FDE	403	Food Biotechnology	(3-0)3
FDE	412	Engineering Principles of Fermentation Technology	(3-0)3
FDE	415	Food Plant Sanitation	(3-0)3
FDE	418	Chemistry of Food Preservation and Packaging	(3-0)3
FDE	431	Food Quality Control	(3-0)3
FDE	432	Sensory Analysis	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

FDE 101 Introduction to Food Engineering (1-0)1

Scope, definition and historical development of food engineering. Principles of biological and physical sciences related to the food systems. Introduction to structure and properties of food materials, preservation techniques and engineering aspect of food processing from harvest to packaging and distribution.

FDE 201 Material and Energy Balances (4-0)4

Systems of units and dimensions. Material balances for processes with and without chemical reaction. Gases and vapors, saturation and humidity. Energy balance, physical and chemical heat effects, use of steam tables. Simultaneous material and energy balances. Engineering ethics, responsibilities, health and safety considerations.

FDE 224 Food Engineering Operations I (4-0)4

Introduction to unit operations of food engineering and momentum transfer. General concepts of fluid flow. Newtonian and non-Newtonian fluids. Macroscopic mass, momentum and energy balances. Friction factors, flow around submerged objects. Dimensional analysis. Flow metering and transport devices. Fluid mixing. Engineering ethics, responsibilities, health and safety considerations.
Prerequisite: FDE 201.

FDE 300 Summer Practice I NC

Twenty working days of practical training in a plant designated or approved by the Department. A final report is required at the end of the training period.
Prerequisite: FDE 201.

FDE 305 Food Microbiology Laboratory (0-2)1

Basic techniques for handling microorganisms in the laboratory. Methods for obtaining pure cultures, enumeration, detection and control of microorganisms in foods through case studies. Assessment of quality by microbiological analysis.
Corequisite: FDE 311.

FDE 310 Food Materials Laboratory (0-2)1

Laboratory experiments on chemical and physical characterization of food materials with regard to chemical composition, structure and functionality. Chemical and physical changes during processing, physical and chemical stability of processed foods.
Corequisite: FDE 314.

FDE 311 Food Microbiology (3-0)3

Relationship of microorganisms to foods. Characteristics of predominant microorganisms in foods. Sources and significance of microorganisms in foods. Food born pathogens. Indices of food sanitary quality and microbiological standards.

Presence of viruses in foods. Sporulation and sporulating organisms in foods.
Prerequisite: BIO 107 or (GENE 103 and GENE 104)

FDE 312 Food Processing (3-0)3
A study of the basic methods by which foods are preserved. Commercial methods of canning, freezing, irradiation, dehydration. Packaging and storage of foods.
Prerequisite: FDE 321.

FDE 313 Food Chemistry (3-0)3
Chemistry of major and minor components of food materials. Effects of changes in the chemical properties of food components on their functional, nutritional and physical properties. Inter-and intra-molecular associations and their functions. Complex enzymatic and chemical reactions involving food components and the effect of these reactions on the properties of food systems.
Prerequisites: BIO 107 and CHEM 229

FDE 314 Physical Properties of Food Materials (3-0)3
Characterization of food materials with regard to their functionality, rheological, thermal and electrical properties. Colloidal food systems and functionality of food components as emulsifiers, stabilizers, texturizers, gelling and foaming agents. Measurement of physical attributes of food materials such as size, shape, volume, surface area, density, porosity and shrinkage. Importance of water activity and sorption properties of food materials.
Prerequisites: CHE 204 and FDE 313.

FDE 318 Biochemical Changes in Raw Foods (3-0)3
Biochemistry of raw foods: red meat, poultry, fish, eggs, post-harvest physiology of fruits and vegetables, cereals, legumes, milk, toxicants and contaminants. Interactions in colloidal systems, chemistry of browning reactions and lipid oxidation reactions, glass transition and state diagrams of foods..
Prerequisite: FDE 313.

FDE 320 Applied Kinetics (3-0)3
Rate of a chemical reaction. Kinetics of biological reactions. Kinetics of biomass production, substrate utilization and product formation in cell cultures. Kinetics of microbial death and enzyme inactivation. Design and analysis of biological reactors. Immobilized biocatalysts, reaction with diffusion.
Corequisite: FDE 313.

FDE 321 Food Engineering Operations II (4-0)4
Fundamentals of heat transfer, principles of conduction, convection and radiation. Empirical models for the evaluation of heat transfer coefficients. Heat transfer operations in food engineering with emphasis on heat exchange in non-Newtonian flow, boiling and condensation, evaporation, and concentration, pasteurization and sterilization, cooking and cooling, freezing. Engineering ethics, responsibilities, health and safety considerations.
Prerequisites: FDE 224 and MATH 219.

FDE 322 Applied Food Microbiology (3-0)3
Introduction to beneficial uses of microorganisms in food industry through case studies. Bacteriophage problems in starter cultures. Use of probiotics.
Prerequisite: FDE 311.

FDE 324 Food Engineering Operations III (4-0)4
Fundamentals of mass transfer, principles of diffusion, convection and phase equilibria. Principles of absorption, distillation, extraction, leaching, drying, crystallization, adsorption and membrane processes with emphasis on food industry and engineering ethics, responsibilities and safety considerations.
Prerequisites: FDE 224, CHE 204 and MATH 219

FDE 400 Summer Practice II NC
Twenty working days of practical training in a plant designated or approved by the Department. A final report is required at the end of the training period.
Prerequisite: FDE 300.

FDE 403 Food Biotechnology (3-0)3
An introduction to the basic concepts of biotechnology, classical versus modern biotechnology, properties and utilization of biological organisms, bioreactors, and bioengineering, downstream processing, modern food biotechnology applications.
Prerequisite: FDE 313.

FDE 407 Process Control Applications in Food Engineering (3-0)3
Importance of process control in the manufacture of processed foods with desired shelf-life and acceptable quality, application of process control principles to handle the complexity of food systems leading to difficulties in modeling and simulation. Simulation and control of selected food processing operations.
Prerequisites: FDE 321 and FDE 324.

FDE 412 Engineering Principles of Fermentation Technology (3-0)3
Production of food and food ingredients through fermentation processes. Aerobic and anaerobic systems, batch versus continuous operations, bioreactor design and operation, microbial kinetics, engineering principles of baker's yeast, pickles and olives, industrial enzymes, flavorings, vitamins, alcoholic beverages, organic acid and amino acid production.
Prerequisite: FDE 320.

FDE 413 Food Technology (3-0)3
Raw materials, handling, processing, packaging, storage and distribution of food products; cereal technology, fruit and vegetable processing, meat technology, poultry and egg technology, seafood technology, milk and dairy technology, baking and pasta technology, fat and oil technology, sugar and candy technology, cocoa and chocolate technology, coffee and tea technology, alcoholic and non-alcoholicbeverage technology.
Prerequisite: FDE 321.

FDE 415 Food Plant Sanitation (3-0)3
The role of sanitation in food industry, the relationship of microorganisms to sanitation. Introduction to Hazard Analysis and Critical Control Points (HACCP). Sanitation practices in different food processing systems, cleaning compounds, sanitizers, waste product handling.
Prerequisite: FDE 311.

FDE 416 Food Engineering Operations Laboratory (1-4)3
Experiments on a variety of food engineering operations (drying, extraction, pasteurization, filtration, size reduction, centrifugation, fluid flow, fermentation). Experimental design, analysis and interpretation of data in the form of written reports.
Prerequisites: FDE 321 and FDE 324.

FDE 418 Chemistry of Food Preservation and Packaging (3-0)3
Chemical preservation methods: use of antimicrobials, antioxidants, curing agents. Preservation by using polymers: design and use of encapsulation systems and edible coatings and films. Preservation through food packaging. Types of packaging materials used, engineering principles of packaging, food-package interactions, recent advances in packaging, applications of nanotechnology in food packaging.
Prerequisite: FDE 313.

FDE 425 Food Engineering Design (2-2)3
Engineering ethics, responsibilities, health and safety considerations. Design and optimization of equipment used in food industry through case studies. Optimization of operational conditions. The principles of engineering operations are extensively utilized in a design report for each case including a technical specification sheet.
Prerequisites: FDE 320 , FDE 321, FDE 324 and CHE 423.

FDE 426 Food Product and Plant Design (2-2)3
Engineering ethics, responsibilities, health and safety considerations. Selection of a novel product and a process from food industry through market survey. Food product development. Selection of the location, preparation of the plant layout, material and energy balances. Design of the major units and sizing of the ancillary equipment including services, health and safety considerations. Plant and product cost estimation.
Prerequisites: FDE 320, FDE 321, FDE 324 and CHE 423.

FDE 431 Food Quality Control (3-0)3
Principles of quality control system design in a food plant with emphasis on quality control circles and feed-back loop concept. Review of the statistical background of quality control as applied to food quality factors. Quality control charts for measurements and attributes as applied for foods and beverages. Sampling techniques and acceptance sampling plans. Design of experiments and application of HACCP in the food industry.
Prerequisite: ES 303.

FDE 432 Sensory Analysis (3-0)3
Sensory attributes of foods; appearance, odor, flavor and feel of different products and the mechanisms by which those attributes are perceived. Visual, olfactory, gustatory and tactile/kinesthetic senses. Psychophysical senses will be scaled, measured, analysed, interpreted to product characteristics. Principles of taste and odor testing, physical methods of color and texture measurements. Training sensory panels, questionary design analysis, difference testing, threshold and dilution tests, ranking tests. Descriptive and rating methods, hedonic tests.
Prerequisite: ES 303.

FDE 434 Drying of Foods and Dryers (3-0)3
Importance of drying in food industry and dried products. Fundamental conservation rules of drying as a simultaneous heat and mass transfer operation. Humidity and the psychrometric chart, water sorption and desorption isotherms, theoretical relations and their importance on the operation. Effect of food structure on the expected mechanism

of drying and methods to estimate the behavior. General types of dryers used in food industry. Spray, freeze and other special dryers. Drying by microwaves. IR and integrated systems. Design and control of dryers for batch and continuous operations.
Prerequisite: FDE 324.

FDE 483 Food Markets and Legislation (3-0)3
Introduction to microeconomics; consumer and producer economics; food market equilibrium; trade and welfare; global food market structure; world trade rules; global food regulatory framework; food legislation; EU compliance of Turkish food legislation; competitiveness of food sector.

FDE 484 Engineering Principles of Novel Food Preservation Technologies (3-0)3
Definitions of thermal and non-thermal processing technologies; ohmic heating, microwave heating, high hydrostatic pressure treatment, pulsed electric field treatment, irradiation and high intensity light treatment. Engineering principles of novel food preservation technologies.
Prerequisite: FDE 321.

FDE 490 Food Engineering Research (1-4)3
Application of knowledge, abilities and creativity to a research topic, involving either a market survey, an experimental study in the laboratory or participation in an existing project. Research projects are presented by a final report and a seminar at the end of the semester.
Prerequisite: Fourth year standing.

FDE 491-495 Special Topics in Food Engineering (3-0)3
These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.
Prerequisite: Consent of the department

GRADUATE PROGRAMS AT THE DEPARTMENT OF FOOD ENGINEERING

Master of Science and Doctor of Philosophy degrees are offered in the graduate program of Food Engineering.

GRADUATE CURRICULUM

M. S. in Food Engineering:

FDE	500	M.S. Thesis	NC
FDE	519	Transport Phenomena in Food Engineering	(3-0)3
FDE	591	Seminar	NC

6 elective courses*

Total minimum credits: 21
Number of courses with credit (min): 7

Ph.D. in Food Engineering:

If admitted by B.S. degree:

FDE	500	M.S. Thesis	NC
FDE	519	Transport Phenomena in Food Engineering	(3-0)3
FDE	591	Seminar	NC
FDE	600	Ph.D. Thesis	NC

13 elective courses***

Total minimum credits: 42
Number of courses with credit (min): 14

If admitted by M.S. degree:

FDE	600	Ph.D. Thesis	NC
FDE	519	Transport Phenomena in Food Engineering**	(3-0)3

6 elective courses**,***

Total minimum credits: 21
Number of courses with credit (min): 7

***** *At least one from ES 501, ES 502, ES 507, ES 509, CHE 550, FDE 561 or one equivalent course with consent of department.*
*** will be replaced by an elective course if taken in the M.S. program.*
******* *At least two from ES 501, ES 502, ES 507, ES 509, CHE 550, FDE 561 or two equivalent courses with consent of department.*

GRADUATE COURSES

FDE	500	M.S. Thesis	NC
FDE	510	Total Quality Management for the Food Industry	(3-0)3
FDE	511	Non-Thermal Processing Technology in Food Industry	(3-0)3
FDE	515	Enzyme Engineering	(3-0)3
FDE	518	Advanced Process Calculations	(3-0)3
FDE	519	Transport Phenomena in Food Engineering	(3-0)3
FDE	561	Food Engineering Analysis	(3-0)3
FDE	571	Advanced Food Biochemistry	(3-0)3
FDE	572	Advanced Food Microbiology	(3-0)3
FDE	573	Advanced Biological Process Engineering	(3-0)3
FDE	575	Food Analysis	(3-0)3
FDE	576	Industrial Microbiology	(3-0)3
FDE	578	Fabricated Foods Technology	(3-0)3
FDE	579	Food Additives, Contaminants and Toxicology	(3-0)3
FDE	580	Food Packaging	(3-0)3
FDE	581	Biochemical Engineering	(3-0)3
FDE	582	Thermal Process Engineering	(3-0)3
FDE	585	Engineering Properties of Food	(3-0)3
FDE	586	Supercritical Fluid Processing of Food	(3-0)3

FDE	587	Rheological Methods in Food Engineering	(3-0)3
FDE	589	Microwave Processing of Foods	(3-0)3
FDE	591	Seminar I	NC
FDE	592	Seminar II	NC
FDE	600	Ph.D. Thesis	NC
FDE	7XX	Special Topics in Food Engineering	(3-0)3 or (2-2)3
FDE	8XX	Special Studies	(4-2)NC
FDE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

FDE 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between student and a faculty member. Students must start registering to this course no later than second semester of the program and do so in all semesters while the research program or write-up thesis is in progress.

FDE 510 Total Quality Management for the Food Industry (3-0)3
The philosophy and importance of Total Quality Management in food industry. Application of its tools and techniques: Quality Function Deployment, Benchmarking, Continuous Improvement, Deming Cycle, Statistical Process Control as well as Hazard Analysis and Critical Control Points to dairy, fermentation, meat and beverage industries. TQM applications in novel food processing techniques. Comparative study on real-life situations and problems in a typical food plant.

FDE 511 Non-Thermal Processing Technology in Food Industry (3-0)3
Principles of non-thermal processing foods. High hydrodrostatic (HHP), Pulsed Electric Field (PEF), Pulsed Light and Ozone applications. The theory of engineering systems and effects on microbiological, structural and biochemical systems of foods. Quality and shelf-life evaluations.

FDE 515 Enzyme Engineering (3-0)3
A biochemical engineering course on the production, purification and use of enzymes. The application of enzymatic processes in the food, pharmaceutical and chemical industries. The engineering principles involved in the analytical and industrial use of the immobilized enzymes.

FDE 518 Advanced Process Calculations (3-0)3
Critical review and discussion of the advanced modeling, optimization and control techniques appearing in the recent food and bioprocess engineering literature concerning kinetics of microbial death/growth and product formation; sterilization reactors, thermal processing, freezing preservation, drying, freeze drying, filtration, membrane separation, evaporation, crystallization, freeze concentration and distilled beverage production techniques.

FDE 519 Transport Phenomena in Food Engineering (3-0)3
Microscopic and macroscopic balances for momentum, energy and mass transport. Solutions of the equations for rheological systems with emphasis on food materials.

FDE 561 Food Engineering Analysis (3-0)3
Formulation of mathematical models describing food processing operations. Applications of numerical differentiation, integration; finite differences and regression analysis of food engineering problems.

FDE 571 Advanced Food Biochemistry (3-0)3
Advanced food chemistry with emphasis on proteins and enzymes. Protein interactions and their effect on the physical and chemical characteristics of foods. Preparation and kinetic properties of enzymes and their uses.

FDE 572 Advanced Food Microbiology (3-0)3
The interaction of microorganisms in foods and their role in food spoilage and bioprocessing.
Bacterial sporulation, germination and physiological properties of bacterial spores and food safety.

FDE 573 Advanced Biological Process Engineering (3-0)3
Liquid-liquid extraction, solid-liquid extraction, chromatography, adsorption, ion exchange. Extrusion, expression. Membrane operations. Microwave heating. Radiation preservation.

FDE 575 Food Analysis (3-0)3
Advanced instrumental methods of food analysis including theory and applications.

FDE 576 Industrial Microbiology (3-0)3
Microbial processes involved in food and pharmaceutical processes, such as amino acids,

nucleotides, vitamins, enzymes, antibiotics. Regulation of cellular activity. Molecular strain improvement technologies.

FDE 578 Fabricated Foods Technology (3-0)3
Novel sources of protein, fats and carbohydrates. Single cell proteins, hydrolyzed vegetable proteins, synthetic flavors. Separation, purification and texturizing new protein foods.

FDE 579 Food Additives, Contaminants and Toxicology (3-0)3
Intentional and non-intentional additives, natural toxic constituents of plant and animal foods. Mycotoxins, detoxification processes, package-food interactions. Food-drug interactions, residue analysis in foods.

FDE 580 Food Packaging (3-0)3
Requirements and functions of containers, types of containers, packaging materials; metal, glass, paper, plastics and films, laminates, edible films. Package testing, environmental issues.

FDE 581 Biochemical Engineering (3-0)3
Review of biological processes of engineering interest. Kinetics of enzyme catalyzed reactions. Kinetics of substrate utilization, biomass and product formation. Transport phenomena in microbial systems. Design and analysis of mixed culture systems. Isolation of biologically active materials.

FDE 582 Thermal Process Engineering (3-0)3
General principles of heat transfer. Conduction and thermal conductivity. Experimental methods for the determination of thermal conductivity, methods of analysis. Steady and unsteady state conduction. Analytical and numerical solutions. Thermal methods applied in food processing.

FDE 585 Engineering Properties of Foods (3-0)3
Critical review of various procedures for measurement and estimation of engineering properties of relevance to the design of food processing operations.

FDE 586 Supercritical Fluid Processing of Food (3-0)3
Supercritical fluid processing of food and biomaterials. Extraction, crystallization, extrusion processing, biochemical reactions, microbial inactivation.

FDE 587 Rheological Methods in Food Engineering (3-0)3
The theory of rheological testing and determination of rheological properties of foods from experimental data. Stress and strain. Solid and fluid behaviours. Tube and rotational viscometry. Extensional flow. Transient and oscillatory testing for viscoelasticity.

FDE 589 Microwave Processing of Foods (3-0)3
Principles of microwave heating. Microwave processing: drying, baking, blanching, thawing, sterilization and cooking of foods. Modeling microwave heating characteristics. Development of microwavable foods.

FDE 591 Seminar I NC
M.S. students present their thesis proposal. Students must register to this course in the second semester of the program.

FDE 592 Seminar II NC
M.S. students present their thesis work. The seminar should include reasonable amount of results.

FDE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between student and a faculty member. Students must start registering to this course no later than the second semester of the program and do so in all semesters while the research program or write-up thesis is in progress.

FDE 7XX Special Topics in Food Engineering (3-0)3or (2-2)3
Courses not listed in catalogue. Contents vary from year to year according to interests of students and instructors in charge. Typical contents include Food Engineering, Food Processing, Food Science, Food Technology, Biotechnology etc.

FDE 8XX Special Studies (4-2) NC
M.S. students choose and study a topic under the guidance of faculty member, normally his/her advisor.

FDE 9XX Advanced Studies (4-0) NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of faculty member, normally his/her advisor.

DEPARTMENT OF GEOLOGICAL ENGINEERING

PROFESSORS

AKGÜN, Haluk: B.S., METU; M.S., Ph.D., University of Arizona; P.E. (New Jersey).
ALTINER, Demir: B.S., M.S., METU; Ph.D., Universite de Geneve.
ALTINER, Sevinç Özkan: B.S., M.S., METU; Ph.D., University of London.
BOZKURT, Erdin ***(Department Chair)***: B.S., M.S., METU; Ph.D., University of Keele.
ÇAMUR, M. Zeki: B.S., Karadeniz Technical University; M.S., Ph.D., University of Cincinnati.
GÖNCÜOĞLU, M. Cemal: B.S., M.S., İstanbul University; Ph.D., Fredrich Wilhelm University of Bonn.
GÜLEÇ, Nilgün: B.S., M.S., METU; Ph.D., University of Cambridge.
KARAHANOĞLU, Nurkan: B.S., M.S., Ph.D., METU.
KAYMAKÇI, Nuretdin: B.S., M.S., METU; Ph. D., University of Utrecht.
ROJAY, Bora: B.S., M.S., Ph.D., METU.
SÜZEN, M. Lütfi ***(Vice Chair)***: B.S., M.S., Ph. D., METU.TOPAL, Tamer: B.S., M.S., Ph.D., METU.
TÜRKMENOĞLU, Asuman Günal: B.S., M.S., METU; Ph.D., University of Cincinnati.
YAZICIGİL, Hasan: B.S., METU; M.S., Iowa State University; Ph.D., Purdue University.

ASSOCIATE PROFESSOR

YILMAZ, İ. Ömer: B.S., M.S., Ph. D., METU.

ASSISTANT PROFESSORS

KÖKSAL, Fatma Toksoy ***(Vice Chair)***: B.S., M.S., Ph.D., METU.
ÖZACAR, A. Arda: B.S., M.S., METU; Ph.D., University of Arizona.
YILMAZ, K. Koray: B.S., M.S., METU; Ph.D., University of Arizona.

INSTRUCTOR

SAYIT, Kaan: B.S., M.S., Ph. D., METU.

GENERAL INFORMATION

Undergraduate Program: Geological Engineering requires integration of geological science and engineering principles and methods for the recognition, analyses and solution of various engineering problems which require professional and specialized geological investigations.

Geological Engineering encompasses professional engineering application of geology to mineral resources (both metallic and non-metallic) exploration; identification and evaluation of problems associated with surface and underground construction works, site investigation; exploration of construction material sources; development and management of groundwater resources; groundwater contamination and environmental impact assessment; and identification, assessment and remediation of natural hazards.

The educational mission of the Geological Engineering Department of the Faculty of Engineering of Middle East Technical University is to graduate professionals who are capable of providing innovative solutions to geological engineering problems met by private, public, industrial and government entities, as well as being able to follow, utilize and disseminate developments in related areas of science and technology.

The undergraduate education of professional geological engineers is based on a balanced combination of mathematics and basic science, engineering science, social sciences and humanities, and departmental courses. The training program includes active laboratory works, computer applications, numerous weekend field trips, field geology training and two periods of summer practice (total of ten weeks). The field geology training is carried out as daily trips within the semester and either as daily trips or as field camps following final exams of the semester. The skill gained by the graduating student is tested through geological engineering design projects.

A wide selection of employment opportunities is offered to the graduates having a good command of a foreign language and a computer literacy skill.

Program Educational Objectives: The Geological Engineering Undergraduate Program is designed to graduate students who in their professional life

1. can successfully practice the geological engineering profession in the areas of natural resources, natural hazards, geotechnical and environmental issues that are related to geological materials and processes,

2. can pursue advanced studies and conduct research in the academic institutions, and

3. are able to discharge the necessary professional responsibilities in areas such as ethical, societal, environmental and self-improvement issues.

Student Outcomes: Targeted outcomes of the METU Geological Engineering Program of the Faculty of Engineering are listed below:

a. acquisition and application of knowledge on mathematics, basic sciences, geological sciences and engineering sciences for the solution of geological engineering problems,

b. development of ability to visualize topographical and geological features in 4-D for solving Geological Engineering problems,

c. development of capabilities for analytical thinking and seeking alternative solutions in modeling, analyzing and solving Geological Engineering problems by using modern engineering tools and methods,

d. development of professional and ethical responsibilities to protect both occupational and public health and safety,

e. development of ability to design and conduct Geological Engineering projects and experiments individually, or in single-or multidisciplinary teams,

f. development and improvement of ability to effectively communicate in order to inform the society on the impact of Geological Engineering problems and their possible solutions through oral, written and poster presentation,

g. improvement of awareness of the contemporary issues concerning Geological Engineering, through actual contact with the people involved, and

h. improvement of awareness of the need for life-long learning including the use of multi-language sources.

Graduate Program: The graduate programs are designed to lead to M.S. and Ph.D. degrees in Geological Engineering with specialization in any branch of geology, including interdisciplinary fields as well. Students may take any suitable combination of optional courses with the approval of thesis advisor and the Chairperson of the Department. The objective of the programs is to provide the students with field oriented education supplemented by laboratory works and practical applications.

Research Interest and Departmental Facilities: The research interests of the staff cover a wide spectrum of geological sciences and engineering applications including engineering geology, hydrogeology, geostatistics, modeling and computer simulations, geochemistry, economical geology, petroleum geology, environmental geology, stratigraphy, paleontology, structural geology, neotectonics, sedimentology, remote sensing and geographic information system, petrology of igneous and metamorphic rocks, and clays. Research in these fields with the involvement of graduate students is supported through national and international grants.

The Department has the following laboratories and computer facilities for both teaching and research:

Chemistry Laboratory: Eqipped for wet-chemical analysis.

Clay Mineralogy Laboratory: Equipped for sample preparation of clay materials for their X-ray and chemical identifications.

Computer Laboratory: 50 PCs and a server connected to campus network and internet.

Economic Geology Laboratory: Equipped for examination of hand specimens from metallic and industrial mineral deposits.

Engineering Geology Laboratory: Equipped for standard tests on rocks.

Geology Museum: Display of a wide variety of minerals, rocks and fossils for educational purposes.

Hydrochemistry Laboratory: Equipped for water quality analysis.

Hydrogeology Laboratory: Equipped for aquifer studies.

Integrated Basin Analysis Laboratory: Equipped with workstations, PC's for Landmark Graphic Software.

Marine Micropaleontology Laboratory: High resolution microscopes, computer facilities, and peripheral units.

Microscope Laboratory: Equipped with polarizing and stereoscopic microscopes, image analyzer system.

Mineralogy and Petrography Laboratory: Equipped for examination of hand specimens and thin sections of minerals and rocks.

Mineral Separation Laboratory: Equipped with magnetic separator, heavy liquid separation system, stereomicroscope.

Ore Microscopy Laboratory: Equipped with microscopes for examination of polished sections.

Paleontology Laboratory: Equipped for examination of hand macrofossils and microfossils.

Photogeology Laboratory: Equipped with stereoscopes for the study of aerial photographs.

Remote Sensing and GIS Laboratory : Equipped with PC's and required software.

Sample Preparation Laboratory: Equipped for the preparation of mineral and rock samples for petrographic and chemical analysis.

Sedimentology Laboratory: Equipped for grain-size analysis and heavy-mineral separation.

Geophysics Laboratory and Seismological Observatory: Equipped with automatic resistivity system. Very broad band digital and analog seismograph, included in USGS Worldwide Network, dial-up connections.

Tectonic Research Laboratory: Equipped with paleo-and-neotectonics research facilities.

Thin-Section and Polished Section Laboratory: Equipped for the preparation of thin and polished sections for rocks and minerals.

XRD Laboratory: Equipped with X-ray diffractometer.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
MATH	119	Calculus with Analytic Geometry	(4-2)5	MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	105	General Physics I	(3-2)4	PHYS	106	General Physics II	(3-2)4
CHEM	111	General Chemistry I	(3-2)4	CHEM	112	General Chemistry II	(3-2)4
GEOE	105	Introduction to Geological Engineering	(2-0)NC	CE	101	Civil Engineering Drawing	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4	ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC				

SECOND YEAR

Third Semester				Fourth Semester			
MATH	219	Introduction to Differential Equations	(4-0)4	ES	224	Strength of Materials	(3-0)3
Restricted Elective*			(3-0)3	CENG	230	Introduction to Computers and C Programming	(2-2)3
ES	221	Engineering Mechanics I	(3-0)3	GEOE	208	Mapwork	(2-2)3
GEOE	209	Physical Geology	(2-2)3	GEOE	210	Petrography	(1-4)3
GEOE	213	Mineralogy	(2-4)4	GEOE	214	Principles of Stratigraphy	(2-2)3
Non-technical Elective			(3-0)3	ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC	HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester				Sixth Semester			
MINE	317	Introduction to Rock Mechanics	(2-2)3	CE	364	Soil Mechanics	(2-2)3
GEOE	303	Geophysical Prospecting	(3-0)3	CE	374	Fluid Mechanics	(3-0)3
GEOE	309	Historical Geology and Paleontology	(3-2)4	ES	303	Statistical Methods for Engineers	(3-0)3
GEOE	313	Structural Geology	(2-2)3	GEOE	318	Geochemical Thermodynamics	(3-0)3
Restricted Elective**			(2-2)3	GEOE	326	Field Geology	(2-0)2
Non-technical Elective			(3-0)3	GEOE	327	Field Geological Mapping	(0-6)3
TURK	303	Turkish I	NC	TURK	304	Turkish II	NC
GEOE	300	Summer Practice I	NC				

FOURTH YEAR

Seventh Semester				Eighth Semester			
GEOE	401	Mineral Deposits	(3-0)3	GEOE	492	Geological Engineering Design II	(1-4)3
GEOE	407	Engineering Geology	(2-2)3	Technical Elective***			
GEOE	423	Hydrogeology	(2-2)3	Technical Elective***			
GEOE	425	Computer Applications in Geological Engineering	(2-2)3	Technical Elective***			
GEOE	491	Geological Engineering Design I	(2-2)3	Technical Elective***			
				Free Elective		GEOE 400	
				Summer Practice II		NC	

All elective courses are minimum 3 credits.

Restricted Elective*: ECON210 / CE231 / IE248
Restricted Elective**: GEOE 304 / GEOE 310
Technical Elective***: At least two of four technical elective courses should be from the courses containing engineering design credit.

The Geological Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

DOUBLE MAJOR PROGRAM IN GEOLOGICAL ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the Department.

MINOR PROGRAM IN EARTH SCIENCES

This program is designed to provide necessary background to the students who are directly or indirectly involved with the earth resources and/or processes in their major field of studies. The major objectives are to broaden the spectrum of the interested students, to strengthen their interdisciplinary communication and to provide the foundations for future scientific research and/or professional applications.

Compulsory Courses

GEOE	208	Mapwork	(2-2)3
GEOE	209	Physical Geology	(2-2)3
GEOE	210	Petrography	(1-4)3
GEOE	213	Mineralogy	(2-4)4
GEOE	214	Principles of Stratigraphy	(2-2)3
GEOE	313	Structural Geology	(2-2)3

DESCRIPTION OF UNDERGRADUATE COURSES

GEOE 104 Geology for Civil Engineering (3-0)3
Structure of the Earth. Geological cycles, minerals and rocks. External processes on land and in the sea. Internal processes, including deformation of rocks and earthquakes. Topics of interest to Civil Engineering students.

GEOE 105 Introduction to Geological Engineering (2-0)NC
The Earth and its crust. Economic resources of the crust. Geological hazards (earthquakes, volcanic eruptions, landslides), Hydrologic environment. Opportunities in Geological Engineering. Engineering ethics and professional responsibilities.

GEOE 201 General Geology (3-2)4
Structure of the Earth. Elements, minerals, and rocks of the Earth's crust. Igneous and metamorphic processes. Weathering. Sedimentary processes. Geological external processes. Rock formation. Earth's dynamic processes and rock deformation. Map studies.
(For Petroleum Engineering students only).

GEOE 207 Principles of Mineralogy and Petrography (3-0)3 (2-2)3
Introduction to mineralogy and petrography. Physical, chemical and descriptive mineralogy. Classification of minerals, description of common rocks. General classification of igneous, sedimentary and metamorphic rocks particularly for field use. Identification of common minerals and rocks in hand specimens.
(Offered to non-GEOE students only).

GEOE 208 Mapwork (2-2)3
Concepts of geological features on topographic maps. Scale and orientation. Three dimensional views in problem solving. Use of space geometry in geological map problems. Introduction to basic design concepts through geological maps.
Prerequisite: GEOE 209 or consent of the department.

GEOE 209 Physical Geology (2-2)3
Framework of Earth processes and products. Concepts and terminology of basic geological

features. Interrelation of various branches of the scientific study of Earth.

GEOE 210 Petrography (1-4)3
Description of rocks. General classification of igneous, sedimentary and metamorphic rocks (particularly for field use). Identification of common rocks in hand specimens and under the petrographic microscope.
Prerequisite: GEOE 213.

GEOE 213 Mineralogy (2-4)4
Elementary crystallography, physical and chemical mineralogy, chemical classification. Optical properties of minerals. Identification of minerals in hand specimens and in thin sections.

GEOE 214 Principles of Stratigraphy (2-2)3
Depositional processes and classification of depositional environments. Stratification, unconformities, and facies concepts. Fundamentals of stratigraphic nomenclature. Lithostratigraphic, biostratigraphic, chrono - stratigraphic and geochronologic units.
Prerequisite: GEOE 209 or consent of the department.

GEOE 215 Principles of Structural Geology (2-2)3
Introduction to diastrophic and non-diastrophic rock structures. Study of contacts, unconformities, diapirs, folds, joints, faults, foliations, and lineations. Kinematics of diastrophic structures.
Prerequisite: GEOE 231.
(Offered to non-GEOE students only).

GEOE 231 Elements of Geology (3-0)3
Shape and Structure of the Earth. Elements, minerals and rocks of the crust. Igneous and metamorphic processes. Weathering. Sedimentary process. Actions and geologic agent. Rock formation. Earth's dynamics and rock deformation.
(Offered to non-GEOE students only).

GEOE 300 Summer Practice I NC
Getting familiar with the work of a private or state organization where geological engineering is practiced. A report, introducing the organization and outlining the activities and equipment concerned, must be submitted to the Department of Geological Engineering during the Registration Period following Summer Practice I.

GEOE 303 Geophysical Prospecting (3-0)3
Introduction to geophysical surveying methods and their applications to engineering and geological problems. Global aspects of seismology. Computing laboratory works and case studies.

GEOE 304 Igneous and Metamorphic Petrology (2-2)3
Modal and chemical classification of igneous rocks. The genesis and evolution of magmas, magma generation at different tectonic settings. Igneous rock suites. Metamorphic reactions and metamorphic assemblages. Thermotectonic modeling and interpretation of plate tectonic settings of metamorphism. Field studies of metamorphic and igneous rocks.
Prerequisite: GEOE 210.

GEOE 309 Historical Geology and Paleontology (3-2)4
Ordering geologic events. Geological time concepts and methods of correlation. Chronological earth history and life record. Classification of the major fossil groups and their significance in the evolution of life.

GEOE 310 Sedimentary Petrology (2-2)3
Origin and classification of sedimentary rocks. Texture, mineralogy, composition, structure and diagnosis of siliciclastic, volcaniclastic and non-clastic sedimentary rocks. *Prerequisite: GEOE 213.*

GEOE 313 Structural Geology (2-2)3
Review of common diastrophic and non-diastrophic rock structures. Introduction to the mechanical properties of rocks. Kinematics of bending, fracture, shear and flow. Application to the study of faults, folds, cleavage, joints, foliation, and lineation. Use of stereograms in structural studies. Plate tectonics.
Prerequisites: GEOE 208.

GEOE 318 Geochemical Thermodynamics (3-0)3
Fundamental concepts (systems, states, processes, state variables). Laws of thermodynamics (zeroth, first, second and third laws; enthalpy and free energy). Thermodynamics of solutions. Phase equilibria and phase diagrams. Equilibrium constant. Mineral-solution equilibria. Oxidation-reduction reactions (partial pressure and Eh-pH diagrams). *Prerequisite: CHEM 112.*

GEOE 326 Field Geology (2-0)2
Reading topographic maps. Equipment used in geological mapping. Organization and interpretation of geological maps. Preparation of generalized columnar sections and cross-sections. Techniques of measuring stratigraphic sections. First aid and safety in the field. Ethics in earth sciences.
Prerequisite: GEOE 214 and GEOE 313.
C*orequisite: GEOE 327.*

GEOE 327 Field Geological Mapping (0-6)3
Use of topographic maps, compass, altimeter and GPS in the field. Recognition and description of rock units, and geological structures. Geological nomenclature. Geological mapping in the field. Preparing of illustrations and writing a geological report. (Field studies are carried out as daily trips on weekends within the semester and either as daily trips or as field camps following final exams of the semester).
C*orequisite: GEOE 326.*

GEOE 400 Summer Practice II NC
Experience in the field, laboratory or office work of a private or state organization where geological engineering is extensively practiced. Students should be actively involved in one or more ongoing projects. A report, outlining the work in which the student has been involved, must be presented to the Department of Geological Engineering during the Registration Period following Summer Practice II.

GEOE 401 Mineral Deposits (2-2)3
Mineral resources concepts, textures and structures of mineral deposits, paragenesis and zoning, geothermometry, major theories ore genesis, magmatic segregation, contact metasomatism, hydrothermal deposits, massive sulfides, residual and mechanical concentration, sedimentation, oxidation and supergene enrichment, metamorphism, metallogenic concepts.

GEOE 402 Mineral Deposits of Turkey (3-0)3
Mineral deposits in relation to plate tectonics concepts. Metallogenic concepts. Mineral deposits of Pontids. Menderes Massif and Western Anatolia. Kırşehir Massif and Central Anatolia. Eastern Anatolia. Taurids and Border Folds. Reserve base and mineral inventory concepts.

GEOE 404 Geology of Turkey (3-0)3
Review of lithologies, distribution, tectonic setting and origin of the main geological belts in Turkey.

GEOE 406 Earthquake Geology (3-0)3
Mechanism and resources of earthquakes. Global distributions of earthquake epicenters and their relationship with the plate boundaries. Earthquake prediction and paleoseismology. Destructive effects of earthquakes. Major earthquake belts in Turkey and their relationship with fault zones.

GEOE 407 Engineering Geology (2-2)3
Review of engineering properties of rocks and soils. Stages of site investigation. Engineering geological evaluation of dam and reservoir sites, and tunnels. Introduction to soil and rock slope stability. Types and sources of construction materials. Case histories. *Prerequisite: CE 364.*

GEOE 408 Geomorphology (2-2)3
Origin of landscapes and geomorphic features. Cycle of erosion. Denudation, chronology of rivers, lakes and landscapes. Characteristics of karstic regions. Principles of geomorphological mapping.

GEOE 409 Photogeology (2-2)3
Principles of stereoscopic vision. Identification of drainage patterns and geomorphological interpretation. Identification and interpretation of rock units, folds, faults and joints from aerial photographs. Preparation of geological maps and cross-sections from aerial photographs.
Prerequisite: GEOE 313.

GEOE 410 Petroleum Geology (2-2)3
Physical and chemical properties of oil and gas; generation and accumulation of oil; traps; Regional distribution of oil; reservoir mechanics; subsurface exploration techniques. Geodynamic evolution of the major tectonic units.

GEOE 412 Exploration and Mining Geology (2-2)3
Guides for exploration. Economic framework or exploration and mining operations. Methods of systematic collection, correlation and interpretation of geological data through phases of reconnaissance and exploration. Sampling and estimating reserves. Examination and evolution of prospects. Geological work at developing and operating mines.

GEOE 414 Environmental Geology (2-2)3
Environmental concepts of population and environment. Hazardous Earth processes; flooding, mass movements, earthquakes, and coastal hazards. Human interaction with environment. Groundwater contamination and the geological aspects of waste disposal. Environmental health.

GEOE 416 Micropaleontology (2-2)3
Value of micropaleontologic studies in geologic exploration. Sampling and sample preparation techniques. Microfossil groups including foraminifera, nannoplanktons, calpionellids and radiolaria. Microfossils as chronometers of the Phanerozoic and as paleoenvironmental and paleogeographic indicators. Stratigraphic section analysis by using micropaleontologic data.

GEOE 417 Metamorphic Petrography (2-2)3
Classification and description of common metamorphic rock types in hand specimens and under the microscope. Textures and structures of

metamorphic rocks. Concepts of metamorphic zones and facies. Metamorphic rock associations. Metamorphic rocks and global tectonics.
Prerequisite: GEOE 210.

GEOE 418 Geochemistry (3-0)3
Crystal chemistry (principles and rules for atomic substitution). Composition of universe (sun, planets, meteorites). Composition and evolution of Earth and its reservoirs (core, mantle, crust, hydrosphere, biosphere, atmosphere). Major and trace element behaviour in magmatic processes (melting and crystallization models). Products of magmatic processes (volcanics and granitoids). Geochemistry in sedimentary and metamorphic processes.
Prerequisite: GEOE 318.

GEOE 419 Gemology (2-2)3
Brief information about crystallography, physical and chemical information to recognize the gemstones. Polishing and faceting technics. Origin and occurrence of the gemstones. Descriptive gemology.
Prerequisite: GEOE 213.

GEOE 420 Geostatistics (3-0)3
Introduction to probability concepts. Testing hypothesis. Testing normal populations of geological nature. Analyses of geological sequences. Runs tests. Regression analysis, auto-correlation, crosscorrelation, crossassociation in stratigraphy. Transition matrices. Further analyses of geological problems.
Prerequisite: ES 303.

GEOE 423 Hydrogeology (2-2)3
Elements of surface hydrology. Origin, occurrence, and movement of groundwater. Water-bearing properties of rocks and sediments. Well hydraulics. Groundwater exploration. Drilling, development, and completion of water wells. Regional groundwater flow. Groundwater budget. Sea water intrusion in coastal aquifers. Groundwater quality.
Prerequisite: CE 374.

GEOE 424 Geothermal Systems (3-0)3
Definition and classification of geothermal systems, heat flow, geothermal anomalies and their plate tectonic framework. Prospecting for geothermal resources. Water chemistry in geothermal exploration, estimation of reservoir temperatures, effects of mixing and underground boiling.
Geothermal resource terminology. Geothermal energy utilization. Environmental aspects of geothermal energy development.

GEOE 425 Computer Applications in Geological Engineering (2-2)3
Application of computer techniques to the solution of problems related with Geological Engineering. Use of word processing, data management. Finite differences, finite elements and geostatistics softwares.

GEOE 428 Industrial Rocks and Minerals (3-0)3
Characteristic features of industrial rocks and minerals. Place value and unit value concepts. Classifications of industrial rocks and minerals. Geologic occurrences, physical and chemical properties, uses and economics of igneous, metamorphic and sedimentary rocks and minerals related to pegmatitic, hydrothermal, metamorphic and sedimentary processes.

GEOE 429 Geowriting (3-0)3
Form and content of geological reports. Maps, cross sections, vertical sections, columnar sections, correlation charts, orientation of photos, scale factor. Reference citations. Figures, plates and tables. Assignment of term papers.

GEOE 430 Groundwater and Well Hydraulics (2-2)3
Basic definitions. Theory of groundwater flow. Steady and unsteady radial flow to wells in confined, unconfined, and leaky aquifers. Design of pumping-test programs. Analysis and evaluation of pumping test data. Use of computers in groundwater flow and pumping test analysis.
Prerequisite: GEOE 423.

GEOE 431 Introduction to Remote Sensing (3-0)3
Overview and history of remote sensing and earth observation. Application of electromagnetic radiation principles to remote sensing. Interactions of energy-matter in atmosphere and earth surface. Sensors and platforms. Available satellite systems for earth observation. Future trends.

GEOE 432 Hydrogeochemistry and Water Quality (2-2)3
Hydrogeochemical processes controlling the water quality in natural environments. Analytical determination and evaluating the quality of the physical and chemical properties of water. Sources and control of water contamination.
Prerequisite: GEOE 423 or consent of the department.

GEOE 433 Marine Geology (3-0)3
Physical and chemical environments of the oceans and related marine basins. Clastic and chemical processes of sedimentation. Types, distribution, rate

of accumulation and abundance of sediments. Character of geological environments of ocean floor. Heat flow, seismic, magnetic and gravity features of ocean floor.

GEOE 434 Igneous Petrography (2-2)3
Classification and description of common igneous rock types in hand specimens and under the microscope. Textures and structures of igneous rocks. Modal and chemical analysis of igneous rocks. Calculation of norms. Magma and formation of igneous rocks. Petrographic provinces and igneous rock associations.
Prerequisite: GEOE 210.

GEOE 435 Exploration and Development of Groundwater Resources (3-0)3
Geological, geophysical, and geochemical methods for exploration and development of groundwater resources. Hydrogeological mapping. Water well drilling techniques. Well logging. Water well design. Installing well screens. Development and completion of water wells. Well sterilization. Corrosion and incrustation. Pumps and power units. Well and pump cost factors, operation and maintenance.
Prerequisite: GEOE 423 or consent of the department.

GEOE 436 Stratigraphic and Paleontologic Analyses in Exploration (2-2)3
Treatment of stratigraphic and paleontologic data in geologic exploration. Stratigraphic correlation. Facies analysis. Use of fossil record in recognition of sedimentary rock bodies. Biostratigraphic, paleoenvironmental and paleogeographic applications.

GEOE 437 Geomechanics (2-2)3
Classification and index properties of rocks. Rock strength and failure criteria. Initial stresses in rocks and their measurements. Planes of weakness and deformability of rocks. Application of geomechanics in geological engineering.
Prerequisite: ES 224.

GEOE 438 Engineering Geological Mapping (2-2)3
Principles of engineering geological mapping. Methods of data collection, evaluation, and presentation. Stripe method and zoning concept in engineering geological mapping. Cost effective mapping. Preparation of thematic engineering geological maps in planning of land-use and the location, construction and maintenance of various engineering structures.
Prerequisite: GEOE 407.

GEOE 439 Geology and Paleobiology (3-0)3
Nature of the Earth's interior. Elements, minerals and rocks of the Earth's crust. Surface and internal processes. Stratigraphy, geologic time concept and chronologic Earth history. The origin of life. Major events in the history of life. The evolutionary process and the fossil record.
Prerequisite: Consent of the department.
(Offered to non-GEOE students only)

GEOE 441 Applied Mineral Science (3-0)3
Relationships between fundamental properties and behavior of minerals in natural environments and industry. Applications based on surface, electrical, magnetic, mechanical, thermal, optical and nuclear properties. Adsorption on minerals and ion exchange. Mineral catalysts, fluxing capacity. Minerals, health hazards and natural environments. Ceramics, glasses, abrasives, conductors, mineral pigments, mineral dusts.
Prerequisite: GEOE 213 or consent of the department.

GEOE 443 Aerial Thematic Mapping (2-2)3
Fundamentals of thematic mapping using aerial photographs. Recognition and identification of different landforms. Terrain characteristics. Thematic mapping approaches. Case studies.

GEOE 445 Aerial Photography (3-0)3
Fundamentals of aerial photographs and aerial camera; mission planning in airborne remote sensing. Errors in airborne systems. Orthophotos. Mosaics. Parallax calculations. Establishment of stereograms, use of terrestrial stereophotography.

GEOE 447 Digital Terrain Analysis (2-2)3
Handling of various interpolation techniques of geo-spatial data. Recognition and classification of different terrain aspects, terrain morphometry, interpretation of Digital Terrain Model (DTM) and derivatives, production of thematic maps and analysis of selected terrains.

GEOE 480 Management in Geological Engineering (3-0)3
Basic concepts and principles of management. Planning, organizing, staffing, directing and controlling of field and laboratory projects in

organizations where geological engineering is the main practice.

GEOE 491 Geological Engineering Design I (2-2)3

Basic concepts in engineering and design. Engineering ethics. Needs and information analysis. Modeling and simulation. Problem solving and decision making. Engineering economical analysis. Project planning and scheduling. Optimization. Engineering reports, proposals and presentations. Health and safety. Case studies and design project proposals on the full range of geological engineering applications.

Prerequisite: GEOE 327 or consent of the department.

GEOE 492 Geological Engineering Design II (1-4)3

Discipline dependent design course that involves the application of geological principles and engineering design concepts to the solution of geological engineering problems. Students are required to complete one or more projects individually or in small groups, starting from needs analysis to the preparation of plans for implementation. Engineering reports, complete with specifications, analyses, and results, are required.

Prerequisite: GEOE 491 and GEOE 401 or GEOE 407 or GEOE 423.

GEOE 493-498 Special Topics in Geological Engineering (3-0)3

These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF GEOLOGICAL ENGINEERING

M.S. in Geological Engineering

GEOE	500	M.S. Thesis	NC
GEOE	590	Graduate Seminar (M.S.)	(0-2)NC

7 elective courses

Total minimum credit: 21
Number of Courses with credit (min):7

Ph.D. in Geological Engineering

GEOE	600	Ph.D. Thesis	NC

7 elective courses

Total minimum credit: 21
Number of Courses with credit (min):7

GRADUATE COURSES

GEOE	500	M.S. Thesis	NC
GEOE	501	Global Tectonics	(3-0)3
GEOE	502	Advanced Seismic and Electrical Methods	(3-0)3
GEOE	503	Advanced Igneous and Metamorphic Petrology	(3-0)3
GEOE	504	Advanced Gravity and Magnetic Methods	(3-0)3
GEOE	505	Sedimentary Petrology and Sedimentation	(3-0)3
GEOE	506	Advanced Photogeology	(2-2)3
GEOE	508	Geochemistry of Mineral Deposits	(3-0)3
GEOE	509	Advanced Mineralogy	(2-2)3
GEOE	510	Mineral Economics	(3-0)3
GEOE	512	Petroleum Geochemistry	(2-2)3
GEOE	513	Stratigraphic Paleontology	(3-0)3
GEOE	514	Isotope Geology	(3-0)3
GEOE	515	Advanced Geochemistry	(3-0)3
GEOE	516	Geochronology	(3-0)3
GEOE	517	Advanced Geostatistics	(2-2)3
GEOE	519	Advanced Stratigraphy I	(3-0)3
GEOE	520	Advanced Stratigraphy II	(3-0)3
GEOE	522	Instrumental Geochemical Analysis	(2-2)3
GEOE	523	Metamorphic Petrogenesis	(3-0)3
GEOE	524	Ore Microscopy	(2-2)3
GEOE	525	Biostratigraphy	(3-0)3
GEOE	527	Elements of Seismology	(2-2)3
GEOE	528	Remote Sensing	(3-0)3
GEOE	530	Economics of Energy Resources	(3-0)3
GEOE	531	Carbonate Petrology	(2-2)3
GEOE	532	Subsurface Geology	(2-2)3
GEOE	533	Microtectonics	(2-2)3
GEOE	534	Geochemical Prospecting	(2-2)3
GEOE	535	Spectral Classification of Satellite Images	(2-2)3
GEOE	537	Flow Through Porous Media	(3-0)3
GEOE	538	Granite Tectonics	(3-0)3
GEOE	540	Clay Mineralogy	(2-2)3
GEOE	541	Volcanology	(2-2)3
GEOE	542	Mechanical Behaviour of Earth Materials	(3-0)3
GEOE	543	Mechanical Geology	(3-0)3
GEOE	544	Stability of Soil Slopes in Engineering. Practice	(3-0)3
GEOE	545	Applied Sedimentology	(3-0)3
GEOE	547	Hydrocarbon Seismology	(3-0)3
GEOE	548	Well Logging	(3-0)3
GEOE	550	Applied Geophysics	(2-2)3
GEOE	551	Groundwater Modeling Techniques	(3-0)3
GEOE	552	Geohydrology	(3-0)3
GEOE	553	Site Investigation	(3-0)3
GEOE	554	Engineering Geology Case Studies	(3-0)3
GEOE	555	Principles and Applications of Imaging Radar Systems	(3-0)3
GEOE	556	Enhancement Techniques in Remote Sensing	(2-2)3
GEOE	557	Geographic Information Systems in Earth Sciences	(2-2)3
GEOE	559	GIS Models in Natural Hazard Assessment	(3-0)3
GEOE	560	Rocks and Minerals in Archaeological Studies	(2-2)3
GEOE	567	Groundwater Contamination	(3-0)3
GEOE	568	Paleoclimatology	(3-0)3
GEOE	590	Graduate Seminar (M.S.)	(0-2)NC
GEOE	593	Advanced Field Mapping	(1-4)3
GEOE	600	Ph.D. Thesis	NC
GEOE	605	Basin Analysis	(3-0)3
GEOE	607	Advanced Seismology and Seismic Instrumentation	(3-0)3
GEOE	610	Geology of Clays	(3-0)3
GEOE	612	Petrofabric Analysis	(2-2)3
GEOE	614	Groundwater Systems Planning and Management	(3-0)3
GEOE	616	Geochemistry of Natural Waters	(3-0)3
GEOE	621	Neotectonics	(3-0)3
GEOE	623	Advanced Micropaleontology	(2-2)3

GEOE 697 Advanced Seminar I (Ph.D.) (0-2)NC
GEOE 7XX Special Topics in Geological Engineering (3-0)3 or (2-2)3
GEOE 8XX Special Studies (4-2)NC
GEOE 9XX Advanced Studies (4-0)NC

DESCRIPTION OF GRADUATE COURSES

GEOE 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up thesis is in progress (F&S)*.

GEOE 501 Global Tectonics (3-0)3
Plate tectonics theory. Its principles, processes and mechanism. Geological processes taking place on and around major tectonic features of the Earth's crust and processes of major tectonic events such as continental break-up, arc-continent and continent-continent collision. (F)

GEOE 502 Advanced Seismic and Electrical Methods (3-0)3
Seismic refraction and reflection techniques. Theory and field application, data reduction and minerals, self potential, resistivity, electromagnetic, induced polarization, magnetotelluric methods; theory, field techniques and interpretation. (R)

GEOE 503 Advanced Igneous and Metamorphic Petrology (3-0)3
Advanced study of the petrography and petrogenesis of the igneous and metamorphic rocks. Use of phase equilibrium, detailed study of chemistry of rock forming minerals, chemical compositions of rocks, geochemical processes in rocks. Problems of classification. Special classification systems. Modes of occurrence and relation to tectonics. Petrographic provinces of the world in general and of Turkey in detail. (F)

GEOE 504 Advanced Gravity and Magnetic Methods (3-0)3
Principles of the application of gravity and magnetic methods in the search for oil and minerals and in the solution of geological and mining problems. Types of survey, reduction of observations, interpretation of results. Miscellaneous methods (including telluric), with stress on interpretation.(R)

GEOE 505 Sedimentary Petrology and Sedimentation (3-0)3
Advanced study of the petrography and problems of classification of the sedimentary rocks. Sedimentary associations and structures. Study of environment and provenance in deposition of sediments. Resedimentation. Detailed study of an area and/or association of sedimentary rocks, or, modern deposition of sediments. (F).

GEOE 506 Advanced Photogeology (2-2)3
Geological interpretation of aerial photographs and preparation of photo-geologic maps from stereoscopic aerial photographs. (F)

GEOE 508 Geochemistry of Mineral Deposits (3-0)3
Theories of formation of mineral deposits. Detailed study of the geochemistry of mineral deposits, physical chemistry of ore forming fluids. (AS)

GEOE 509 Advanced Mineralogy (2-2)3
Advanced theory and practices in mineralogy. Phase equilibria in mineralogy. Detailed study of selected mineral groups. (R)

GEOE 510 Mineral Economics (3-0)3
Review of mineral commodities with regard to history, geologic occurrences, consumption, trade, price, financial control and the future positions of key mining countries. Study of fundamentals including business organization in the mineral industries, governmental control, national mineral policies, depletion allowance, taxation, tariffs, stockpiling, conservation and secondary usage. (AF)

GEOE 512 Petroleum Geochemistry (2-2)3
Chemical properties of oil and natural gas. Source rock analyses. Alteration of petroleum in the reservoir rock. The application of petroleum geochemistry in the exploration of oil and natural gas. Laboratory methods and equipment.
*Prerequisite: Consent of the department (*S)

GEOE 513 Stratigraphic Paleontology (3-0)3
Review of the relationship of fauna, facies and environment; ancient life provinces and migration of fauna. General study of the world faunal successions and detailed study of selected stratigraphic systems, particularly from Turkey. (R)

GEOE 514 Isotope Geology (3-0)3
Principles of nuclear physics. Radioactive decay equation and mechanisms. Rb-Sr, Sm-Nd and He

isotope systematics in geochronology and petrology. Concepts of crustal growth, mantle depletion, mantle degassing, mantle metasomatism, and crustal contamination.(R)

GEOE 515 Advanced Geochemistry (3-0)3
Concept of fractionation in igneous processes. Behaviour of compatible and incompatible elements during melting and crystallization. Geochemical aspects of magma generation and evolution. (R)

GEOE 516 Geochronology (3-0)3
Geological problems of age determinations. Application and reliability of radioactivity and other methods of determining age of geologic processes. (F)

GEOE 517 Advanced Geostatistics (2-2)3
Theory of regionalized variables, semivariogram modeling, spectral analysis, kriging, multiple regression, multivariate extension of elementary statistics, discriminant functions, cluster analysis, principal component and factor analysis, analysis of directional data.
Prerequisite: Consent of the department (F)

GEOE 519 Advanced Stratigraphy I (3-0)3
The Precambrian, Paleozoic and Mesozoic Eras. Lithology, age, fossils and development of geological formations. Sedimentation, igneous activity, tectonic evolution of selected geosynclines, platforms and cratons. (R)

GEOE 520 Advanced Stratigraphy II (3-0)3
The Cenozoic Era (Tertiary and Quaternary). Lithology, age, guide fossils and development of geologic formations. Sedimentation, igneous activity, evolution of selected geosynclines, platforms and cratons. (R)

GEOE 522 Instrumental Geochemical Analysis (2-2)3
Principles, and applications of methods of chemical analysis related to mineralogical, petrological and geochemical problems. Preparation and concentration of samples. Spectrophotometric methods, emission and atomic absorption spectrometry. XRD and XRF analysis. Electronmicroprobe and electron microscopy. Thermal techniques and IR analysis. (F)

GEOE 523 Metamorphic Petrogenesis (3-0)3
Advanced study of metamorphic minerals and rocks, supported by field studies, detailed study of petrography and petrochemistry of metamorphic rocks. Metamorphic Facies concept and its general application to global tectonics. Petrogenesis of contact, dynamic, regional and burial metamorphism. Metasomatism. Distribution of metamorphic rocks in Turkey: Detailed study of an area and/or association of metamorphic rocks. (S)

GEOE 524 Ore Microscopy (2-2)3
Preparation of polished specimens. Optical and physical properties of opaque minerals. Textures, mineral assemblage and sequence of crystallization. Microhardness and reflectivity measurements. Identification of opaque minerals. (S)

GEOE 525 Biostratigraphy (3-0)3
Review of basic concepts and principles of biostratigraphy. Study of the different biostratigraphic models of invertebrate fossils in Paleozoic and Mesozoic. Correlation and calibration of the Turkish biostratigraphic units with the standard zonation schemes. (R)

GEOE 527 Elements of Seismology (2-2)3
Causes and effects of earthquakes; intensity. Seismic waves. Principles of seismographs. Seismograms. Determination of hypocenters. Magnitude scale. Field observations and analysis. Earthquake engineering. (R)

GEOE 528 Remote Sensing (3-0)3
Review of Remote Sensing definitions. Characteristics of the remote sensing platforms and sensors. Spectral reflectance curves and spectral libraries. Physical properties of earth materials in spectral reflectance curves. Fundamentals of spectral and spatial enhancement. Theories and applications of remote sensing on the evaluation of resource exploration, natural hazards and environmental problems. (F-WE)

GEOE 530 Economics of Energy Resources (3-0)3
Review of energy resources with regard to history, geologic occurrences, production, consumption, trade, price, and future, Study of fundamentals including business organization in the industry, conservation, and alternative uses. (F)

GEOE 531 Carbonate Petrology (2-2)3
Classification of carbonate rocks. Principles of deposition and diagenesis of carbonate rocks. Modern and ancient environments of carbonate sedimentation. Recrystallization of limestones. Dolomitization. Thin-section studies stress the petrogenetic aspects of carbonate rock textures and their organic constituents. (F)

GEOE 532 Subsurface Geology (2-2)3
Stratigraphic principles applied to subsurface. Essentials of reservoir geology and formation evaluation. Laboratory work include lithofacies analysis, correlation of well logs, subsurface maps and illustrations. (S)

GEOE 533 Microtectonics (2-2)3
Tectonic fabric. Deformation and strain. Strain-induced mineral growth in deformed rocks. Deformation of some rock-forming minerals and related microstructures. Shear zones and related deformation. Determination of shear sense in thin sections of oriented samples. Micro-cracks and their analyses using oriented samples. Reconstruction of the structure and metamorphic history of a volume of rock. (R)

GEOE 534 Geochemical Prospecting (2-2)3
Basic principles of geochemical prospecting, primary dispersion, soil formation, secondary dispersion. Soil and drainage survey, biogeochemical and geobotanical surveys. Field methods, principles and practice of trace analysis, methods of interpretation. (R)

GEOE 535 Spectral Classification of Satellite Images (2-2)3
Concept of spectral classification in remotely sensed data. Selection and evaluation of training sites. Different methods of unsupervised (sequential cluster, statistical cluster, isodata) and supervised (parallelepiped, minimum distance, Mahalanobis distance, maximum likelihood/ Bayesian) classification. Application of the methods and case studies from Turkey.

GEOE 537 Flow Through Porous Media (3-0)3
Properties of porous media. Introduction to flow of fluids in porous media. General differential equation governing fluid flow and deformation. Initial and boundary value problems and specific solutions with emphasis on reservoir hydraulics involving pumping well, steady and transient infiltration. Applications of conformal mapping techniques. Hydrodynamic dispersion. Numerical and analog models in porous media flow problems. (AF)

GEOE 538 Granite Tectonics (3-0)3
Distribution of granitic belt of Turkey and the world. Anatomy of a batholith, major divisions of a granitoid. Emplacement mechanisms and structural control on the type of emplacement. Structural analysis of enclaves, lineation and foliation, shear zones, dykes and joints. Geological characteristics of intrusive contacts and roof pendants. (S)

GEOE 540 Clay Mineralogy (2-2)3
Classification and structural mineralogy of the major groups of clay minerals based on AIPEA nomenclature. Species variation within groups discussed in terms of substitution, layer stacking arrangement and ion exchange capacity. Dehydration-rehydration reactions and clay organic complexes. Laboratory devoted to analytical methods, interpretation of data and calculation of structural formulas. (F)

GEOE 541 Volcanology (2-2)3
Active and extinct volcanoes. Volcanic processes and products. Regional distribution of volcanic activity and relation to tectonic processes and environments. Particular reference to volcanism in Turkey and in the Middle East. (S)

GEOE 542 Mechanical Behaviour of Earth Materials (3-0)3
Review of stress and strain concepts. Elastic, viscous and plastic behaviour of natural materials. Basic differential equations, applications to the problems of geological and mining engineering. (F)

GEOE 543 Medical Geology (3-0)3
Relations between minerals, health, and the geologic environment; methods for mineral characterization in the biological field; surface thermodynamic properties of silicates and their interactions with biological materials; geological environment and health, toxicity of environment pollutants, pollutant metal sources.

GEOE 544 Stability of Soil Slopes in Engineering Practice (3-0)3
Modes and mechanisms of slope failures particularly in soils. Shear strength and related failure criteria, and other geomechanical parameters considered in slope design. Methods of stability analysis. Back analysis of failed slopes, and sensitivity approach. Field instrumentation, monitoring and remedial measures for the design of slopes. *Prerequisite: Consent of the department* (S)

GEOE 545 Applied Sedimentology (3-0)3
Atmospheric-oceanographic feed-back mechanisms in sedimentary systems. Chemical signals in sedimentary rocks (stable isotopes and element analysis). Use of event sedimentation and provenance analysis. Compaction and decompaction of sedimentary rocks. Applications of integrated sedimentological methods in exploration of hydrocarbon and ore deposits.
Prerequisite: Consent of the Department.

GEOE 547 Hydrocarbon Seismology (3-0)3
Basics of seismic wave propagation. Seismic reflection acquisition and processing. Seismic expression of geological structures. Hydrocarbon basin and trap types. Structural and structural interpretation. Prospect evaluation exercise involving structural mapping, prospect identification and risk assessment.

GEOE 548 Well Logging (3-0)3
Fundamentals of borehole measurements. Self potential, resistivity, acoustic, and radioactivity logging devices. Applications in petroleum geology and petroleum engineering. (R)

GEOE 550 Applied Geophysics (2-2)3
Seismic, gravity, electrical, magnetic, airborne magnetic and electromagnetic and marine geophysical methods; field procedures and interpretation. (R)

GEOE 551 Groundwater Modeling Techniques (3-0)3
Fundamentals of groundwater modeling. Differential equations of confined and unconfined flow. Review of analog models and sand tank models. Analytical and numerical methods. Numerical analysis by finite difference and finite element methods. Computer applications in groundwater modeling. (F)

GEOE 552 Geohydrology (3-0)3
Basic definitions. Theory of groundwater movement. Flow nets and seepage. Mechanics of well flow, steady and unsteady flow. Leaky aquifers. Analysis and evaluation of pumping test data. Sea water intrusion in coastal aquifers. (AF)

GEOE 553 Site Investigation (3-0)3
The role of engineering geologist in site investigation. Stages of site investigation, planning, boring, sampling, testing, and reporting. Description and evaluation of in-situ tests. Site visits. (S)

GEOE 554 Engineering Geology Case Studies (3-0)3
Study, analysis, and solution of geological engineering problems as related to special surface and subsurface conditions. Intensive literature review of engineering case histories and reports on geological problems. (S)
Prerequisite: Consent of the department.

GEOE 555 Principles and Applications of Imaging Radar Systems (3-0)3
Earth observation systems and space related activities. Review of Remote Sensing Principles. Basic principles, the theory and practice of Imaging Radar Systems. The nature of microwaves. Characteristics and applications of SAR imagery. Image analysis and post processing techniques. Radar image interpretation and synergistic use with other remotely sensed data. SAR interferometry.

GEOE 556 Enhancement Techniques in Remote Sensing (2-2)3
Types of enhancement techniques used for Satellite images. Single band enhancement (spatial and spectral), multiband enhancement (arithmetic operations, principal component analysis). Applications in different engineering problems (AS)

GEOE 557 Geographic Information Systems in Earth Sciences (2-2)3
Spatial geo-data models and structures. Attribute table structures and normalization. Tools for map analysis (single maps, map pairs, multiple maps). DEM applications. Case studies.

GEOE 559 GIS Models in Natural Hazard Assessment (3-0)3
Concept of Hazard vulnerability and risk. Types and Classification schemes of natural hazards. Phases in GIS. Types of natural Hazard Assessment Approaches (Expert oriented, heuristic, statistical, univariate, bivariate, multivariate, deterministic and probabilistic) in GIS. New methods and trends in Natural Hazard Assessment GIS.

GEOE 560 Rocks and Minerals in Archaeological Studies (2-2)3
Physical properties of minerals, physical and chemical tests for their hand specimen identification. Elementary description of rocks with general classification and nomenclature of common igneous, metamorphic and sedimentary rocks. Practical studies on hand specimens of rocks with emphasis on the most commonly used archaeological materials. Effects of geological processes (weathering, diagenesis) on rocks and minerals. (R)

GEOE 567 Groundwater Contamination (3-0)3
Fundamental concepts of groundwater contamination and modeling. Derivation of solute transport equations and dispersion coefficients. Analytical and numerical methods for solving groundwater contamination problems. Modeling ground water contamination and sea-water intrusion. (S)

GEOE 568 Paleoclimatology (3-0)3
The climate system and feed back mechanisms. Variations of the Earth's orbital parameters and Milankovitch Theory. Paleoclimatic informations from marine and non-marine sediments, sedimentary rocks, corals, terrestrial organisms and ice cores. Global carbon, oxygen and sulfur cycles

in the Earth's history. Phanerozoic paleoclimate changes. Determination of Paleotemperature. Effects of climate change on sea level. Paleoclimate models and future predictions.(S)

GEOE 590 Graduate Seminar (M.S.)(0-2)NC
Papers prepared and presented by graduate students on topics of interest in their fields. Each paper is followed by a round table discussion participated in by students and members of faculty. (F&S)

GEOE 593 Advanced Field Mapping (1-4)3
This course may be taken by graduate students during the summer months under the direction of a faculty member and it may include preparation work for thesis or attendance in international seminars approved by the department. (R)

GEOE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up thesis is in progress. (F&S)

GEOE 605 Basin Analysis (3-0)3
Paleocurrents, fabrics and geophysical properties, cross bedding and ripple mark, linear structures, deformation, internal structures, dispersal and current systems, sedimentary models, methods of study. (R)

GEOE 607 Advanced Seismology and Seismic Instrumentation (3-0)3
The theory of seismic wave transmission applied to the determination of the properties of the Earth's interior. The study of fault mechanisms in an elastic Earth. The physical principles underlying the design and operation of the seismograph. The selection of a seismograph for specific problems, the calibration and response characteristics. Installation and calibration of modern seismographs. (R)

GEOE 610 Geology of Clays (3-0)3
Soil clays in the geochemical cycle. A brief review of silicate hydrolysis. Geology of clays in continental sediments and marine sediment from point of view of environmental factors. Comparison of ancient and modern clay deposits. Clay mineral genesis by inheritance and transformation, neoformation, and diagenesis. Brief consideration of clay mineral synthesis, hydrothermal origin and low grade metamorphism of layer silicates.
Prerequisite: Consent of the department (S)

GEOE 612 Petrofabric Analysis (2-2)3
Advanced study and practices in establishing penetrative features of deformed and metamorphic rocks observed and measured with a petrographic microscope. Interpretation of the orientational patterns and their relation to recrystallization. (R)

GEOE 614 Groundwater Systems Planning and Management (3-0)3
Groundwater systems, elements, input and output components. Numerical simulation of groundwater systems. Benefit-cost analysis. Formulation of objectives and constraint functions for optimum development and operation of groundwater reservoirs. Solution of groundwater management problems by operations research techniques. Multiobjective programming of groundwater systems. (S)
Prerequisite: Consent of the department

GEOE 616 Geochemistry of Natural Waters (3-0)3
Study of thermodynamics of the reactions which control the chemistry of natural waters. Solution thermochemical under equilibrium conditions. Reaction between natural waters and natural materials. Thermochemical modeling applied to natural waters. (S)

GEOE 621 Neotectonics (3-0)3
Active tectonics. Investigation of active faults. Active tectonic regimes and related neotectonic structures. Neotectonical depositional settings and sedimentation. Rifting. Future Earth's movements and neotectonical synthesis of eastern Mediterranean and Turkey. (R)

GEOE 623 Advanced Micropaleontology (2-2)3
Detailed study of the principal groups of microfossils; their ecology and stratigraphic distribution. Statistical studies of microfossils especially related to zonal distribution and age determination. (R)

GEOE 697 Advanced Seminar I (Ph.D.) (0-2)NC
Similar to GEOE 590 but open to doctoral students only. (F&S)

GEOE 7XX Special Topics in Geological Engineering. (3-0) or (2-2)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge. (R)

GEOE 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor. (F &S).

GEOE 9XX Advanced Studies (4-0)NC Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor. (F &S)

* F. Fall, S: Spring, A: Alternate Year, R: Upon Request, WE: Wide Elective.

DEPARTMENT OF INDUSTRIAL ENGINEERING

PROFESSORS

AZİZOĞLU, Meral: B.S., M.S., Ph.D., METU.
ÇİLİNGİR, Canan: B.S., M.S., METU; M.S., Loughborough University; Ph.D., Ege University.
KIRCA, Ömer: B.S., M.S., METU; Ph.D., Georgia Institute of Technology.
KÖKSAL, Gülser: B.S., M.S. METU; Ph.D., North Carolina State University.
KÖKSALAN, Murat ***(Department Chair)***: B.S., M.S., METU; Ph.D., State University of New York at Buffalo.
ÖZDEMİREL, Nur Evin: B.S., M.S., METU; Ph.D., Arizona State University.
SERİN, Yasemin: B.S., M.S., METU; Ph.D., University of North Carolina.
SÜRAL, Haldun: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

AVŞAR, Z. Müge: B.S., M.S., METU; Ph.D., Rutgers University.
KARASAKAL, Esra: B.S., METU; M.S., Lancaster University; Ph.D., METU.
BAKAL, İsmail Serdar: B.S., M.S., METU; Ph.D., University of Florida.
BAYINDIR, Pelin (***Vice Chair)***: B.S., M.S., Ph.D., METU.
DURAN, Serhan: B.S., METU; M.S., Ph.D., Georgia Institute of Technology.
GÜREL, Sinan: B.S., M.S., Ph.D., Bilkent University.
MERAL, Sedef: B.S., M.S., Ph.D., METU.
SAVAŞANERİL, Seçil ***(Vice Chair)***: B.S., METU; M.S., Ph.D., Georgia Institute of Technology.
SEPİL, Canan: B.S., M.S., METU; Ph.D., University of Florida.

ASSISTANT PROFESSORS

BATUN, Sakine: B.S., M.S., METU; Ph.D. University of Pittsburg
İYİGÜN, Cem: B.S., METU; M.S., Ph.D., Rutgers, The State University of New Jersey.
KARAER, Özgen: B.S., METU; M.S., Ph.D., Stanford University.
TURAL, Mustafa Kemal: B.S., Boğaziçi University, Ph.D., University of North Carolina at Chapel Hill.

GENERAL INFORMATION: The programs offered by the Department aim to develop knowledge and skills with which organizational problems can be effectively addressed. Of particular interest are questions of design, installation, planning, improvement, operation and control of human activity systems under conditions of scarcity. The approach needed for this type of inquiry draws on specialized knowledge in mathematics, natural and social sciences, as well as engineering analysis and design.

The Department offers courses leading to the degrees of Bachelor of Science, Master of Science, and Doctor of Philosophy in Industrial Engineering. There is also a Master of Science program in Engineering Management offered for non-majors. The curricula are regularly updated taking note of scientific advances, as well as local conditions and requirements.

In general, the programs are designed to provide broad based training for the purpose of achieving effectiveness and efficiency in manufacturing and service systems. The graduate programs go further and provide in-depth coverage of selected research and application areas.

The Department coexists and shares its faculty and facilities with the Master of Science and Doctor of Philosophy Programs of Operational Research.

The graduates of the Department find employment in almost all sectors of the industry and government agencies.

The Industrial Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

PROGRAM MISSION STATEMENT: The Industrial Engineering Department of METU studies organized human activity and educates engineers capable of creating value in socio-technical systems. Our work is founded on critical reason and systems thinking and on strong quantitative analysis. Our approach emphasizes identifying and structuring issues and formulating problems, as much as it seeks to develop and implement courses of action. We promote interdisciplinary research and participation in joint research programs. We encourage the involvement of the industry, the students and the alumni in departmental activities.

PROGRAM EDUCATIONAL OBJECTIVES: METU Industrial Engineering Department identifies:

1. Graduates of the METU Industrial Engineering program have successful careers in industrial engineering practice and research in a broad range of organizations,

2. Taking a systems approach and using scientific inquiry, they provide leadership and actively participate in problem solving and system design in these organizations,

as the program educational objectives.

A primary objective of our program is to educate students who depend on critical reason and systems thinking to effectively apply qualitative and quantitative methods of inquiry in general, and statistical analysis, mathematical modeling and information technologies in particular, to real-life problem solving and systems design. We understand systems thinking at the very least, as realizing that organized human activity takes place in systems of purposeful individuals and scarce resources, and that such systems do not have fixed boundaries.

In pursuing our educational objectives we ensure systematic integrity and focus in our curricula, we make industrial experience and real-life problems an integral part of education and we maintain mutual respect and effective interaction between faculty and students. We actively search for and maintain qualified faculty and seek to attract graduate students from diverse backgrounds.

STUDENT OUTCOMES: METU Industrial Engineering Department aims that by the time of graduation the students will acquire the following skills, knowledge and behaviors:

a1. The students will be able to understand and apply concepts of mathematics and basic sciences.
a2. The students will be able to understand and apply concepts of engineering and computer science.
a3. The students will be able to understand and apply concepts of social, administrative, and economical sciences.
b. The students will be able to design and conduct scientific experiments, as well as to analyze and interpret data.
c. The students will be able to design a system, component, or process to meet desired needs.
d. The students will be able to work in cooperation with others and facilitate teamwork.
e1. The students will be able to identify and formulate industrial engineering problems.
e2. The students will be able to generate creative and meaningful solution and design alternatives for industrial engineering problems.
f. The students will observe professional responsibility and ethical conduct.
g. The students will be able to effectively communicate.
h. The students will understand the role and impact of industrial engineering within a wider societal and global context.
i. The students will recognize the need for lifelong learning and will be able to engage in it.
j. The students will have an awareness of contemporary issues such as globalization, environmental impact and conflicting interests in society.
k. The students will be able to make effective use of scientific methods and tools (such as mathematical models, statistical methods and techniques) necessary for industrial engineering practice.
l. The students will be able to design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and energy.
m. The students will be able to apply critical reason and systems thinking in problem solving and systems design.

n. The students will have an awareness of developments in science (such as computational and behavioral sciences) and technology (such as information, manufacturing and material technologies).
o. The students will honor and practice uninhibited exchange of ideas.
p. The students will be able to practice their profession in a wide variety of industries.
r. The students will be able to take initiative in their professional lives.
s. The students will be able to manage projects effectively.

RESEARCH INTERESTS AND FACILITIES: The faculty is strongly committed to theoretical and implementable research in order to keep abreast with the newly emerging concepts and technologies in production that are of importance to compete in world markets. For this reason the department also takes active interest in applied research sponsored by the industry and the government.

A selection of recent graduate theses points out some of the active research areas:

- A methodology of swarm intelligence for clustering based on neighborhood construction
- Mathematical modeling for energy policy analysis
- Converging preferred regions in multi-objective combinatorial optimization problems
- Effects of natural disaster trends on the prepositioning in humanitarian logistics networks
- Order driven flexible shop management
- Resource investment problem with time/resource trade-offs
- Service models for airline revenue management problems
- Robust facility location with mobile customers
- An assessment of two-echelon inventory systems against alternative systems
- Data mining applications in manufacturing systems and quality improvement

The department has facilities for research and educational purposes including an Ergonomics Laboratory, a Work Study Laboratory, and a Design and Optimization Laboratory. There are also an Active Learning Laboratory and extensive computing facilities with networking capabilities.

UNDERGRADUATE CURRICULUM
FIRST YEAR

First Semester				**Second Semester**			
MATH	119	Calculus with Analytic Geometry	(4-2)5	MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	105	General Physics I	(3-2)4	MATH	260	Basic Linear Algebra	(3-0)3
CHEM	107	General Chemistry	(3-2)4	PHYS	106	General Physics II	(3-2)4
CENG	230	Introduction to Computers and C Programming	(2-2)3	ME	105	Computer Aided Engineering Graphics	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4	IE	102	Industrial Engineering Orientation	(2-0)2
IS	100	Introduction to Information Technologies and Applications	NC	ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
ECON	211	Principles of Economics I	(3-0)3
ME	212	Principles of Production Engineering	(3-0)3
IE	241	Financial and Managerial Accounting for Engineers	(3-0)3
IE	251	Linear Programming	(3-0)3
IE	265	Introduction to Probability	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

ECON	212	Principles of Economics II	(3-0)3
IE	252	Network Flows and Integer Programming	(3-0)3
IE	266	Engineering Statistics	(4-0)4
METE	230	Fundamentals of Materials Science and Engineering	(3-0)3
ENG	211	Advanced Reading and Oral Communication	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC
Restricted Elective*			

THIRD YEAR

Fifth Semester

EE	381	Systems and Control	(3-0)3
IE	323	Production and Service Operations Planning I	(3-0)3
IE	333	Work Systems Analysis and Design	(3-0)3
IE	347	Engineering Economy	(3-0)3
IE	361	Stochastic Models in Operations Research	(3-0)3
TURK	303	Turkish I	NC
IE	300	Summer Practice I	NC
Non-technical Elective			

Sixth Semester

ME	351	Thermodynamics of Heat Power	(3-0)3
IE	304	Production and Service Information Systems	(3-0)3
IE	324	Production and Service Operations Planning II	(3-0)3
IE	368	Quality Planning and Control	(3-0)3
IE	372	Simulation	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

IE	404	Management for Engineers	(3-0)3
IE	489	Systems Thinking	(3-0)3
IE	497	Systems Design I	(1-4)3
IE	400	Summer Practice II	NC
Technical Elective			
Technical Elective			
Non-technical Elective			

Eighth Semester

IE	422	Seminar in Industrial Engineering Practice	(2-0)NC
IE	498	Systems Design II	(1-4)3
Technical Elective			
Technical Elective			
Non-technical Elective			
Free Elective			

All elective courses are minimum 3 credit hours.

Restricted Elective* : One of the following courses: CENG 301, CENG 305, EE 441, IE 206

DOUBLE MAJOR PROGRAM IN INDUSTRIAL ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses taken in other programs are determined by the Department.

MINOR PROGRAM IN OPERATIONAL RESEARCH

The essential quality of operational research derives from the use of scientific inquiry into complex socio-technical systems, complemented by mathematical modeling which emphasizes both goal-seeking and open-systems aspects. It has found widespread applications in all sectors of the government and the industry. The Operational Research Minor Program aims to provide an understanding of the techniques and methods of operational research as they are used in organizational decision making. It will be of benefit to students who want to develop a more focused and systematic view of work organization and management.

Compulsory courses

IE	251	Linear Programming	(3-0)3
IE	252	Network Flows and Integer Programming	(3-0)3
IE	265	Introduction to Probability	(3-0)3
IE	266	Engineering Statistics	(4-0)4

Two of the following courses

IE	361	Stochastic Models in Operations Research	(3-0)3
IE	372	Simulation	(3-0)3
IE	451	Decision Analysis	(3-0)3
IE	452	Mathematical Modeling and Applications	(3-0)3
IE	453	Topics in Optimization	(3-0)3
IE	454	Network Flows and Project Management	(3-0)3
IE	455	An Introduction to Combinatorial Analysis	(3-0)3
IE	456	Network Routing	(3-0)3
IE	489	Systems Thinking	(3-0)3
IE	492	Decision Making in Health Care	(3-0)3

MINOR PROGRAM IN PRODUCTION PLANNING AND CONTROL

Production planning and control are of central importance in many domains of engineering activity. These functions are likely to assume even more significance, as focus in production shifts towards creating more value for the customer, and design and manufacturing become integrated. The Production Planning and Control minor program provides the necessary basic concepts in four compulsory courses and then allows more specialization through two electives. It will be useful to students who want to complement their training with an organization-wide understanding of the processes and problems of production.

Compulsory courses

IE	251	Linear Programming	(3-0)3
IE	323	Production and Service Operations Planning I	(3-0)3
IE	324	Production and Service Operations Planning II	(3-0)3

One of the following courses

IE	241	Financial and Managerial Accounting for Engineers	(3-0)3
IE	304	Production and Service Information Systems	(3-0)3
IE	333	Work Systems Analysis and Design	(3-0)3

Two of the following courses

IE	252	Network Flows and Integer Programming	(3-0)3
IE	368	Quality Planning and Control	(3-0)3
IE	418	Supply Chain Management	(3-0)3
IE	419	Topics in Order and Lot Scheduling	(3-0)3
IE	421	Inventory Planning Problems	(3-0)3
IE	424	Scheduling	(3-0)3
IE	425	Plant Location and Layout	(3-0)3
IE	426	Topics in Production Management	(3-0)3
IE	429	Topics in Production Planning	(3-0)3
IE	454	Network Flows and Project Management	(3-0)3
IE	461	Forecasting Methods	(3-0)3

IE	489	Systems Thinking	(3-0)3
IE	491	Industrial Networks and Clusters	(3-0)3
IE	494	Industry Analysis	(3-0)3

MINOR PROGRAM IN QUALITY PLANNING AND CONTROL

Quality planning and control comprises the concepts and approach of a new notion of quality that seeks to maximize customer satisfaction. Work in this area is not of interest to industrial engineers only, but also to other engineering disciplines as well as to students in industrial design, business administration, and statistics. The Quality Planning and Control minor program aims to contribute to the training of graduates who can improve and enhance quality in all phases of production such as in planning, research and design, manufacturing, distribution or customer relations.

Compulsory courses

IE	251	Linear Programming	(3-0)3
IE	265	Introduction to Probability	(3-0)3
IE	266	Engineering Statistics	(4-0)4
IE	368	Quality Planning and Control	(3-0)3

One of the following courses

IE	495	Off-line Quality Control	(3-0)3
IE	542	Quality Engineering	(3-0)3
IE	545	Total Quality Management	(3-0)3
IE	566	The Design and Analysis of Experiments	(3-0)3

One of the following courses

IE	304	Production and Service Information Systems	(3-0)3
IE	323	Production and Service Operations Planning I	(3-0)3
IE	333	Work Systems Analysis and Design	(3-0)3
IE	372	Simulation	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

IE 102 Industrial Engineering Orientation (2-0)2
Science as a human activity. Engineering. History of engineering. Emerge of industrial engineering. Historical development of industrial engineering. Technology. Industrial engineering and technology. Topics in industrial engineering: History and prospects. Overview of IE curriculum at METU.

IE 206 Scientific Computing for Industrial Engineers (2-2)3
Computer arithmetic. Vectors and matrices. Numerical, symbolic, and graphical capabilities of MATLAB. Execution control and data structures. User-defined and built-in functions. Developing algorithms and programming. Recursion, searching and sorting. Complexity of algorithms and performance analysis. Function approximation, integration, and differentiation by numerical methods. Solution of systems of equations. Graph search and network algorithms. Random number generation and statistical applications. Visualization and plotting of results.
Prerequisite: CENG 230

IE 241 Financial and Managerial Accounting for Engineers (3-0)3
Basics of financial accounting. Preparation of balance sheet, income statement and flow of funds statement. Inventory valuation and depreciation methods. Basics of accounting. Definition of costs. Absorbtion cost techniques, with an emphasis on allocation of overhead in manufacturing organizations. Budgeting. Variance Analysis. Cost-Volume-Profit Analysis. Pricing decisions, special decisions based on incremental analysis.

IE 251 Linear Programming (3-0)3
History and methodology of operational research. Introduction to linear programming and graphical solution. Linear programming models and interpretation of solutions. Simplex method,

sensitivity analysis and duality. Multi-criteria decision making. Game Theory.
Prerequisite: MATH 260.

IE 252 Network Flows and Integer Programming (3-0)3
Transportation and network models. Solution algorithms. Project scheduling. Integer programming models. Weak and strong formulations. Cutting plane and branch and bound algorithms. Heuristic approaches to large-scale problems. Introduction to nonlinear programming. Karush-Kuhn-Tucker optimality conditions.
Prerequisite: IE 251.

IE 265 Introduction to Probability (3-0)3
Elements of probability. Random variables and distributions. Two and higher dimensional random variables. Mathematical expectation. Generating functions. Limiting and sampling distributions.
Prerequisite: MATH 120.

IE 266 Engineering Statistics (4-0)4
Descriptive statistics, statistical estimation, hypothesis testing, simple and multiple linear regression, introductory experimental design with emphasis on industrial engineering applications.
Prerequisite: IE 265.

IE 300 Summer Practice I NC
A minimum of four weeks (20 working days) training in manufacturing involving observations of the production system and the discussion in detail of the various aspects of the production process. The training is based on the content of the Summer Practice Manual.
Prerequisite: Consent of the department.

IE 304 Production and Service Information Systems (3-0)3
Analysis and design of information systems with special emphasis given to production sub-systems. Basic information concepts, data processing technology and its applications. Information systems development methodology in terms of systems analysis, design and implementation. The information requirements of production systems in modular form.

IE 323 Production and Service Operations Planning I (3-0)3
Introduction to production and service planning. Facilities location and layout. Manufacturing systems and related soft technologies. Inventory control. Forecasting.
Prerequisites: IE 251 and IE 265.

IE 324 Production and Service Operations Planning II (3-0)3
Systemic issues in supply chain management. Production planning with emphasis on APP, MPS, capacity planning and MRP. Machine scheduling, cyclic schedules and scheduling in services. Distribution systems and routing. Design and development of services and service delivery systems. Managing capacity and demand in service systems. Service productivity and measurement performance.
Prerequisite: IE 323.

IE 333 Work Systems Analysis and Design (3-0)3
Introduction to human work systems and layout. Systematic layout planning. Manual work design principles. Industrial safety and accident prevention. Material handling and warehousing. Computer-aided layout planning. Method study and work measurement techniques.

IE 347 Engineering Economy (3-0)3
Economic analysis for engineering and managerial decision making. Techniques for evaluating the worth of prospective projects, investment opportunities and design choices. Interest and time value of money, methods for evaluation of alternatives: present worth, annual equivalent worth, rate of return, benefit cost ratio method, and payback method. Replacement analysis, inflation and cost estimation. After tax economic analysis, and methods of financing. Sensitivity and risk analysis.

IE 361 Stochastic Models in Operations Research (3-0)3
Introduction to stochastic processes. Discrete-time Markov chains. Mean first passage times. Steady-state analysis. Basics of queueing theory. Types of queues. Deterministic and stochastic dynamic programming.
Prerequisite: IE 265.

IE 368 Quality Planning and Control (3-0)3
Quality of products/services and quality characteristics. Concepts of quality of design and quality of conformance. Quality costs. Total quality management and quality standards. On-line and off-line quality control activities. Statistical process control. Control charts. Capability analysis. Measurement system analysis. Acceptance sampling. Six sigma programs. Development and design of quality products and processes. Basic reliability concepts and approaches.
Prerequisite: IE 265.

IE 372 Simulation (3-0)3
Simulation methodology and model building. Modeling with a simulation language. Random variate generation. Basic issues in the design, verification and validation of simulation models. Case studies.
Prerequisites: CENG 230 and IE 265.

IE 400 Summer Practice II NC
A minimum of four weeks (20 working days) training in an organization, involving the observation and discussion in detail of the various aspects of products, processes, organizational activities, managerial issues and applications. The student is also expected to identify structure, and formulate and approach for a valid solution methodology concerning an observed industrial engineering problem at the practice organization. The content of the practice is defined in the Summer Practice Manual supplied by the department.
Prerequisite: Consent of the department.

IE 401 Business Law (3-0)3
Fundamental concepts and terminology. Formulation of employment contracts. Health and safety at work, occupational accidents, employers' liabilities. Collective bargaining, collective agreement. Conciliation and arbitration, strikes and lock-outs. Social security and legal provisions.

IE 402 Occupational Safety Law (3-0)3
Basic principles, duties of the State, health and safety legislation and regulations, health and safety inspections, employers' liability, organization of safety in the workplace, safety committees and representatives, administrative and criminal sanctions, duties of trade unions, collective agreements.

IE 404 Management for Engineers (3-0)3
Managerial core concepts such as managing knowledge and learning, culture, structure, sustainability, power and politics in organizations and organizational control. Gender and management. Managing ethically. Management processes such as managing motivation, leading, managing teams, managing conflict, managing change, decision making in organizations. Strategic management. Networks and inter-organizational relations and managing in a virtual world.

IE 405 Facilities Planning (3-0)3
Capacity and technology selection, facility location, plant organization (layout), material handling systems, plant management. (Offered to non-IE students only).

IE 407 Fundamentals of Operational Research (3-0)3
An introduction to the methodology of operational research. Survey and examples of OR models. Basics of linear programming. Networks, integer programming and queuing models. Dynamic programming. (Offered to non-IE students only).

IE 409 Organization Theory and Development (3-0)3
Systems theory and organizations. Goals, values and measures of effectiveness for manufacturing and service organizations in government and industry. The basic structure of an organization and its variations. Determinants of structure. The life cycle of an organization and management of change.

IE 415 Revenue Management (3-0)3
Demand management decisions.Quantity-based revenue management, single-resource and multiple-resource capacity control, control mechanisms. Static and dynamic models for single-resource control. Exact and approximate models for multiple-resource control. Static and dynamic overbooking models.
Prerequisites: IE 251 and IE 265.

IE 418 Supply Chain Management (3-0)3
Defining the supply chain and components of the supply chain. Design issues in supply chain management. Logistics network design and inventory planning. Value of information. Competitive and collaborative relations among participants. Supply chain integration. Warehouse operations management.
Prerequisite: IE 323.

IE 419 Topics in Order and Lot Scheduling (3-0)3
Quantitative tools in detailed medium-to-short term production planning in make-to-order manufacturing environments. Cyclic and acyclic scheduling, transfer lots, lot scheduling in flow shops and on parallel machines, order review/release, input/output control, capacity planning, shop loading and due date management.
Prerequisite: IE 324.

IE 420 Service Systems (3-0)3
Structure of service producing systems. Basic design and operational concepts in service and process selection, capacity planning, facility planning, work design, aggregate service planning, scheduling, service quality and information systems.
Prerequisite: IE 251.

IE 421 Inventory Planning Problems (3-0)3
Definitions. Deterministic inventory problems. Deterministic inventory problems with constraints. Unconstrained, infinite horizon, stochastic demand continuous review problems. Single period, stochastic demand problems. (s,S) policies for periodic review, infinite horizon problems.
Prerequisite: IE 323.

IE 422 Seminar in Industrial Engineering Practice (2-0)NC
Informing senior students about professional life in industrial engineering. Depending on lectures given by practicing industrial engineers, establishing the link between the courses the students have taken during their education and application of industrial engineering techniques and approaches in real-life cases.

IE 424 Scheduling (3-0)3
Scheduling and sequencing problems. Basic formulation. Single processor, multi processor scheduling procedures and solution approaches.
Prerequisite: IE 324.

IE 425 Plant Location and Layout (3-0)3
Introduction to the planning and the design of manufacturing facilities. Organization of data for facilities design. Analysis of production plans and processes to compute equipment and manpower requirements. Identification of production support activities and computation of related facilities requirements. Design of layout and materials handling systems. Facilities location.
Prerequisites: IE 251 and IE 333.

IE 426 Topics in Production Management (3-0)3
Production line design. Just-in-time(JIT) production systems. Optimized production technology (OPT). Flexible manufacturing systems (FMS). Cellular Manufacturing Systems
Prerequisite: IE 323.

IE 429 Topics in Production Planning (3-0)3
Automated manufacturing and production management in automated manufacturing. Performance issues and stochastic modeling of automated manufacturing. Factory dynamics in production lines.
Prerequisite: IE 324.

IE 431 Ergonomics in Analysis and Evaluation of Jobs (3-0)3
Work system, task and job demand will be analyzed in different systems to establish adequate guidelines for work design to minimize stress and strain in the work environment.
Prerequisite: IE 333.

IE 432 Human Factors in Information Systems (3-0)3
The human element in information systems design. Information theory, decision making process and human communication. Introduction to cybernetics.
Prerequisites: IE 304 and IE 333.

IE 433 Human Factors Engineering (3-0)3
The effect of thermal factors, noise, vibration, illumination, control display design, age and shift work on the performance of human beings will be explored.

IE 439 Topics in Ergonomics (3-0)3
Ergonomical issues of modern industrial society are introduced. Problems of automation, humanization of work environment, shift work, disabled and aged workers in industry are discussed.
Prerequisite: IE 333.

IE 440 Engineering Economy (3-0)3
Modeling economic factors bearing on design and decision-making. Basic time value models. Methods of evaluating alternatives. The effect of taxes and depreciation on investment decisions. The impact of inflation. Measuring costs in industry. Analysis of public projects. Risk and sensitivity analysis in engineering economic analysis. (Offered to non-IE students only).

IE 441 Modeling in Engineering Economy (3-0)3
Investment and financing decisions of the firm. Cost of capital and selection of a minimum attractive rate of return. Economic analysis under risk and uncertainty. Effects of inflation and construction and use of index numbers.
Prerequisite: IE 347.

IE 443 Economic Models for Decision and Policy Analysis (3-0)3
Kuhn-Tucker optimality conditions and review of LP duality. Optimization models to study problems of auctions, decentralization, vertical integration in the firm, industrial programming and activity analysis in a partial equilibrium framework and financial planning.
Prerequisite: IE 252.

IE 445 Industrial Economics (3-0)3
Utility maximization and the theory of consumption. Derived demand and supply functions. Elasticities of demand and substitution effects. Production and cost theory, the duality between production and cost functions. Market structures and pricing. Modern topics in industrial economics.

IE 451 Decision Analysis (3-0)3
Maximizing expected monetary value. Utility theory. Judgmental probabilities. Value of information. Normal form of analysis. Risk sharing. Multi attribute utility theory.
Prerequisite: IE 265.

IE 452 Mathematical Modeling and Applications (3-0)3
The aim of this course is to develop better skills in building and understanding mathematical modeling. Deterministic models in the areas of transportation, distribution, location, production and economic planning are analyzed.
Prerequisite: IE 252.

IE 453 Topics in Optimization (3-0)3
Advanced techniques which are not covered in elementary operational research courses are covered. Linear, nonlinear, integer and dynamic programming algorithms.
Prerequisite: IE 252.

IE 454 Network Flows and Project Management (3-0)3
Basic network flow problems such as shortest path, minimal spanning tree and maximal flow problems. Principles of project management. Network representation and terminology. Network planning with respect to costs and durations. Resource constrained network planning. Financial planning and cost control. Project scheduling with probabilistic networks.
Prerequisite: IE 251.

IE 455 An Introduction to Combinatorial Analysis (3-0)3
Introduction to combinatorial reasoning and modeling; the systematic analysis of different possibilities; the exploration of the logical structure of a problem. General counting methods, generating functions, recurrence relations, inclusion-exclusion. Applications to operations research problems.

IE 456 Network Routing (3-0)3
Models and basic solution methods for the network flows motivated by transportation applications. Traveling salesman problem. Arc routing problem. Vehicle routing problem. Extensions and applications.
Prerequisite: IE 252.

IE 461 Forecasting Methods (3-0)3
An overview of forecasting. Available methodologies, comparing individual methodologies, selecting a methodology and designing a forecasting system that fits the specific management - decision making requirements of the organization. Smoothing techniques, adaptive filtering, simple and multiple regression and correlation analysis, time series forecasting, Box-Jenkins methods, Input-Output and Econometric models.
Prerequisite: IE 266.

IE 472 Applications of Simulation Modeling (3-0)3
Advanced simulation modeling concepts in process interaction orientation. Modeling of manufacturing systems. Station submodels. Continuous and mixed simulation. Introductory output analysis for a single system and comparison of alternatives.
Prerequisite: IE 372.

IE 485 Technology Management (3-0)3
Definition of technology concept in production and service sectors. History of technological developments on a sectoral basis. Relationships with science and engineering. Models for technology development: techno-parks, science parks, research institutes. Organizations and media toward technology surveys and technology transfer. Role of technology in national economic development and global competition.

IE 489 Systems Thinking (3-0)3
Inquiry and research. Methods of science. Fundamental systems concepts and notions. Systems thinking as a mode of inquiry; historical and methodological account. Contrasting and clarifying the systems position vis-à-vis science. The relation between systems thinking and operational research. Principal stains of systems thinking and the systems approaches.
Prerequisite: IE 251.

IE 491 Industrial Networks and Clusters (3-0)3
Inter-enterprise relations, theories of the firm and external cooperation, boundaries of the firm, organization and structure of networks, scientific an technological collaboration, production networks, strategic alliances, innovation networks, complex networks, theories of regional economy, clusters, cluster analysis, development.

IE 492 Decision Making in Health Care (3-0)3
Measurement of costs and value of health outcomes. Health-related quality of life issues. Evaluation of health interventions. Modeling value and time preferences (patient, physician, provider) and uncertainty in medical decision making for research or policy purposes. Knowledge of basic probability theory and Operations Research techniques are required.

IE 494 Industry Analysis (3-0)3
Macroeconomic framework of industrial activity. Key macro indicators. Classification schemes for economic activity. Long-term trends in major sectors. Surveys and censuses for industrial activity. Key industry indicators. Sources for monitoring developments in industries. Analysis of selected industries. Brief remarks on history and future of industry. Knowledge of principles of economics and statistics is required.

IE 495 Off-Line Quality Control (3-0)3
The total quality concept. Continuous quality improvement. Quality control activities (off-line, on-line). Quality loss. System design. Parameter design. Taguchi method. Tolerance design. Quality function deployment. Quality standards. Quality awards.
Prerequisite: IE 266.

IE 496 Financial Engineering (3-0)3
Basic concepts in modern finance. Fixed income securities, yield curve and interest rate models. Financial risk management, derivative instruments, option pricing, value-at-risk.
Prerequisite: IE 347

IE 497 Systems Design I (1-4)3
Systems design and design issues in industrial engineering. Team experience in design projects. The conception, structuring and formulation of a real-life system design problem that draws upon and synthesizes knowledge accumulated throughout the IE degree program, underlying ethical and other social aspects.
Prerequisite: -
Co-requisite: IE 489 and consent of the department.

IE 498 Systems Design II (1-4)3
The second of a two-course sequence in systems design project. Analysis, formulation, modeling, validation and implementation stages of system design.
Prerequisite: IE 497.

IE 4900-4910 Special Topics in Industrial Engineering (3-0)3
These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF INDUSTRIAL ENGINEERING

GRADUATE CURRICULUM

Graduates of Industrial Engineering and of other disciplines can be admitted to the graduate programs upon satisfying the requirements of the Department. Candidates from other disciplines are normally required to complete a deficiency program.

M.S. Program

IE	500	M.S. Thesis	NC
IE	553	Linear Optimization	(3-0)3
IE	561	Stochastic Models*	(3-0)3
IE	590	Graduate Seminar**	(0-2)NC

5 elective courses

Total minimum credit: 21
Number of courses with credit (min): 7

**or OR 590

Ph.D. Program

If admitted by M.S. degree

IE	554	Discrete Optimization *	(3-0)3
IE	566	The Design and Analysis of Experiments**	(3-0)3
IE	600	Ph.D. Thesis	NC
IE	690	Research Topics in IE***	(3-0)3

5 Elective Courses***

* or IE 555 Nonlinear Optimization
** or IE 568 Statistical Applications in Engineering
*** or OR 690 or equivalent

Total minimum credit: 24
Number of courses with credit (min): 8

If admitted by B.S. degree:

IE	553	Linear Optimization	(3-0)3
IE	554	Discrete Optimization*	(3-0)3
IE	562	Stochastic Processes in Decision Models I	(3-0)3
IE	566	The Design and Analysis of Experiments*	(3-0)3
IE	590	Graduate Seminar*	(0-2)NC
IE	690	Research Topics in IE*	(3-0)3
IE	600	Ph.D. Thesis	NC

10 elective courses

Total minimum credit: 45
Number of courses with credit (min): 15
* IE 554 or IE 555; IE 566 or IE 568; IE 590 or OR 590; IE 690 or OR 690 or equivalent

GRADUATE COURSES

IE	500	M.S. Thesis	NC
IE	505	Heuristic Search	(3-0)3
IE	513	Strategic Planning	(3-0)3
IE	515	Pricing And Revenue Management	(3-0)3
IE	518	Quantitative Models In Supply Chain Management	(3-0)3
IE	521	Production System Analysis	(3-0)3
IE	522	Production Planning and Scheduling	(3-0)3
IE	523	Sequencing and Scheduling	(3-0)3
IE	524	Project Scheduling	(3-0)3
IE	525	Advanced Topics in Facilities Layout and Location	(3-0)3

IE	527	Production and Inventory Theory	(3-0)3
IE	528	Logistic Systems Engineering	(3-0)3
IE	529	Topics in Modern Manufacturing	(3-0)3
IE	531	Research Techniques in Human Engineering	(3-0)3
IE	532	Man Machine Information and Control Systems	(3-0)3
IE	533	Methodology of Fatigue Assessment	(3-0)3
IE	539	Topics in Ergonomics	(3-0)3
IE	542	Quality Engineering	(3-0)3
IE	543	Industrial Economics	(3-0)3
IE	545	Total Quality Management	(3-0)3
IE	553	Linear Optimization	(3-0)3
IE	554	Discrete Optimization	(3-0)3
IE	555	Nonlinear Optimization	(3-0)3
IE	558	Multiobjective Decision Making	(3-0)3
IE	561	Stochastic Models	(3-0)3
IE	562	Stochastic Processes in Decision Models I	(3-0)3
IE	563	Stochastic Processes in Decision Models II	(3-0)3
IE	564	Forecasting	(3-0)3
IE	566	The Design and Analysis of Experiments	(3-0)3
IE	568	Statistical Applications in Engineering	(3-0)3
IE	570	Time Series Analysis with Applications	(3-0)3
IE	571	System Simulation	(3-0)3
IE	581	Artificial Intelligence, Expert Systems and Decision Support Systems	(3-0)3
IE	582	Business Process Reengineering	(3-0)3
IE	583	Qualitative Methods for Engineers	(3-0)3
IE	590	Graduate Seminar	(0-2)NC
IE	600	Ph.D. Thesis	NC
IE	690	Research Topics in IE	(3-0)3
IE	7XX	Special Topics in IE	(3-0)3
IE	8XX	Special Studies	(4-2)NC
IE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

IE 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their third semester while the research program or write-up of thesis is in progress. (F&S)*

IE 505 Heuristic Search (3-0)3
Heuristic search approaches for solving difficult combinatorial problems. Categorization of heuristic search techniques. Traditional heuristics for combinatorial optimization problems. Metaheuristics including simulated annealing, tabu search and evolutionary algorithms. Constraint handling techniques. Computational complexity of heuristics.

IE 513 Strategic Planning (3-0)3
Methods and techniques of strategic management, that is, formulation, implementation and evaluation of actions that enable an organization to achieve its mission and objectives. Strategic Choice and Decision Making, Strategy Implementation Process Structure and Planning Style, Strategy Review, Evaluation and Control.

IE 515 Pricing And Revenue Management (3-0)3
Price-response function, price response with competition, price differentiation, volume discounts, opportunity cost, variable pricing, markdown pricing, first-price auctions, second-price Auctions, English suctions, vickrey auctions, booking control, protection levels, network bid price control.

IE 518 Quantitative Models In Supply Chain Management (3-0)3
Decision-making and information management issues in supply chains with emphasis on integrating procurement, operations, and logistics; stages from raw materials to customer demand, with emphasis on quantitative models of supply chain.

IE 521 Production Systems Analysis (3-0)3
State-of-the-art tools for gaining perspective in management and control of manufacturing function in organizations supported by case studies. An evaluative treatment of materials management, master production scheduling and production planning from a bottom-up perspective. Material Requirements Planning (MRP) versus Just-in-Time (JIT) implementations. Optimized Production Technology (OPT). Differences in make-to-order and assemble-to -order production settings.

Computer support, system conversion and integration issues in manufacturing planning and control.

IE 522 Production Planning and Scheduling (3-0)3

Analysis of some specific problem areas within the context of planning and scheduling of production activities. Definition, formulation and available solution procedures for aggregate planning, lot sizing. Scheduling in manufacturing systems, scheduling in service systems, design and operation of scheduling systems.

IE 523 Sequencing and Scheduling (3-0)3

Sequencing and scheduling concepts and terminology. Characteristics of sequencing problems. Sequencing heuristics and procedures. Scheduling approaches. Priority rules and job shop scheduling.

IE 524 Project Scheduling (3-0)3

Principles of project management. Representation of project operations: project breakdown, network representation and terminology, network data. Network planning with respect to costs and durations: critical path analysis, linear time cost trade-off analysis. Resource-constrained network planning, resource scheduling, resource leveling. Financial planning and cost control in project systems. Project scheduling with probabilistic networks.

IE 525 Advanced Topics in Facilities Layout and Location (3-0)3

Formal and heuristic techniques of layout and location analysis, philosophical aspects of facilities planning in general. Special topics such as design of non-manufacturing facilities and warehouse automation.

IE 527 Production and Inventory Theory (3-0)3

Structure of production-inventory systems. Deterministic and stochastic ordering decision models in continuous and periodic review systems. Coordinated replenishment of multiple items.

IE 528 Logistic Systems Engineering (3-0)3

Introducing Logistics Systems. Logistics Network Design. Distribution Strategies. Transportation Operations and Management. Order Management. Inventory Management (coordinated replenishments, multi-echelon systems).

IE 529 Topics in Modern Manufacturing (3-0)3

This course is designed to promote interest in modern manufacturing systems. Various papers and references are presented related to FMS and CIM. State of-the-art papers are discussed.

IE 531 Research Techniques in Human Engineering (3-0)3

Laboratory and field research techniques in industry. Practical applications, instrumental methods and the general principles of project development. Classroom discussions, term projects and library research.

IE 532 Man Machine Information and Control Systems (3-0)3

Displays and controls. Human decision making process. Information theory. Human communication essentials. Cybernetics. Control systems. Behavioral control theory.

IE 533 Methodology of Fatigue Assessment (3-0)3

Fatigue and its relations with work load stress and strain, objective determination of physical and mental work load; laboratory testing procedures and their field applications, use of radio telemetry instrumentation for fatigue assessment.

IE 539 Topics in Ergonomics (3-0)3

Ergonomical issues of modern industrial society are introduced. Problems of automation humanization of work environment, shift work, disabled and aged workers in industry are discussed.

IE 542 Quality Engineering (3-0)3

Introduction to Quality Engineering. Parameter design by Taguchi design of experiment, Taguchi's Loss Function. Tolerance design and tolerancing. Online feedback quality control. Online process parameter control.

Prerequisites: IE 266 and IE 566 or consent of department.

IE 543 Industrial Economics (3-0)3

A review of quantitative microeconomics theory covering demand, production and market structures. A selection of medium-to-long term issues such as competition and pricing. Concepts of equilibrium and welfare. Modern topics in industrial economics such as the transaction cost and property rights approaches and government regulation.

IE 545 Total Quality Management (3-0)3

Total quality concept. Total quality management decision. Customer focus. Quality organization. Team formation and problem solving. Policy deployment. Quality through planning. Design and

control. Quality standards and award models. Real life applications and cases.

IE 553 Linear Optimization (3-0)3
Linear programming in matrix form. The revised, dual, and primal-dual simplex methods. Bounded variables. Duality and sensitivity analysis. The transportation and assignment algorithms. Basic concepts of decomposition. (F)

IE 554 Discrete Optimization (3-0)3
The linear minimal cost flow problem and its solution by the network simplex algorithm. Maximal flow, shortest route and circulation problems. The integer programming problem and its solution by branch and bound and decomposition methods. Lagrangian relaxation.

IE 555 Nonlinear Optimization (3-0)3
Review of convex sets and functions. Local and global optima. Basic methods of constrained optimization. Lagragian duality.

IE 558 Multiobjective Decision Making (3-0)3
Formulation of the general multiobjective programming problem, classification of multiobjective programming methods; generating techniques, preference oriented methods, multiple-decision-maker methods. Multiobjective analysis of certain problems in public sector.

IE 561 Stochastic Models (3-0)3
Markov chains: Transient and steady state behavior, First Passage times. Markov process: Transient and steady state behavior, First Passage times and phase type distributions. Queuing networks. Markov decision process (MDP): Continuous and discreet time models, MDP as linear programs, MDP under constraints, Maintenance applications. Reliability and maintenance problems: Definition, System configurations, Reliability improvements with cost considerations, Reliability bounds. (F)

IE 562 Stochastic Processes in Decision Models I (3-0)3
Probability spaces and classification of stochastic processes. Markov chains with discrete and continuous parameter spaces; characterization and limiting behaviour. Birth and death processes and their application to queuing theory. (F)

IE 563 Stochastic Processes in Decision Models II (3-0)3
Introduction to renewal theory. Applications in reliability and replacement models. Semi-Markov processes.

IE 564 Forecasting (3-0)3
Forecasting methodology and techniques, moving averages, exponential smoothing. Winters method, Box-Jenkins models, and Bayesian methods.

IE 566 The Design and Analysis of Experiments (3-0)3
The way in which information is used in inference making will be discussed by covering linear statistical models, multiparameter hypotheses, incomplete block designs. Random and mixed models.

IE 568 Statistical Applications in Engineering (3-0)3
Computer aided exploration, analysis and classification of data and empirical model building in engineering through the use of descriptive statistics, random sampling, probability distribution fitting, analysis of variance, regression analysis, discrimination and classification and clustering.

IE 570 Time Series Analysis with Applications (3-0)3
Stationarity and the autocovariance functions. Hilbert Spaces, The Projection Theorem and the mean square convergence. Stationary ARMA Processes. Prediction of Stationary Processes. Estimation of the mean and the autocovariance function. Estimation for ARMA models. Forecasting with ARIMA processes.

IE 571 System Simulation (3-0)3
Simulation methodology and its comparison with other techniques, discrete change simulation concepts. Selecting input distributions, random variate generation, statistical analysis of output. Selected applications of simulation.

IE 581 Artificial Intelligence, Expert Systems and Decision Support Systems (3-0)3
Introduction to artificial intelligence. Knowledge representation using formalized symbolic logic, dealing with uncertainties and inconsistencies, structured knowledge. Knowledge acquisition, organization and expert systems. Intelligent decision support systems: integration of DSS, DBMS and ES.

IE 582 Business Process Reengineering (3-0)3
The course concentrates on engineering of organizational processes and systems. The focus is on the fundamental redesign of strategic and value-adding business processes. Organizations are modelled as systems in order to gain insight into their structure, processes and performance. This knowledge is used in engineering more effective

organizations and information systems to provide value-added support for organizational evolution.

IE 583 Qualitative Methods for Engineers (3-0)3
Qualitative research methods serving as means to understand complex socio-economic systems. Models and techniques employed for gaining a better understanding and change of human interactions. Theory, methodology and research design in qualitative research. Qualitative performance evaluation in organizations. System dynamics and Delphi technique.

IE 590 Graduate Seminar (0-2)NC
This seminar is designed to promote research interest in various areas of IE. Master's students must register and fulfill departmental requirements of the seminar. (F&S)

IE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their third semester while the research program or write-up of thesis is in progress. (F&S)

IE 690 Research Topics in IE (3-0)3
This course is designed to promote research interest in various areas of IE. References and state-of-the-art papers are discussed.

IE 7XX Special Topics in IE (3-0)3
Courses not listed in the catalog. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include advanced fields of study in industrial engineering and operational research.

IE 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor. (F&S)

IE 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor. (F&S)

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT

Core Courses:

EM	501	Financial and Management Accounting	(3-0)3
EM	502	Operations Management	(3-0)3
EM	503	Systems and Organizations	(3-0)3
EM	505/MS 501	Decision Models	(3-0)3
EM	517	Business Economics	(3-0)3
5 Approved Elective Courses * 15 Credits			
EM	590	Seminar	(0-2)NC
EM	599	Term Project	NC

Total Minimum Credit: 30
Number of courses with credit (min.): 10

List of Elective Courses:

EM	504	Technology Management	(3-0)3
EM	506	Project Management	(3-0)3
EM	507	Total Quality Management	(3-0)3
EM	508	Strategic Planning	(3-0)3
EM	510	Business Process Reengineering	(3-0)3
EM	512	Qualitative Methods for Management	(3-0)3
EM	516	Logistics	(3-0)3
EM	520	Management Information and Decision Support System	(3-0)3

EM	521	Applied Statistics	(3-0)3
EM	522	Data Mining For Business Intelligence	(3-0)3
EM	531	Engineering Economy and Investment Management	(3-0)3
EM	532	Finance for EM	(3-0)3
EM	533	Quality Engineering	(3-0)3
EM	534	Supply Chain Management	(3-0)3
EM	590	Seminar	(0-2)NC
EM	7xx	Special Topics in Engineering Management	(2-2)3 or (3-0)3
EM	8XX	Special Studies	(0-2)NC
EM	9XX	Advanced Studies	(4-0)NC

Justification: Accelerating technological competition is presenting new challenges for management all over the world. Progress in technology has enabled companies to develop, market, and distribute new products and services at an increasing rate. The business environment has become more dynamic and unpredictable and its increasing dominance of the role of technology has created a corresponding need for improvement in its management. Maintaining a competitive edge now depends foremost on integrating technology into the overall corporate strategy. Graduates in management, however, are finding it difficult to understand the new technologies in manufacturing, quality management, marketing and distribution and are not equipped with the analytical tools and methods needed to cope with issues related to these technologies. Engineers who have been promoted into management, on the other hand, do not know much about the management of new technology and the people who use it. The days of managers who get along with only technical expertise or purely administrative skills seem to be over and there is a need for a new type of professional.

Objectives of the Proposed Program: The target group, namely engineers and business school graduates, equipped with the knowledge and practice of this training program, will have a much more broader vision and scope. They will gain the ability to manage socio-technical affairs more intelligently. Quality management, human resources management, technology management, project management, information management, engineering economy, among others, are disciplines which have emerged or reformed recently and through this program the target group will catch the chance to refresh and update themselves.
The objective of the program is to provide engineers and scientists with the skills, knowledge and attitude necessary for leadership in the management of current and future generations of technology. The program lends the methodological strength of science and engineering and the conceptual breadth of management in a powerful framework for managing engineering and technology. Graduates will have gained improved skills to take a global perspective in formulating, analyzing, and solving management problems with particular concern for strategic technologies and their use in all areas of business activity. They will also acquire a greater awareness of interpersonal relations, group dynamics and team motivation for innovation and effective communication.

Organization of the Program: The admission requirements, list of faculty, structure of the graduate program and the description of the courses are given below.

Admission Requirements:
A bachelor's degree in engineering (except industrial engineering), basic sciences, management, economics or similar fields,
A background in calculus, probability, statistics, and computer programming,
Proficiency in English in TOEFL or in METU proficiency exams,
A certain minimum grade at the Graduate Admission Examination (ALES or GRE) (to be determined),
A letter explaining the goals of the candidate,
A favorable opinion of the Program Admission Committee.

Course and Credit Requirements:
The course work requirements for non-thesis M.S. degree are composed of 5 required courses, and 5 elective courses. List of course requirements are given below:

Required Courses:

EM	501	Financial and Management Accounting
EM	502	Operations Management
EM	503	Systems and Organizations
EM	505	Decision Models
EM	517	Business Economics

Elective Courses:

EM	504	Technology Management
EM	506	Project Management
EM	507	Total Quality Management
EM	508	Strategic Planning
EM	510	Business Process Reengineering
EM	512	Qualitative Methods for Management
EM	516	Logistics
EM	520	Management Information and Decision Support Systems
EM	521	Applied Statistics
EM	531	Engineering Economy and Investment Management
EM	532	Finance for EM
EM	533	Quality Engineering
EM	534	Supply Chain Management
EM	7XX	Special Topics in EM
EM	8XX	Special Studies
EM	9XX	Advanced Studies

Degree Requirements:

The requirements, in addition to the course and credit requirements above, for the M.S. degree in Engineering Management comprise the following courses:

EM	590	Seminar	(0-2)NC
EM	599	Term Project	(0-4)NC

DESCRIPTION OF THE COURSES

EM 501 Financial and Management Accounting (3-0)3
Basics of financial accounting. Preparation of balance sheet, income statement and flow of funds statement. Inventory valuation and depreciation methods. Basics of accounting. Definition of costs. Absorption cost techniques, with an emphasis on allocation of overhead in manufacturing organizations. Economic analysis for engineering and managerial decision making. Techniques of evaluating the worth of prospective projects, investment oppurtunities, and design choices. Replacement analysis, incorporation of the effect of inflation into economic analysis.

EM 502 Operations Management (3-0)3
Capacity and technology selection, facility location, plant organization (layout), material handling systems, plant management. Structure of service producing systems. Basic design and operational concepts in service and process selection, capacity planning, facility planning, work design, aggregate service planning, scheduling, service quality and information systems.

EM 503 Systems and Organizations (3-0)3
Focus on foundations of management, covering the essential concepts in management like planning, organizing, leading and controlling with a strong practical orientation. A systemic approach to organizational structures considering environmental hierarchy around contemporary organizations and modern-day constraints like environmental concerns. Study of change phenomenon in organizations as a result of environmental and internal forces. Analysis and design of information systems as meshed with organizational design. Basic information concepts, data processing technology and its applications. Information systems development methodology in terms of systems analysis, design and implementation. Use of decision support systems and expert systems.

EM 504 Technology Management (3-0)3
Definition of technology concept in production and service sectors. History of technological developments on a sectoral basis. Relationships with science and engineering. Models of technology

development: techno-parks, science parks, research institutes. Organizations and media toward technology surveys and technology transfer. Role of technology in national economic development and global competition.

EM 505 Decision Models (3-0)3
Introduction to methodology of deterministic decision models. Kuhn-Tucker conditions of optimality. Linear programming using simplex method. Duality theory. The dual simplex method and post optimality analysis. Parametric linear programming. The transportation algorithm. Transshipment and assignment problems. Integer programming models and an introduction to enumerative algorithms.

EM 506 Project Management (3-0)3
Principles of project management. Representation of project operations: project breakdown, network representation and terminology, network data. Network planning with respect to costs and durations: critical path analysis, linear time cost trade-off analysis. Resource-constrained network planning, resource scheduling, resource leveling. Financial planning and cost control in project systems. *Prerequisite: EM 505*

EM 507 Total Quality Management (3-0)3
Total quality concept. Total quality management decision. Customer focus. Quality organization. Team formation and problem solving. Leadership and empowerment. Quality through planning, design and control. Quality standards and award models. Real life applications and cases.

EM 508 Strategic Planning (3-0)3
Methods and techniques of strategic management and planning, that is, formulation, implementation and evaluation of actions that enable an organization to achieve its mission and objectives. Strategic Analysis, Strategic Choice and Decision Making, Strategy Implementation Process, Structure and Planning Style, Strategy Review, Evaluation and Control. *Prerequisite: EM 501*

EM 510 Business Process Reengineering (3-0)3
Fundamental redesign of strategic and value-adding business processes. Organizations are modeled as systems in order to gain insight into their structure, processes and performance. This knowledge is used in engineering more effective organizations and information systems to provide value-added support for organizational evolution. Cross-functional view of organizational activities.

EM 512 Qualitative Methods For Management (3-0)3
Qualitative research methods serving as means to better understand and change a complex social phenomenon. Models employed in applied fields for gaining a better understanding of human interactions are among others, qualitative interviewing and observation, Delphi technique, Balanced Scorecard and System Dynamics. Through systematic means the students will gather information about actions and interactions, reflect on their meaning, arrive at and evaluate conclusions, and eventually put forward an interpretation.

EM 516 Logistics (3-0)3
Introducing Logistics Systems. Logistics Network Design. Distribution Strategies. Transportation Operations and Management. Order Management. Inventory Management (coordinated replenishments, multi-echelon systems).
Prerequisite: EM505

EM 517 Business Economics (3-0)3
A review of quantitative microeconomics theory covering demand, production and market structures. A selection of medium to long term issues such as competition and pricing. Concepts of equilibrium and welfare. Modern topics in industrial economics such as the transaction cost and property rights approaches and government regulation.

EM 520 Management Information and Decision Support System (3-0)3
Individual and organizational decision making. Normative and behavioral models of decision making. Utility functions. Basic concepts of DSS. Data collection, database management, modeling support user interface design issues. EIS, ES, intelligent DSS. Integration of MSS. Basics of modeling, model building blocks. Implementation issues. *Prerequisite: EM 503*

EM 521 Applied Statistics (3-0)3
Basic concepts of probability and statistics, computer aided exploration and analysis of data, and empirical model building for engineering management. Descriptive statistics, random sampling, probability distribution fitting, hypothesis testing, analysis of variance, regression analysis.

EM 522 Data Mining For Business Intelligence (3-0)3
Introduction to data mining. Data mining process. Selecting and preparing data. Knowledge representation. Data mining techniques and evaluating the models. Key methods in business decision-making context. Case studies.

EM 531 Engineering Economy and Investment Management (3-0)3
Interest and time value of money. Economic Equivalence; nominal and effective rates; methods for evaluating alternatives. Replacement analysis; before and after tax analysis. Index numbers; inflation and escalating costs. Sensitivity analysis; methods of financing. Deterministic capital budgeting models.

EM 532 Finance for EM (3-0)3
Fundamental concepts of financial management; objectives, tasks and decisions made by financial managers. Asset valuation, market efficiency, risk and return analysis, bond and stock valuation, asset pricing models. *Prerequisite: EM 501*

EM 533 Quality Engineering (3-0)3
Total quality concept. Quality assurance and control activities. Statistical process control. Control charts. Acceptance sampling. Process capability. Quality through product, process and service design. Failure modes and effects analysis. Inventive problem solving approaches for quality improvement.
Prerequisite: EM 521

EM 534 Supply Chain Management (3-0)3
Decision making and information management issues in supply chains with emphasis on integrating procurement, operations, and logistics stages, from raw material to customer demand.
Prerequisite: EM 502

EM 590 Seminar (0-2)NC
This seminar is designed to promote research interest in various areas of EM. Master's students must register and fulfill departmental requirements of the seminar.

EM 599 Term Project (0-4)NC
A term project on engineering management topics carried out under the supervision of a project advisor. Project topics are announced by the department at the beginning of each semester. Students are required to submit a written report at the end of the semester.

EM 720 Interfirm Networks (3-0)3
Markets, firms and external cooperation; cooperative strategy, trust and social capital; business relationships; proximities; network organization and dynamics; types of networks; industrial districts and clusters.

EM 721 Econimics Analysis for Engineering Management (3-0)3
Analysis of economies, sectors, industries and companies through key indicators. Discussion of major productivity and management challenges at the sectoral and industry level. Study of interactions between macroeconomic and industrial policies.

EM 723 Monte Carlo Simulation for Operations Analysis (3-0)3
Introduction to Monte Carlo simulation. Principles of simulation modeling. The design and analysis of simulation models. Performing Monte Carlo simulations via Excel spreadsheet models. Use of simulation as a decision tool. Monte Carlo simulation applications in the areas of production and service systems. Statistical analysis of simulation input and output data. Case studies.

EM 7XX Special Topics in EM (3-0)3 or (2-2)3
Courses not listed in catalog. Contents vary from year to year according to interests of students and instructors in charge. Typical contents include advanced fields of study in engineering management and related areas.

EM 8XX Special Studies (0-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

EM 9XX Advanced Studies (4-0)NC
Graduate students as a group study advanced topics under the guidance of a faculty member, normally his/her advisor.

DEPARTMENT OF MECHANICAL ENGINEERING

PROFESSORS

AKKÖK, Metin: B.S., M.S., METU; Ph.D., Imperial College.
AKSEL, M. Halûk: B.S., M.S., METU; Ph.D., Lehigh University.
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ARIKAN, M.A. Sahir: B.S., M.S., Ph.D., METU.
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DAĞ, Serkan: B.S., M.S., METU; Ph. D., Lehigh University.
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VURAL, Hüseyin: B.S., İ.T.Ü.; M.S., Boğaziçi University; Ph.D., Rutgers University.
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ASSOCIATE PROFESSORS

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DÖLEN, Melik: B.S., İ.T.Ü.; M.S., University of New Hampshire; Ph.D., University of Wisconsin-Madison.
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INSTRUCTORS

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ÖZDEMİR, Mustafa: B.S., M.S., Ph.D., METU.

GENERAL INFORMATION: Mechanical Engineering is a creative profession concerned with the design of devices, machines, processes and systems that involve mechanical work and its conversion from and into different forms of energy. It includes the conversion of chemical, thermal and nuclear energy into mechanical energy through engines and power plants; transporting energy in terms of devices like heat exchangers, gear transmissions, mechanisms and pipelines and utilizing energy to perform a variety of tasks such as transportation vehicles, manufacturing tools and equipment and household devices. In short, Mechanical Engineering is one of the broadest and most versatile areas of the engineering profession.

Mechanical Engineering Department offers educational programs designed to prepare students for professional career by developing a sound base in fundamental engineering sciences. The undergraduate and graduate programs are intended to develop initiative, creativity, talent, leadership and the capability to develop, follow and adopt new technologies in the field of Mechanical Engineering. A variety of courses covering basic and specialized subjects in Thermal and Fluid Sciences, Energy Systems, Applied Mechanics, Design and Production, Theory of Machines and Control Systems are offered. Lectures are supplemented by tutorials, use of computers, and experimental work in various laboratories.

Mechanical Engineering Department is heavily involved in basic and applied research and consultancy. Besides graduate theses, research activities are also motivated by projects sponsored by the public and private sectors, as well as by the international organizations. National and international conferences, workshops, short courses and seminars are regular activities of the Department.

The Department houses the following national and international organizations and research centers:
- The CAD-CAM and Robotics Center (BİLTİR)
- International Center for Heat and Mass Transfer (ICHMT)
- Machine Design and Production Society (MATİM)
- Machine Design and Production Research Center (MATİMAREN)

MISSION OF THE DEPARTMENT: The mission of METU Mechanical Engineering Department is:

- To educate individuals to become creative, inquisitive and productive in both national and international arenas, instilled with global knowledge and abilities, and able to be leaders and pioneers in their field.
- To perform research and development activities that will contribute to science and national technologies.
- To lead and to pioneer in related fields.

RESEARCH INTERESTS AND FACILITIES: Research activities in the Department are concentrated both on the mechanical design aspects of machinery and on the thermo-fluid behavior of working media in engineering systems. The major areas of research may be grouped under main headings as: Applied Mechanics, Design and Production Engineering, Energy, Machine Dynamics and Control, Nuclear Engineering, Thermo-Fluid Sciences; as well as under specific headings as:

- Automotive Engineering
- Biomechanics
- Combustion, Internal Combustion Engines
- Computational Fluid Mechanics
- Computer Aided Design and Manufacturing
- Design and Optimization of Mechanical Systems
- Design and Optimization of Thermal Systems
- Energy Management
- Experimental and Computational Fluid Mechanics and Turbomachinery

- Experimental and Computational Heat and Mass Transfer
- Fuel Cells
- Fracture Mechanics
- Kinematics and Dynamics of Machinery
- Mechatronics
- MEMS
- Micro-Nanoscale Heat Transfer and Fluid Mechanics
- Modeling and Control of Mechanical Systems
- New and Renewable Energy Resources and Utilization
- Non-destructive Testing
- Non-traditional Manufacturing Processes
- Pipeline Engineering
- Plasticity and Metal Forming
- Robotics
- Solar Energy
- Vibration and Acoustics

The following laboratories of the Mechanical Engineering Department are used for student experiments in undergraduate courses, for graduate research and for industrial tests and projects:

1. Undergraduate Heat Transfer Laboratory
2. Heat Transfer Research Laboratory
3. Thermal Environmental Engineering Laboratory
4. Thermal Power Laboratory
5. Optical Laboratory for Heat and Mass Transfer Research
6. Fluid Mechanics and Fluid Machinery Laboratory
7. Nuclear Engineering and Radioisotope Applications Laboratory
8. Dimensional Metrology Laboratory
9. Machine Shop
10. Machine Tool and Production Laboratory
11. Stress Analysis Laboratory
12. Photoelasticity Laboratory
13. Materials Testing Laboratory
14. Plasticity and Metal Forming Laboratory
15. Fatigue Laboratory
16. Electrical Discharge Machining (EDM) Laboratory
17. Dynamic Systems Laboratory
18. Control Laboratory
19. Internal Combustion Engines and Gas Turbines Laboratory
20. Automotive Laboratory
21. Computer Integrated Manufacturing (CIM) Laboratory
22. Undergraduate Mechatronic Laboratory
23. Machine Design Laboratory
24. Biomechanics-Gait Analysis Laboratory
25. Machine Tool Automation Laboratory
26. Machine Elements Laboratory
27. IVDS Laboratory

The Department has a Local Area Network (LAN) which is connected to the University backbone network through which Internet facilities can be accessed. For number crunching computing in graduate level research, the IBM Scalable Power Parallel System-SP2 at the Computer Center of the University can be used through the network. Computing facilities also include over 200 personal computers and several work stations, which are connected to the Department LAN. The students are introduced to the use of computers in their first year Computer Aided Engineering Graphics Courses, and are constantly involved in computer oriented education and practice throughout their undergraduate study.

Scheduled and general use of computers in educational programs are conducted in the Computer Graphics Laboratory and the Computer Room for Undergraduate Studies as well as in the computational facilities distributed through various laboratories and offices in the Department.

UNDERGRADUATE PROGRAM: The undergraduate curriculum leading to the degree of Bachelor of Science in Mechanical Engineering shown on the following page indicates the minimum requirements for the degree, and must be completed in a maximum of 14 semesters. Some courses in the curriculum are also offered in summer schools, enabling the students to distribute their course loads, to catch up with the program, as well as to supplement the program with additional courses they are interested in. The six technical electives in the fourth year of the curriculum provide the students the opportunity to get specialized in the field of their interest. All undergraduate students of Mechanical Engineering are required to spend a minimum of four weeks, twice during their undergraduate study, in industry to gain practical experience during summers.

A culminating feature of the Mechanical Engineering curriculum for senior level students is the Design Project Competition in the compulsory course ME 407 Mechanical Engineering Design. Groups of three students tackle with design problems which require analytical ability, judgment, technical skills, creativity and innovation and produce a working prototype of their design. The prototypes are tested and evaluated on the basis of some pre-established merits.

The second compulsory course in the fourth year of the curriculum is ME 410 Mechanical Engineering Systems Laboratory. This course is an overview of the basic courses of the first three years of the curriculum, giving the students the opportunity to apply the knowledge acquired on basic concepts during experiments on practical engineering systems. Groups of three students conduct experiments on systems such as internal combustion engine, turbomachinery, energy conversion equipment, metrology-quality control in production, vibrating machinery, machine tools, etc., which might not have been fully covered in the compulsory courses of the curriculum.

PROGRAM EDUCATIONAL OBJECTIVES: The graduates of the B.S. program of the Mechanical Engineering Department of the METU are engineering professionals who:

I. are sought in areas of new technology and/or product development, being innovative and entrepreneurial individuals with leadership abilities and pioneering abilities in professional areas.
II. identify and solve engineering problems using scientific approach with their sound engineering base.
III. seek rational solutions in their professional practice while considering their social, environmental, economical and ethical dimensions.

PROGRAM OUTCOMES:

1. Ability to establish the relationship between mathematics, basic sciences and engineering sciences with engineering applications.
2. Ability to find and interpret information.
3. Ability to follow the literature and technology related to his/her topic of interest.
4. Recognition of the need to keep oneself up to date in his/her profession.
5. Possession of written and oral communication skills.
6. Ability to conduct team work (within discipline, inter-disciplinary, multi-disciplinary).
7. Ability to produce original solutions.
8. Use of scientific methodology in approaching and producing solutions to engineering problems and needs.
9. Openness to all that is new.
10. Ability to conduct experiments.
11. Ability to do engineering design.
12. Awareness of engineering ethics, knowledge and adoption of its fundamental elements.
13. Ability to take societal, environmental and economical considerations into account in professional activities.
14. Possession of pioneering and leadership (characteristics in areas related to the profession).

GRADUATE PROGRAMS: Mechanical Engineering Department seeks to provide high quality graduate education in the advanced technical and professional fields of Mechanical Engineering. The prime objective of the program is to educate graduates to acquire the state of the art knowledge in the different fields of Mechanical Engineering. This is to fulfill the growing need for well-trained experts with breadth of vision of the technologically developing industry. Mechanical Engineering Department educates graduate students in the subjects which are relevant to the present and future requirements of the industry, with critical thinking capabilities which will benefit the student and the community. The graduate program is noteworthy in its emphasis both on technology development areas and/or practical applications. Graduate courses are designed to give a sound background which would ease the efforts of the students to understand, set-up and solve many problems which they would be confronting in their thesis projects and in their professional career. The Department expects high scholarship from its graduate students and not only tries to educate technically competent engineers but engineers with a sense of civic responsibility.

The Department offers three programs to qualified students for further education and research at advanced level, leading to the degree of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Mechanical Engineering. The graduate programs consist of courses and a thesis. The thesis dissertation topics are developed from the interactions of the faculty with the needs of the community and industry in compliance with current progresses in the scientific and technical world. The Department also offers Mechanical Design and Manufacturing (MDM), a non-thesis evening program.

All students admitted to the M.S. program in Mechanical Engineering are required to designate their thesis supervisor and topic at the start of their program. In addition to an M.S. thesis, students are required to take a minimum of 7 courses, one of which should be selected from a pool of designated analytical mathematics courses. The course program of the student is designed by the thesis supervisor and it may contain at most 2 courses offered by other departments. The course program must have at least 4 courses with ME 5XX codes, excluding ME 521, totaling a minimum of 12 credit hours. The M.S. program must be completed in a maximum of 6 semesters.

Students admitted to Mechanical Design and Manufacturing (MDM), non-thesis evening master program are required to take 10 courses (2 compulsory and 8 elective) with 30 credits and a term project.

Students admitted to the Ph.D. program in Mechanical Engineering are required to take 7 graduate courses with credit in a maximum of four consecutive semesters. The course programs of the students are prepared by their thesis supervisors. The Ph.D. program involves a qualifying examination in addition to the courses and a Ph.D. dissertation, and must be completed in a maximum of 12 semesters.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MATH	119	Calculus with Analytic Geometry	(4-2)5
PHYS	105	General Physics I	(3-2)4
CENG	230	Introduction to Computers and C Programming	(2-2)3
ME	113	Computer Aided Engineering Drawing I	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	106	General Physics II	(3-2)4
CHEM	107	General Chemistry	(3-2)4
ME	114	Computer Aided Engineering Drawing II	(2-2)3
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
EE	209	Fundamentals of Electrical and Electronics Engineering	(3-0)3
METE	227	Basic Concepts in Materials Science	(3-0)3
ME	200	Mechanical Engineering Orientation	(0-4)NC
ME	203	Thermodynamics I	(3-0)3
ME	205	Statics	(3-0)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

METE	228	Engineering Materials	(3-0)3
ME	202	Manufacturing Technologies	(3-0)3
ME	204	Thermodynamics II	(3-0)3
ME	206	Strength of Materials	(3-0)3
ME	208	Dynamics	(3-0)3
ME	210	Applied Mathematics for Mechanical Engineers	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

ECON	210	Principles of Economics	(3-0)3
ME	301	Theory of Machines I	(3-0)3
ME	303	Manufacturing Engineering	(3-0)3
ME	305	Fluid Mechanics I	(3-0)3
ME	307	Machine Elements I	(3-0)3
ME	311	Heat Transfer	(3-0)3
TURK	303	Turkish I	NC
ME	300	Summer Practice I	NC

Sixth Semester

ME	302	Theory of Machines II	(3-0)3
ME	304	Control Systems	(3-0)3
ME	306	Fluid Mechanics II	(3-0)3
ME	308	Machine Elements II	(3-0)3
ME	310	Numerical Methods	(3-0)3
ME	312	Thermal Engineering	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

ME	407	Mechanical Engineering Design	(2-2)3

Technical Elective
Technical Elective
Technical Elective
Non-technical Elective***
Free Elective

ME	400	Summer Practice II	NC

Eighth Semester

ME	410	Mechanical Engineering Systems Laboratory	(2-2)3

Restricted Elective*
Technical Elective**
Non-technical Elective
Technical Elective****

All elective courses are minimum 3 credits.
* One of the following courses: ME 403, ME 421, ME 426, ME 437, ME 476, ME 481 or any course approved by the department with thermo-fluid design content.
** Can also be ME5XX (excluding ME521 and ME510).
*** Students who started Mechanical Engineering program prior to 2006-2007 academic year have to take one more NTE or ENG 311 to graduate.
**** Can also be taken from another engineering department of METU subject to restrictions announced.

The Mechanical Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org .

DOUBLE MAJOR PROGRAM IN MECHANICAL ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses are determined by the Department.

MINOR PROGRAM IN PRODUCTION

Mechanical Engineering Department also offers a Minor Program on Production for undergraduate students of other disciplines. The purpose of the Minor Program on Production is to give the interested and successful students a general view of production technology, with the expectation that they will perform better in their own discipline, having acquired a wider scope of knowledge and a different perspective. The courses are divided into two categories; five compulsory courses and three restricted elective courses. The compulsory courses are to create the necessary background and to teach the fundamental principles. The students can extend their knowledge in a selected field of production through the elective courses.

Compulsory Courses

ME	105	Computer Aided Engineering Graphics	(2-2)3
ME	202	Manufacturing Technologies	(3-0)3
or			
ME	212	Principles of Production Engineering	(3-0)3
METE	227	Basic Concepts in Materials Science	(3-0)3
ME	303	Manufacturing Engineering	(3-0)3
ME	307	Machine Elements I	(3-0)3

Three of the following courses

ME	308	Machine Elements II	(3-0)3
ME	416	Tool Design	(3-0)3
ME	433	Engineering Metrology and Quality Control	(3-0)3
ME	440	Numerically Controlled Machine Tools	(3-0)3
ME	443	Engineering Economy and Production Management	(3-0)3
ME	445	Integrated Manufacturing Systems	(3-0)3
ME	471	Production Plant Design	(3-0)3
ME	535	Metal Cutting	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

ME 105 Computer Aided Engineering Graphics (2-2)3
Basic principles of engineering drawing using computer aided design and projections. Geometrical constructions. Orthographic projections. Sketching to generate two and three dimensional drawings and solid CAD models based on the conventions of engineering graphical communication. Multiple view drawings. Theory of projections for isometric, oblique and perspective pictorial views. Sectional views. Dimensioning principles. Simple assemblies. (Offered to non-ME students only).

ME 113 Computer Aided Engineering Drawing I (2-2)3
Introduction to computer aided drawing. Geometrical constructions. Orthographic drawing and sketching. Three dimensional drawings. Dimensioning principles. Sectioning and conventions.

ME 114 Computer Aided Engineering Drawing II (2-2)3
Working drawings, assembly drawings. Screw threads, threaded fasteners. Keys, springs, locking devices, rivets, welding, piping layouts. Gears and cams. Dimensioning and tolerances. Introduction to descriptive geometry, points, lines, planes. Piercing points, dihedral angle. Angle between line and plane. Parallelism, perpendicularly. Intersections. Developments.
Prerequisite: ME 113 or consent of the department.

ME 200 Mechanical Engineering Orientation (0-4)NC
Introduction to mechanical engineering. Demonstrations in Mechanical Engineering department laboratories. Practical work in the machine shop. Workshop safety. Lectures on ethics. Technical trips to various industrial sites.

ME 202 Manufacturing Technologies (3-0)3
Introduction. Casting. Powder metallurgy. Metal working; hot working and cold working processes. Chip removal processes. Non-traditional machining processes. Welding. Manufacturing systems and automation. Machine shop practices.

ME 203 Thermodynamics I (3-0)3
Basic concepts and definitions. Properties of a pure substance. Equations of state. Work and heat. First law of thermodynamics. Internal energy and enthalpy. Second law of thermodynamics. Carnot cycle. Entropy.

ME 204 Thermodynamics II (3-0)3
Irreversibility and availability. Vapor power and refrigeration cycles. Air standard power and refrigeration cycles. Thermodynamic relations. Ideal gas mixtures. Gas and vapor mixtures. Chemical reactions. Chemical equilibrium.
Prerequisite: ME 203.

ME 205 Statics (3-0)3
Idealizations and principles of mechanics. Important vector quantities, classification and equivalence of force systems. State of equilibrium. Elements of structures; trusses, beams, cables and chains. Friction. Elements of statics of fluids. Variational methods: principles of virtual work and minimum potential energy.
Prerequisites: PHYS 105 and MATH 158 or consent of the department.

ME 206 Strength of Materials (3-0)3
Concepts: normal and shear stress, strain. Materials, factor of safety, stress concentration. Pressurized thin walled cylinders. Simple loading tension, torsion and bending. Deflections with simple loadings, superposition techniques. Statistically indeterminate members, thermal stresses. Combined stresses, Mohr's circle, combined loadings. Buckling. Energy methods.
Prerequisite: ME 205.

ME 208 Dynamics (3-0)3
Kinematics and kinetics of particles and system of particles. Plane kinematics and kinetics of rigid bodies. Newton's second law of motion. Methods of work-energy and impulse-momentum.
Prerequisite: ME 205.

ME 210 Applied Mathematics for Mechanical Engineers (3-0)3
Fundamentals of vector analysis. Vector algebra. Line, surface and volume integrals. Green's theorem in the plane, Stokes and Gauss theorems. Matrices. Determinant. Systems of linear equations. Characteristic values and characteristic vectors of matrices. Complex numbers. Complex analytic functions, applications.
Prerequisite: MATH 158 or consent of the department.

ME 212 Principles of Production Engineering (3-0)3
Introduction. Material properties. Casting. Powder metallurgy. Metal working; hot working and cold working processes. Chip removal processes. Non-traditional machining processes. Welding. Manufacturing systems and automation.
(Offered to non-ME students only).

ME 220 Introduction to Mechatronics (1-0)1
Introduction to mechatronic systems, components and machines, engineering and non-engineering features of mechatronic products, role of synergy in developing mechatronic products, trends in technological developments.

ME 300 Summer Practice I NC
Students are required to do a minimum of four weeks (twenty working days) summer practice at the shop floor of a suitable factory. The students are expected to practice on manufacturing processes such as machining, foundry work, metal forming, welding, non-traditional machining, heat treatment, finishing, etc. A report is to be submitted to reflect the work carried out personally by the student.
Prerequisite: ME 202.

ME 301 Theory of Machines I (3-0)3
Introduction to mechanisms: basic concepts, mobility, basic types of mechanisms. Position, velocity and acceleration analysis of linkages. Cam mechanisms. Gear trains. Static and dynamic force analysis of mechanisms.
Prerequisite: ME 208.

ME 302 Theory of Machines II (3-0)3
Virtual work method. Driving torque characteristics and machine-prime mover interactions. Modeling and elements of vibratory systems. Free and forced vibrations of single degree-of-freedom systems. Introduction to multi degree-of-freedom systems. Vibration control. Critical speeds of shafts. Balancing of rotating machinery.
Prerequisite: ME 301 or consent of the department.

ME 303 Manufacturing Engineering (3-0)3
Introduction. Strain hardening properties of metals. Theory of metal forming; formability, bulk deformation processes, sheet metal forming processes. Theory of metal cutting; cutting forces

and energy requirement, tool life, machinability, tool materials, cutting fluids, surface quality, machining economics. Metrology and quality assurance. Cost analysis in manufacturing.
Prerequisite: ME 202.

ME 304 Control Systems (3-0)3
Introduction and basic concepts. Modeling physical systems. Control system components. Transient response. Stability. Steady state response and error. Sensitivity. Basic control actions and controllers. Root-Locus methods. Frequency response.
Prerequisites: MATH 253 and ME 208 or consent of the department.

ME 305 Fluid Mechanics I (3-0)3
Introduction. Fluid statics. Kinematics of fluid flow. Integral formulation of basic equations. Bernoulli equation. Differential formulation of basic equations. Similarity. Flow in closed conduits.
Prerequisites: ME 208 and ME 210 or consent of the department.

ME 306 Fluid Mechanics II (3-0)3
Potential flow theory. Boundary layer theory. Compressible fluid flow. Turbomachinery.
Prerequisite: ME 305

ME 307 Machine Elements I (3-0)3
Stress analysis in 3-D. Tolerances and allowances. Static design criteria; stress concentration, factor of safety, theories of failure for ductile and brittle materials. Fatigue design criteria under mean and combined stresses. Design of shafts. Design of permanent joints; riveted joints, welded joints. Design of detachable joints, bolted joints, power screws, keys, splines, pins, rings. Design of springs.
Prerequisite: ME 206.

ME 308 Machine Elements II (3-0)3
Friction, wear and lubrication; systems of lubrication. Design of sliding bearings; journal and thrust bearings. Antifriction bearings; types, selection criteria and calculation procedure. Power transmission; prime mover characteristics and types. Design of gear drives; spur gears, helical gears, bevel gears, worm gears. Design of couplings, clutches and brakes. Design of belt drives; flat belts, V-belts. Design of chain drives and rope drives.
Prerequisite: ME 307 or consent of the department.

ME 310 Numerical Methods (3-0)3
Approximations and errors. Roots of equations. System of algebraic equations, eigenvalues and eigenvectors. Curve fitting, interpolation, least squares. Numerical differentiation and integration. Ordinary differential equations.
Prerequisite: ME 210 or consent of the department.

ME 311 Heat Transfer (3-0)3
1-D steady heat conduction, thermal resistances, extended surfaces. 2-D steady heat conduction, shape factor, finite difference methods. Transient conduction, lumped capacitance method, 1-D transient conduction, product solutions. Boundary layers, laminar and turbulent flow, convective transfer boundary layer equations, dimensionless parameters, Reynolds analogy. External flow, empirical correlations. Internal flow correlations. Free convection.
Prerequisite: ME 203 or consent of the department.

ME 312 Thermal Engineering (3-0)3
Boiling correlations, laminar and turbulent film condensation. Heat exchangers, LMTD and e-NTU methods. Physics of radiation, Kirchhoff's law, spectral radiative properties. Solar radiation. View factors, blackbody radiation exchange, radiation circuits. Diffusion mass transfer, mass diffusion without chemical reaction, convective heat-mass transfer analogy.
Prerequisite: ME 311.

ME 351 Thermodynamics of Heat Power (3-0)3
Conservation of energy. Conservation of mass. Work and heat. First law of thermodynamics. Properties and processes of ideal gases. Second law of thermodynamics. Compressors, internal combustion engines. Properties of steam. Heat exchangers. Steam power plants, nuclear energy power plants. Pumps and fans. Refrigeration.
(Offered to non-ME students only).

ME 400 Summer Practice II NC
Students are required to do a minimum of four weeks (twenty working days) summer practice in a suitable factory, a power station, or an engineering design and consultancy office. They are expected to get acquainted with a real business environment by studying various managerial and engineering practices through active participation. A report is to be submitted to reflect the students' contributions.
Prerequisite: ME 300 or consent of the department.

ME 401 Internal Combustion Engines (3-0)3
Thermodynamic cycle analysis of gas exchange, compression, expansion and combustion processes with dissociation. Mechanism of combustion. Fuel and additive characteristics. Real cycles. Performance characteristics. Brief analysis of the fuel metering and ignition systems, exhaust emissions and control systems, heat transfer, friction and lubrication systems.
Prerequisite: ME 204 or consent of the department.

ME 402 Fluid Machinery (3-0)3
Fundamentals of compressible fluid flow in inertial and rotating coordinate systems. Energy exchange between fluid and rotor, loss mechanisms. 3D, 2D and 1D representation of flow in turbomachinery. Pitch-line design principles. Three dimensional flow and radial equilibrium. Internal aerodynamics of blades and axial flow cascades. Preliminary design principles for axial and radial flow compressors and turbines. Loss and deviation correlations.
Prerequisite: ME 306 or consent of the department.

ME 403 Heating, Ventilating, Air Conditioning and Refrigeration (3-0)3
Psychrometrics and elementary psychrometric processes. Simultaneous heat and mass transfer in external flows. Direct contact transfer devices. Heating and cooling coils-compact heat exchangers. Thermal comfort. Warm water heating systems. Cooling load calculations. Vapor compression refrigeration cycles.
Prerequisite: ME 312 or consent of the department.

ME 404 Thin Walled Structures (3-0)3
Stretching, bending and torsion of thin walled beams, normal stresses and shear flows in open, single cell and multicell section, shear center, Vlasov theory and axial effects, warping torque and bimoment loadings, thin plates, membrane shells, stability of thin walled members.

ME 405 Energy Conversion Systems (3-0)3
Energy demand and available resources in the world and in Turkey. Renewable sources: wind, wave, tide, geothermal, biogas and solar energy. Fossil fuels, combustion and combustion equipment. Steam generators. Atomic structure, nuclear reactions; decay, fusion and fission. Reactors. Environmental effects.
Prerequisites: ME 204 and ME 312 or consent of the department.

ME 407 Mechanical Engineering Design (2-2)3
The design process and morphology. Problem solving and decision making. Engineering ethics. Modeling and simulation. Use of computers in engineering design and CAD. Project engineering, planning and management. Design optimization. Economic decision making and cost evaluation. Aspects of quality. Failure analysis and reliability. Human and ecological factors in design. Case studies. A term project is assigned.
Prerequisite: Consent of the department.

ME 408 Hoisting and Conveying Machinery (3-0)3
Introduction to material handling. Bulk and unit load concepts. Cranes: overhead traveling cranes; FEM rules, calculation methods for bridge girders and carriages, drive and hoist mechanisms and related equipment; jib cranes; gantry cranes. Feeders and conveyors, chain conveyors, roller conveyor, pneumatic conveyors, vibrating conveyors, screw conveyor.
Prerequisite: ME 308 or consent of the department.

ME 410 Mechanical Engineering Systems Laboratory (2-2)3
The need for experiments. Experimental procedure. Professional safety. Generalized measurement system. Report writing. Error treatment. Uncertainty. Frequency distribution. Expected value, standard deviation. Presentation of experimental results. Plotting data. Curve fitting, linear regression. Dimensional analysis. Laboratory experiments.
Prerequisite: Consent of the department.

ME 411 Gas Dynamics (3-0)3
Fundamentals of fluid mechanics. Fundamentals of thermodynamics. Introduction to compressible flow. Isentropic flow. Normal shock waves. Frictional flow in constant area ducts. Flow in constant area ducts with friction. Steady and two-dimensional supersonic flows.
Prerequisite: ME 306 or consent of the department.

ME 413 Introduction to Finite Element Analysis (3-0)3
Review of basic laws of continuum. Variational and weighted residual methods. Element type. Interpolation function. Boundary conditions. Transformation and assembly of element matrices. Solution methods and accuracy. Examples from solid mechanics, heat transfer and fluid mechanics.
Prerequisite: ME 310 or consent of the department.

ME 414 System Dynamics (3-0)3
Introduction and basic definitions. Modeling of physical system components. Modeling of physical systems. Linear graphs of one-port and two-port elements. State models of dynamics systems. Selection of state variables via system graph. Transfer functions and system response. Time response of first and second order systems. Higher order systems. System identification in time and frequency domain. Model reduction.
Prerequisite: ME 304 or consent of the department.

ME 415 Utilization of Geothermal Energy (3-0)3
Thermodynamic aspects of geothermal fluids. Geothermal fluid collection and distribution. Well head equipment and piping. Geothermal electric power plants. Geothermal district heating systems. Scaling, corrosion and environmental pollution problems. Economics of geothermal energy utilization.
Prerequisites: ME 204 and ME 312 or consent of the department.

ME 416 Tool Design (3-0)3
Introduction. Tools used in manufacturing. Jigs and fixture design. Die design for sheet metal work. Die design for forming and extrusion. Die design for injection molding. Computer aided die design applications. Techniques used in tool manufacturing. Tool economy.
Prerequisites: ME 303 and ME 307 or consent of the department.

ME 418 Dynamics of Machinery (3-0)3
Kinematic influence coefficients. Equation of motion and dynamic response of single degree-of-freedom machines: analytical and numerical solution methods. Shaking forces and moments. Balancing of a four-bar linkage. Dynamically equivalent mass systems. Analysis of unbalance in multi-cylinder engines. Kinetostatics: effects of dry friction, power flow in simple and planetary gear trains. Jump phenomenon in rigid cam-follower systems.
Prerequisite: ME 302 or consent of the department.

ME 420 Refrigeration Engineering (3-0)3
Application areas. Cooling load calculations. Vapor compression refrigeration cycle. System components: compressors, evaporators, condensers, expansion devices, piping, auxiliary and control devices. System balance. Alternative refrigeration systems such as thermoelectric, air cycle, steam jet and absorption refrigeration.
Prerequisites: ME 204 and ME 312 or consent of the department.

ME 421 Steam Generator and Heat Exchanger Design (3-0)3
Classification of steam generators. Water tube and fire tube boilers. Fuels and combustion. Thermal analysis of furnaces, superheater, economizer, air-preheater. Cooling towers. Description and calculation of different types of heat exchangers, condenser types, shell-and-tube, mixing-type, compact heat exchangers. Thermal stress. Problems of heat exchangers. Water purification.
Prerequisite: ME 312 or consent of the department.

ME 422 Heating, Ventilating, Air Conditioning and Refrigeration System Design (3-0)3
District heating systems-steam and hot water. Psychrometric analysis of summer air conditioning systems. Air cleaning and filtering. Analysis and design of a year-round air conditioning unit. Ducting and air distribution. Refrigeration equipment in HVAC & R systems. Control equipment and systems in HVAC & R applications.
Prerequisite: ME 403 or consent of the department.

ME 423 Gas Turbines and Jet Propulsion (3-0)3
Introduction to gas turbines. Gas turbine cycles for shaft power and propulsion. Centrifugal and axial compressors and turbines; blade design. Combustion systems. Prediction of gas turbine performance. Laboratory experiments.
Prerequisites: ME 204 and ME 306 or consent of the department.

ME 424 Steam Power Plant Engineering (3-0)3
Fossil fuels, boilers and boiler components, boiler maintenance. Steam turbines and turbine components. Steam cycles. Modern steam and gas turbine combination cycles. Economics and optimization problems and control of power equipment.
Prerequisites: ME 204 and ME 421 or consent of the department.

ME 426 Internal Combustion Engine Design (3-0)3
Design of various types of internal combustion engines as individual projects. Thermodynamic cycle analysis, followed by design of engine components. All design calculations done on a computer environment. Preparation of an independent written project and a stand alone computer program covering the thermodynamic and component design sections of the project by each student.
Prerequisite: ME 401 or consent of the department.

ME 427 Introduction to Nuclear Engineering (3-0)3
Radioactive decay, nuclear reactions, binding energy. Neutron interactions, cross sections, fission. Nuclear reactors, fuels, breeding. Neutron diffusion and moderation, Fick's law, diffusion equation and solutions. Nuclear reactor theory, one-group reactor equation. One-group critical equation. Thermal reactors, four-factor formula, criticality calculations. Reflected reactors. Heterogeneous reactors.
Prerequisite: ME 210 or consent of the department.

ME 428 Nuclear Reactor Engineering (3-0)3

Fundamentals of nuclear reactors and nuclear power plants. Transient behavior of nuclear reactors. Reactivity. Reactor poisoning. Fission to thermal power conversion. Temperature distribution in the reactor core, hot-spot factors; coolant-channel orificing, radiation and thermal shielding. Technological aspects of reactors.

Prerequisites: ME 312 and ME 427 or consent of the department.

ME 429 Mechanical Vibrations (3-0)3

Coulomb and structural damping. Response of single degree-of-freedom systems to periodic and nonperiodic excitation. Vibration measuring devices. Vibration criteria. Diagnostics. Lagrange equations. Multi degree-of-freedom systems. Coordinate transformation and normal coordinates. Eigenvalue problem, modal vectors and orthogonality. Modal analysis. Response to harmonic excitation. Continuous systems.

Prerequisite: ME 302 or consent of the department.

ME 430 Radioisotope Applications in Industry (3-0)3

Radioactive decay. Radiation interactions. Radiation detection systems. Radiation safety. Radiotracer techniques and applications: leak detection, flow measurements, neutron activation analysis, wear measurements, process characteristics. Radiogauging techniques; alpha, beta, X and gamma, neutron gauges for thickness, density, level measurements. X-ray fluorescence analysis. Industrial radiography. Laboratory experiments.

ME 431 Kinematic Synthesis of Mechanisms (3-0)3

Introduction to synthesis, graphical and analytical methods in dimensional synthesis. Two, three and four positions of a plane. Correlation of crank angles. Classical transmission angle problem. Optimization for the transmission angle. Chebyshev theorem. Current topics in mechanism synthesis.

Prerequisite: ME 301 or consent of the department.

ME 432 Acoustics and Noise Control Engineering (3-0)3

Wave motion, wave equation and its solutions. Acoustic plane waves, spherical waves, energy relations. Sound transmission and transmission loss. Mechanism of hearing, sound perception. Noise limits and legislation. Room acoustics. Reverberation. Sabine's equation. Wave theory. Noise control at the source in the path and at the receiver. Design principles to limit noise.

Prerequisites: ME 302 and ME 305 or consent of the department.

ME 433 Engineering Metrology and Quality Control (3-0)3

Analysis of errors. Calibration. Linear, angular measurement. Geometric tolerances and their measurement. Measurement of surface roughness. Measurements of threads and gears. Testing of machine tools. Gage design. Quality assurance systems: ISO 9000 series of standards. Acceptance sampling. Design of sampling plans and control charts. Process capability analysis.

Prerequisites: ME 303 and ME 307 or consent of the department.

ME 434 Advanced Strength of Materials (3-0)3

Fundamental concepts and elementary elasticity. Review of failure theories. Nonsymmetrical bending of beams. Torsion of noncircular long prisms. Elasticity stability and buckling of columns. Selected topics among energy methods, limit analysis, beam-columns, thermal and residual stresses.

Prerequisite: ME 206 or consent of the department.

ME 435 Steam Turbine Design (3-0)3

Types and classification of steam turbines. Typical pressure and velocity diagrams for various turbine types. Nozzles and blades. Elementary theory of turbine staging. Internal losses in steam turbines, definition of turbine efficiencies, reheat factor, condition line. Design principles and calculations for multistage turbines. Variable load operation, governing.

Prerequisites: ME 204 and ME 306 or consent of the department.

ME 437 Pipeline Engineering (3-0)3

Flow in pipelines. Liquid and gas pipelines. Pipeline components: Linepipe, pumps & compressors, valves, regulators. Pumping station hydraulics. Design of transmission and distribution pipelines. Economic, strategic, constructive and operational aspects of design. Constructional practices for pipelines. Operation and control of pipelines. Pipeline transients. Energy transportation, solid transportation, two phase flow pipelines.

Prerequisite: ME 306 or consent of the department.

ME 438 Theory of Combustion (3-0)3

Scope of combustion. Combustion thermodynamics. Basic transport phenomena. Chemical kinetics; reaction rate. Explosions in gases. Laminar and turbulent flames in premixed combustible gases. Structure of detonation. Diffusion flames; liquid droplet combustion. Theory of thermal ignition. Combustion of coal; burning rate of ash forming coal, fluidized bed combustion. Pollutant formation. Propellants and rocket propulsion.

Prerequisite: ME 204 or consent of the department.

ME 440 Numerically Controlled Machine Tools (3-0)3
Introduction to digital systems. Axis and motion nomenclature. Tooling and general considerations for programming. Part programming. Numerical control structure: control unit, machine interface, position and motion control. Interpolators. Computer Numerical Control. Measurement techniques. Drive systems and control loops. Adaptive control of CNC machine tools.
Prerequisite: ME 202 or consent of the department.

ME 442 Design of Control Systems (3-0)3
Introduction and review of basic concepts in frequency response and root locus. Static error coefficients as regard to log-magnitude diagrams. Polar plots and Nyquist diagram. Nyquist stability criterion. Relative stability analysis. Closed-loop frequency response specifications. Constant M and N circles and Nichols charts. Design and compensation techniques.
Prerequisite: ME 304 or consent of the department.

ME 443 Engineering Economy and Production Management (3-0)3
Introduction and present economy studies. Cost concepts. Time value of money and equivalence. Comparison of investment alternatives. Replacement analysis. Depreciation and after-tax analysis. Sensitivity analysis. Evaluation of public projects. Linear programming. Large scale project planning.
Prerequisite: ECON 210 or consent of the department.

ME 444 Reliability in Engineering Design (3-0)3
Failure, durability, safety, reliability. Failure of components. Systems and system failures. Mathematical background related to engineering reliability. Reliability of components and assemblies. Design considerations: cost-redundancy-complexity and hazard. Maintenance. The role of testing and testing techniques. Rules, standards, codes and regulations on reliability. Case studies.
Prerequisite: ME 308 or consent of the department.

ME 445 Integrated Manufacturing Systems (3-0)3
Introduction to new concepts in manufacturing engineering. Group technology. Process planning. Integrative manufacturing planning and control. Numerical control in manufacturing. Measurement, analysis and actuation. Computer Integrated Manufacturing (CIM) systems.
Prerequisite: ME 202 or consent of the department.

ME 448 Fundamentals of Micro Electromechanical Systems and Microsystems (3-0)3
Introduction; overview of Micro Electromechanical Systems (MEMS) and microsystems. Working principles of microsystems. Engineering science and engineering mechanics topics for Microsystems design and fabrication. Application of thermofluid engineering principles in microsystems design. Scaling laws and miniaturization. Materials for MEMS and microsystems. Microsystem manufacturing processes. Microsystem design and packaging.
Prerequisite: Consent of the Department.

ME 450 Nondestructive Testing Methods (3-0)3
The role of NDT in quality assurance. Mechanical engineering applications of the most commonly used NDT methods such as ultrasonic, radiographic, liquid penetrant, magnetic particle, and eddy current. Concept of NDT suitable design.
Testing of products according to NDT standards. Special purpose testing techniques and their working principles.

ME 451 Introduction to Composite Structures (3-0)3
Composite materials and their structural properties. Composite systems. Principles of manufacturing. Structural mechanics of laminated composites. Generalized Hooke's law. Classical lamination theory. Plane stress problems. Engineering applications. Design principles. Failure criteria and damage tolerance.
Prerequisite: ME 206 or consent of the department.

ME 453 Metal Forming Technology (3-0)3
Classification of forming processes. Bulk and sheet metal forming processes. Working spaces of various processes. Product spectrum and properties, materials suitable for forming processes. Forming force and forming work computations. Design of forming tools: punches and dies, tool materials. Forming sequences. Process procedures: heat treatments, raw material preparation, lubrication, environmental issues. Principles of forming machines: hammers, mechanical presses and hydraulic presses, selection of forming machines. Economical aspects.
Prerequisite: ME 303.

ME 455 Manufacturing of Polymeric Structures (3-0)3
Structure and properties (mechanical, thermal, chemical, etc.) of polymers; types of polymers; modeling basics and flow characteristics in manufacturing with polymers; major production

methods: die forming (with design analysis for extrusion), molding (with design analysis for injection molding), secondary shaping processes; manufacturing of polymeric composites (with impregnation analysis for resin transfer molding); rapid prototyping processes.

ME 461 Mechatronic Components and Instrumentation (1-4)3
Basic applied concepts in mechatronic Components and instruments. Laboratory experiments on: identification and classification of mechatronic components, sensors and transducers, machine vision, actuating systems, information and cognitive systems, mechatronic instrumentation, evaluation of mechatronic systems.
Prerequisite: Consent of the Department.

ME 462 Mechatronic Design (2-2)3
Introduction to mechatronic concepts, mechatronic systems and components. Theory of engineering design, synergistic design, design models, systematic design. Mechatronic design project, manufacturing mechatronic products and their performance tests in design contest.
Prerequisite: Consent of the Department.

ME 465 Automotive Engineering (3-0)3
Tires: types and construction, materials, tread pattern, designation, tire manufacture. Wheels: designation, rim flange shapes, bead seat contours, rim profiles. Steering System: basic types, geometrically correct steering, Ackerman linkage, steering error, turning radius. Vehicle handling: .tire cornering force characteristics, plane motions and stability of vehicles. Suspension system: basic functions and components, geometry, front and rear wheel suspension types, roll centers, kinematics. Vehicle ride: vibrational characteristics of vehicles, body bounce, wheel hop, quarter and half car models. Chassis and body design.
Prerequisite: ME 302 and ME 304.

ME 466 Performance of Road Vehicles (3-0)3
Engine characteristics, tractive effort, resistances to motion. Maximum speed and acceleration performance. Clutch engagement. Traction and braking performance: directional stability, weight transfer, brake force distribution. Power and slip limited gradeability. Prediction of fuel consumption. Power train: determination of differential and gear ratios.
Prerequisite: ME 302 and ME 304.

ME 471 Production Plant Design (3-0)3
Fundamentals and design of production systems. Group technology, FMS and CIM. Market survey and plant location analysis. Types of plant layout. Process analysis. Quantity and quality planning and controlling for production. Machine selection. Materials handling. Storages. Safety rules and regulations. Computer applications. Evaluation of design alternatives. A complete design of a production plant as a guided term paper.
Prerequisite: ME 303 or consent of the department.

ME 472 Textile Engineering I (3-0)3
Various phases of textile industry: classification and properties of textile materials, textile processing. Cotton processing: cotton spinning; carding, drafting, combing, drawing, ring carding, ring spinning. Preparatory processes: cheese and cone winding, warping, pirn winding. Basic operations of weaving; utilization of weaving cycle, weft insertion, shedding, beat-up, let-off, take-up, control mechanisms. Shuttleless looms. Knitting.
Prerequisite: ME 301 or consent of the department.

ME 473 Textile Engineering II (3-0)3
Gear drives in ring spinning. Calculation of yarn tension during ring spinning. Primary aspects of power loom design: dynamics of picking mechanism, dynamics and stability of positive let-off motions, shedding cams, spring undermotions. Design consideration of beat-up mechanism. Rapier drive mechanism. Process of cloth formation. Control of fabric structure.
Prerequisite: ME 472 or consent of the department.

ME 476 Second Law Analysis of Engineering Systems (3-0)3
Introduction. Basic exergy concepts. Elements of plant analyses. Exergy analyses of simple processes. Examples of thermal and chemical plant analyses. Thermoeconomic applications of energy.
Prerequisite: ME 204 or consent of the department.

ME 477 Heat and Mass Transfer (3-0)3
Properties of mixtures. Conservation of species. Mass averaged velocity. Diffusion flux. Fick's law. Molecular diffusion in gases, liquids and solids. Convective mass transfer. Mass transfer in laminar flow. Mass transfer in turbulent flow. Simultaneous heat and mass transfer Introduction to thermal process engineering.
Prerequisite: ME 312 or consent of the department.

ME 478 Introduction to Solar Energy Utilization (3-0)3
Nature of solar radiation. Calculation and measurement of insolation on horizontal and tilted planes. Transmission of solar radiation through glass and plastics. Flat-plate collector theory and performance of concentrating type collectors. Heat storage, use of solar energy for power production.

Miscellaneous uses such as distillation, cooking, cooling. Laboratory practice on solar radiation.
Prerequisite: ME 312 or consent of the department.

ME 481 Industrial Fluid Power (3-0)3
Basic principles. Basic hydraulic and pneumatic systems. Hydraulic power systems: Hydraulic oils; distribution system; energy input and transfer devices; energy modulation devices; energy output and transfer devices; other components such as filters and strainers and accumulators; system design and circuit analysis. Pneumatic power systems. Case studies.
Prerequisites: ME 304 and ME 305 or consent of the department.

ME 483 Experimental Techniques in Fluid Mechanics (3-0)3
Instrumentation and measurement techniques in fluid mechanics. Pressure measurements and probe techniques. Fluid velocity and flow measurements. Hot-wire and laser-Doppler anemometry and flow visualization. Scale modeling. Design of experiments. Statistical data analysis. Data acquisition. Designing, constructing and performing fluid mechanics experiments. Experiments and term project.
Prerequisite: ME 306 or consent of the department.

ME 484 Turbulence and Its Measurement (3-0)3
Introduction to basic concepts of turbulence. Turbulence measurements and instrumentation. Pressure measurements, hot-wire, laser-Doppler and pulsed-wire anemometry. Spectral analysis. Wind tunnels. Turbulence experiments.
Prerequisite: ME 306 or consent of the department.

ME 485 Computational Fluid Dynamics Using Finite Volume Method (3-0)3
Conservation laws and boundary conditions, finite volume method for diffusion problems, finite volume method for convection-diffusion problems, solution algorithms for pressure-velocity coupling in steady flows, solution of discretization equations, finite volume method for unsteady flows, implementation of boundary conditions.

ME 490-498 Special Topics in Mechanical Engineering (3-0)3
These course numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF MECHANICAL ENGINEERING

GRADUATE CURRICULUM

M.S. in Mechanical Engineering

ME 500 M.S. Thesis NC
ME 590 Thesis Seminar (0-2)NC
One Mathematics elective course*
4 elective courses with ME 5XX code (except ME 521)

2 elective courses**
Total minimum credit: 21
Number of courses with credit (min): 7

* ME 521, ES 501, AEE 501, MATH 583, MATH 587 or PHYS 503
** With 5XX or 4XX codes from ME or other departments (except the ones mentioned in *)

Ph.D. in Mechanical Engineering

If admitted by M.S. degree:

ME 600 Ph.D. Thesis NC
4 elective courses with ME 5XX code (except ME 521 and ME 510)

3 graduate elective courses

Total minimum credit: 21
Number of courses with credit (min): 7

If admitted by B.S. degree:

ME 600 Ph.D. Thesis NC
ME 590 Thesis Seminar (0-2) NC
One Mathematics elective course*
7 elective courses with ME 5XX code (except ME 521 and ME 510)

4 graduate elective courses
2 elective courses**

Total minimum credit: 42
Number of courses with credit (min): 14
* ME 521, ES 501, AEE 501, MATH 583, MATH 587 or PHYS 503
** With 5XX or 4XX codes from ME or other departments (except the ones mentioned in *)

GRADUATE COURSES

ME 500 M.S. Thesis
ME 501 Numerical Methods in ME I (3-0)3
ME 502 Advanced Dynamics (3-0)3
ME 503 Advanced Gas Dynamics (3-0)3
ME 504 Advanced Heat Transfer I (3-0)3
ME 505 Advanced Heat Transfer II (3-0)3
ME 506 Dynamics of Nonlinear Systems (3-0)3
ME 507 Applied Optimal Control (3-0)3
ME 508 Thermal Radiation (3-0)3
ME 509 Boiling Heat Transfer and Two-Phase Flow (3-0)3
ME 510 Numerical Methods in ME II (3-0)3
ME 511 Modern Control (3-0)3
ME 512 Aerothermochemistry of Rocket Propulsion Systems (3-0)3
ME 513 Vehicle Dynamics (3-0)3
ME 514 Advanced Solar Energy Utilization (3-0)3
ME 515 Application of Electrical Analogy to Heat Transfer Problems (3-0)3
ME 516 Fluid Power Control (3-0)3
ME 517 Advanced Fluid Mechanics (3-0)3
ME 518 Boundary Layer Theory (3-0)3
ME 519 Kinematic Analysis of Mechanisms (3-0)3
ME 520 Analysis and Measurement Techniques for Random Vibrations and Noise (3-0)3
ME 521 Analytical Methods in Engineering I (3-0)3
ME 522 Principles of Robotics (3-0)3

ME	523	Impact Mechanics	(3-0)3
ME	524	Industrial Air Conditioning and Refrigeration Design	(3-0)3
ME	525	Analytical Methods in Spatial Mechanisms	(3-0)3
ME	526	Vibration of Continuous Systems with Computational Methods	(3-0)3
ME	527	Advanced Internal Combustion Engine Design	(3-0)3
ME	528	Flexible Multibody Dynamics	(3-0)3
ME	529	Advanced Internal Combustion Engines	(3-0)3
ME	530	Introduction to Fluidized Bed Combustion	(3-0)3
ME	531	Machine Tool Design	(3-0)3
ME	532	Advanced Machinery Vibrations	(3-0)3
ME	533	Computer-Aided Design (CAD)	(3-0)3
ME	534	Computer Control of Machines	(3-0)3
ME	535	Metal Cutting	(3-0)3
ME	536	Design of Intelligent Machines	(3-0)3
ME	537	Advanced Engineering Thermodynamics I	(3-0)3
ME	538	Advanced Engineering Thermodynamics II	(3-0)3
ME	539	Hydrodynamic Instability, Vortex Dynamics and Turbulence	(3-0)3
ME	540	Analytical Methods in Engineering II	(3-0)3
ME	541	Plasticity and Computer Aided Metal Forming	(3-0)3
ME	543	Theory of Elasticity	(3-0)3
ME	544	Beams, Plates and Shells	(3-0)3
ME	545	Advanced Thermodynamics	(3-0)3
ME	546	Diffusion Problems in Thermal-Fluid Sciences	(3-0)3
ME	547	Introduction to Continuum Mechanics	(3-0)3
ME	549	Experimental Stress Analysis I	(3-0)3
ME	550	Experimental Stress Analysis II	(3-0)3
ME	551	Design of High-Precision CNC Machinery	(3-0)3
ME	552	Micro-and Nanoscale Heat Transfer	(3-0)3
ME	553	Technical and Economical Aspect of Nuclear Power Plants	(3-0)3
ME	560	Tribology	(3-0)3
ME	570	Advanced Topics in Radiative Transfer	(3-0)3
ME	575	Non-Traditional Production Processes	(3-0)3
ME	581	Finite Element Analysis in Solid Mechanics	(3-0)3
ME	582	Finite Element Analysis in Thermofluids	(3-0)3
ME	583	Engineering Fracture Mechanics	(3-0)3
ME	584	Advanced Computational Fluid Dynamics	(3-0)3
ME	586	Variational Principles in Elasticity	(3-0)3
ME	587	Perturbation Methods in Engineering	(3-0)3
ME	588	Impulsive Loading of Solids	(3-0)3
ME	590	Thesis Seminar	(0-2)NC
ME	600	Ph.D. Thesis	NC
ME	7XX	Special Topics in Mechanical Engineering	(3-0)3
ME	8XX	Special Studies	(4-2)NC
ME	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

ME 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between student and a faculty member. Students register to this course in all semesters. (F&S)*

ME 501 Numerical Methods in ME I (3-0)3
Sources of error in numerical analysis. Interpolating polynomials. Difference tables. Lagrange and Chebyshev polynomials. Approximations by rational functions. Cubic splines. Least squares. Numerical differentiation and integration. Roots of equations. Systems of linear and non-linear equations. Eigenvalues and eigenvectors. Power and Jacobi methods. Quadratic forms. (R)

ME 502 Advanced Dynamics (3-0)3
Three dimensional kinematics: Coordinate systems and transformation. Spatial rotations. Euler angles.

Relative velocity and acceleration relationships. Basics of Newtonian mechanics. Inertia tensor. Rigid body dynamics. Gyroscopic effects. Analytical mechanics: Hamilton's principle. Generalized coordinates and forces. Lagrange's equations. Holonomic and nonholonomic constraints. Lagrange multipliers and Lagrange's equations with constraints. Hamilton's equations. (F)

ME 503 Advanced Gas Dynamics (3-0)3
Review of one-dimensional gas dynamics. Wave propagation. Multi-dimensional equations of gas dynamics. Flow with small perturbations. Method of characteristics. Solution of supersonic two-dimensional and unsteady one-dimensional flows with applications. (S)

ME 504 Advanced Heat Transfer I (3-0)3
Formulation of steady, unsteady, multidimensional conduction in different geometries. Methods of solution including separation of variables, integral transformations. Approximations and numerical means. (F)

ME 505 Advanced Heat Transfer II (3-0)3
Equations of motion. Formulation of laminar, free and forced convection including integral techniques. Methods of solution: Similarity, perturbation. Turbulent convection in terms of molecular and eddy diffusivities. Prandtl and Karman's theories. Analogy between heat and momentum transfer. Reynolds, Taylor, Prandtl and Martinelli analogies.
Prerequisite: ME 504 or consent of the department. (S)

ME 506 Dynamics of Nonlinear Systems (3-0)3
Introduction to nonlinear systems. Limit cycle analysis. Piecewise linearization. Forced nonlinear systems. Approximation methods; multiple time scale, Poincare perturbation, Krylov and Bogoliubov methods. Describing function analysis. Stability of nonlinear systems; Lyapunov theory, Aizerman's and Kalman's conjectures, Lure's problem, Popov, circle and parabola criteria.
Prerequisite: ME 511 or consent of the department. (R/S)

ME 507 Applied Optimal Control (3-0)3
Parameter optimization. Performance measures. Variational approach to open loop optimal control, Pontryagin's minimum principle. Optimal feedback control, dynamic programming, linear systems with quadratic performance indices, matrix Riccati equation. Numerical solution techniques of optimal control problems.
Prerequisite: ME 511 or consent of the department. (AS)

ME 508 Thermal Radiation (3-0)3
Electromagnetic background. Definitions of fundamental concepts. Interaction of radiation with homogeneous matter. Interaction of radiation with interfaces. Blackbody radiation. Radiation from real surfaces. Radiative energy transfer between surfaces. Radiative energy transfer in enclosures. Radiation in absorbing, emitting homogeneous media. (R/S)

ME 509 Boiling Heat Transfer and Two-Phase Flow (3-0)3
Thermodynamics of phase change. Nucleation phenomena. Bubble kinetics. Hydrodynamics of boiling process. Correlations. Heat transfer characteristics of two-phase flow. Pressure drop in two-phase flow. Heat transfer coefficient in two-phase flow. Instability of two-phase flow.
Prerequisite: ME 505 or consent of the department. (R/S)

ME 510 Numerical Methods in ME II (3-0)3
Ordinary differential equations. Euler, Runge-Kutta, multi-step, predictor-corrector methods. Boundary value problems. Matrix and shooting methods. Partial differential equations. Finite difference, Crank-Nicholson, Gauss-Seidel methods. (S)

ME 511 Modern Control (3-0)3
Introduction. State space representation. Solution of the state equation. Controllability and observability Lyapunov stability. Controller design with state feedback. Observer design.
Prerequisite: ME 304 and ME 442 or consent of the department. (F)

ME 512 Aerothermochemistry of Rocket Propulsion Systems (3-0)3
Fundamentals of rocket propulsion. The ideal rocket. Rocket equation. Rocket performance parameters. Real rockets: classification of losses and efficiencies. Multi-stage rockets. Types of chemical rocket propulsion systems. Design and performance of rocket propulsion components and systems. Solid and liquid propellants. Classification of solid propellants and their ingredients. Propellant combustion mechanisms and models. Propellant burning-rate laws. Propellant grain configuration and grain design. Advanced rocket propulsion concepts.

ME 513 Vehicle Dynamics (3-0)3
Vehicle handling: Tire cornering force characteristics, vehicle handling model for plane motions; understeer, oversteer, and neutral steer; roll centers and roll axis; four-wheel steering; articulated vehicle dynamics. Vehicle ride: Passive suspensions; vehicle models for bounce, pitch, and roll; higher order models; description of road surface roughness, optimization of suspension parameters; active suspensions.
Prerequisite: ME 436 or consent of the department. (S)

ME 514 Advanced Solar Energy Utilization (3-0)3
Advanced topics including passive, active and hybrid heating techniques. Thermal storage and solar ponds. Equipment in solar systems. Solar distillation and evaporation. Solar cooling and refrigeration. Solar pumping and irrigation. High temperature applications. Photovoltaics. Utilizations of other renewable energy resources; biomass, wind energy, etc.
Prerequisite: ME 478 or consent of the department. (R/S)

ME 515 Application of Electrical Analogy to Heat Transfer Problems (3-0)3
Classification of computers. Direct-indirect electrical analogs of mechanical and thermal systems. Application of the direct electrical analogy to steady state and transient state heat transfer problems. Simulation of bodies with internal heat sources. Electrical model of heat exchangers. Solution of thermal stress problems through electrical analogy. (R/F)

ME 516 Fluid Power Control (3-0)3
Theory and design of hydraulic and pneumatic control systems and components, their applications. Pressure-flow relationships for hydraulic and pneumatic valves. Valve configurations. Valve operating forces. Closed loop systems. Control and measurement of pressure, flow speed, position, force and other quantities. Application of basic principles to component and system design.
Prerequisite: ME 481 or consent of the department. (F)

ME 517 Advanced Fluid Mechanics (3-0)3
Fundamental concepts. Mathematical preliminaries. Fundamental equations of flow. Analysis of motion. Analysis of forces, stresses. Equations of flow theorems. Incompressible potential flow. (F)

ME 518 Boundary Layer Theory (3-0)3
Outline of boundary-layer. Navier-Stokes equations. Creeping flow. Derivation of boundary layer equations for two dimensional flow. General properties of the boundary layer equations. Exact solutions of the steady-state two dimensional boundary layer equations. Boundary layer control. Thermal boundary layers in laminar flow. Laminar boundary layers in compressible flow. Fundamentals of turbulent flow. Turbulent flow through pipes and along a flat plate. Turbulent jets. (F)

ME 519 Kinematic Analysis of Mechanisms (3-0)3
Introduction to modern kinematic analysis. Analytical representation of motions. Euler-Savary equation. Curvature theory. Instantaneous invariants and higher accelerations. Cams. Three dimensional mechanisms. Intermittent mechanisms. Miscellaneous mechanisms. Computer aided kinematic design. Current applications.
Prerequisite: ME 431 or consent of the department. (R/S)

ME 520 Analysis and Measurement Techniques for Random Vibrations and Noise (3-0)3
Random processes. Stationary and ergodic processes. Correlation and spectral density functions. Response of linear, time-invariant systems to stationary and ergodic excitation. Data collection and qualification. Digital data analysis procedures. Discrete Fourier transform, and FFT algorithm. Errors in spectral analysis. Transient and time-dependent nonstationary data. Crossing analysis. (F)

ME 521 Analytical Methods in Engineering I (3-0)3
Review of ordinary differential equations: Series solutions; special functions (Bessel, Legendre, Fourier). Boundary and initial value problems (Sturm-Liouville). Laplace and Fourier transforms. Fourier integrals. Introduction to integral equations. Introduction to calculus of variations. Partial differential equations; separation of variables. Transformations. (R)

ME 522 Principles of Robotics (3-0)3
Robotics and robotic manipulators. Hartenberg-Denavit convention. Rotation matrices. Homogeneous transformations. Direct and inverse kinematics. Jacobian matrix. Velocity and acceleration analyses. Dynamic force analysis via Newton-Euler formulation. Motion equations via Lagrangian formulation. Trajectory planning. Independent joint control. Control with computed

torque method. Compliant motion control. Hybrid control with position and force feedbacks. (S)

ME 523 Impact Mechanics (3-0)3
Stereomechanical impact. Stress waves in solids. Elementary stress wave theory. Applications of elementary one dimensional stress wave theory. Momentum traps. Spalling in bars and flat plates. Fracture with stress waves in bars. Impulsive loading of frames. Penetration. Perforation of solids. (F)

ME 524 Industrial Air Conditioning and Refrigeration Design (3-0)3
Summer and winter air conditioning load calculations. Air conveying and distribution; fans, duct design, and diffusion apparatus for producing comfort in summer. All year air conditioning methods and equipment. Automatic control for air conditioning systems. Refrigeration load. Selection of all units and writing specifications for all equipment for the design work. Methods of development studies in air conditioning industries. (R)

ME 525 Analytical Methods in Spatial Mechanisms (3-0)3
Loop equations for spherical and spatial n-gons: Primary and secondary fundamental, subsidiary, half-angle laws. Dual numbers, quarternions, theory of elimination. Analytical displacement analysis of robot-manipulators via equivalent mechanisms. An introduction to symbolic manipulation. Points, lines, planes, screws. Screw algebra. Static, velocity and acceleration analysis of mechanisms and manipulators via screw algebra. (F)

ME 526 Vibration of Continuous Systems with Computational Methods (3-0)3
Generalized coordinates and Hamilton's principle. Boundary value problem. The eigenvalue problem and generalized orthogonality. Vibration of strings, bars and membranes. Variational methods in vibration of plates. Approximate methods. Classical and variational methods in conjunction with finite difference technique. Modal analysis and response of undamped continuous systems. (R/F)

ME 527 Advanced Internal Combustion Engine Design (3-0)3
Review of basic principles of engine operation. Physics and chemistry of combustion. Mechanism of pollutant formation in I.C. engines. Combustion chamber design. Design for best thermal efficiency. Design for minimum exhaust emissions.
Prerequisite: ME 426 or consent of the department.
(R/S)

ME 528 Flexible Multibody Dynamics (3-0)3
Mechanisms and robotic systems containing flexible links. Multibody kinematics using rigid body and deformation coordinates. Kane's equations. 3-D and 2-D equations of motion. Couplings between rigid body and deformation coordinates. Dynamic invariants of motion. Closed loop and prescribed motion constraints. Coordinate reduction. Changing mode shapes. Impact loading. Computer simulations. (F)

ME 529 Advanced Internal Combustion Engines (3-0)3
Thermodynamic analysis of engine processes. Thermodynamic simulation methods. Theory of two-stroke cycle operation and super-charging. Manifold tuning. Characteristics of engine performance. (R/F)

ME 530 Introduction to Fluidized Bed Combustion (3-0)3
Fundamentals of fluidization. Heat transfer in fluidized beds. Combustion in fluidized beds. Materials handling. Thermodynamic cycles with fluidized bed combustors. Design strategies for an industrial fluidized bed boiler. Recent developments in fluidized bed technology. Specific problems of fluidized bed combustor. (S)

ME 531 Machine Tool Design (3-0)3
Types of machine tools. General requirements in the design of machine tools. Geometry and performance of cutting tools. Basic theories of metal cutting. Actuators and drive systems. Slideways. Spindle and spindle bearings. Control and operating devices. Cooling systems. Work holding devices. Machine tool structures. Machine tool dynamics. (R)

ME 532 Advanced Machinery Vibrations (3-0)3
Proportionally and nonproportionally damped multidegree of freedom systems; viscously and structurally damped systems. Numerical methods; Rayleigh-Ritz method and transfer matrix methods. Rotor dynamics; whirl, critical whirl, gyroscopic effects, flexible bearings, geared shafts and branched systems. Condensation, structural coupling, structural modifications and modal synthesis. Experimental methods and modal testing; modal identification. (S)

ME 533 Computer-Aided Design (CAD) (3-0)3
CAD/CAM system hardware and software. Computer graphics basics and theory in 2-D and 3-D. Data-base fundamentals. Numerical analysis as applied to CAD. Introduction to optimization theory and applications of multidimensional optimization

algorithms to nonlinear engineering problems with constraints. Discussions on engineering problems solved using the CAD approach. (F)

ME 534 Computer Control of Machines (3-0)3

Computer organization: Binary logic, instruction and data processing. Computer interfacing: Digital-to-analog conversion, analog-to-digital conversion, interrupt interfacing. Sensors for computer control. Command generation in machine control: Use for linear and cubic polynomials and spline functions, open-loop position control of step motors. Sequential control: Boolean algebra, ladder diagrams, sequential logic design. (R)

ME 535 Metal Cutting (3-0)3

Machine tools and machining operations. Mechanics of metal cutting. Temperatures in metal cutting. Tool life and tool wear. Cutting fluids and surface roughness. Economics of metal cutting operations. Nomenclature of metal cutting. Chip control, machine tool vibration. Grinding. Manufacturing systems and automation. Design for machining. (S)

ME 536 Design of Intelligent Machines (3-0)3

Application areas of intelligent machinery. Perception of environment. Machine/ computer vision. Artificial intelligence. Expert systems for design. Programming and programming languages. Design of intelligent machines. Case studies. (F)

ME 537 Advanced Engineering Thermodynamics I (3-0)3

Elements of thermodynamics terminology. The First Law for closed systems. Work transfer. The First Law for open systems. The Second Law for closed systems. The Second Law for open systems. Lost available work. Cycles. Entropy generation and exergy destruction. Single-phase systems. Generalized exergy analysis. Air conditioning applications. Multiphase systems. Chemically reactive systems. (F)

ME 538 Advanced Engineering Thermodynamics II (3-0)3

Power generation, maximum power conditions. External and internal irreversibilities. Advanced steam-turbine power plants. Advanced gas-turbine power plants. Combined steam-turbine and gas-turbine cycles. Solar power. Extraterrestrial power plants. Refrigeration. Liquefaction. Magnetic refrigeration. Thermodynamic design: Heat exchangers. Thermal energy storage. Mass exchanger.

Prerequisite: ME 537 or consent of the department. (S)

ME 539 Hydrodynamic Instability Vortex Dynamics and Turbulence (3-0)3

General formulation of the hydrodynamic stability problems. Rayleigh and Orr-Sommerfeld equations. Vortex instability. Crow and Widnall instabilities. Vortex dynamics, vortex models and vortex interactions. Contour dynamics. Statistical theories of turbulence. Closure problem. Theories before and after Kolmogorov. Intermittency models and fractals. Recent direct numerical simulations of turbulence. Chaos. (R)

ME 540 Analytical Methods in Engineering II (3-0)3

Laplace transforms. Integral equations. Integro-differential equations. Calculus of variations. Singularity functions. Fundamentals of matrix algebra and applications in engineering. Introduction to tensor calculus. Complex functions and contour integrals. (R)

ME 541 Plasticity and Computer Aided Metal Forming (3-0)3

Invariants of the stress tensor and formulation of yield criteria. Stress-strain relationships in the plastic range. Plastic anisotropy and instability. Hot and cold rolling of strip materials. Extrusion, wire drawing and deep drawing. Introduction to Slipline Field Theory. Numerical solutions of selected problems using CAD approach. Laboratory experiments on material testing and metal forming. Term project. (S)

ME 543 Theory of Elasticity (3-0)3

Analysis of stress and strain. Constitutive equations. Plane problems of elasticity. Torsion and flexure of beams. Variational methods, theorems of minimum potential energy and complementary energy. Approximate solution by means of variational methods. Introduction to plate theory. (F)

ME 544 Beams, Plates and Shells (3-0)3

Equations of elasticity. Bernoulli-Euler beam theory. Timoshenko beam theory. Kirchoff plate theory. Mindlin plate theory. Kirchoff-Love hypothesis for shells. Reisner theory. Buckling of bems, plates and shells.

ME 545 Advanced Thermodynamics (3-0)3

Foundations of concepts and principles of thermostatics. Second law analysis of engineering systems. Constitutive equations, property relations and their applications to compressible systems, surface phenomena, elastic solid, non-reactive

mixtures. Chemical reactions, thermodynamic stability. Thermodynamics of irreversible processes. Introduction to methods and applications of statistical thermodynamics. Thermoeconomics. (R)

ME 546 Diffusion Problems in Thermal-Fluid Sciences (3-0)3
Conservation laws. Viscosity as momentum diffusivity, thermal diffusivity, time scales and dimensionless quantities. Diffusion of momentum and heat in infinite and finite media. Problems in cylindrical geometry. Vorticity and diffusion of vorticity. Diffusion in boundary layers. Combined heat and mass diffusion, Soret and Dufour effects.

ME 547 Introduction to Continuum Mechanics (3-0)3
General aspects, basic assumptions. Development of mathematical tools. Kinematics of a continuum. Stresses. General principles. Theory of constitutive equations. Basic material laws. Curvilinear coordinate systems in tensors. (R)

ME 549 Experimental Stress Analysis I (3-0)3
General principles governing the approach to the solution of problems. Fundamental concepts of stress and strain in 2-D and 3-D. Mechanical and electrical strain gages, strain rosettes. (F)

ME 550 Experimental Stress Analysis II (3-0)3
Photoelasticity: 2-D and 3-D analysis; stress freezing, scattered ray and birefringent coating techniques. Moire fringes, brittle coatings. Grid methods; analogies and the applications on static and dynamic problems.
Prerequisite: ME 549 or consent of the department. (R)

ME 551 Design of High-Precision CNC Machinery (3-0)3
Introduction, analysis/principles/techniques for designing high-precision machines, Abbe and Bryan principles (or options), geometric/thermal error budgeting, thermal effects, machine structures, design of bearing systems/guideways/spindles, measurement systems, machine metrology, electromagnetic actuators and drive systems, high-precision motion control systems, error compensation techniques, advanced interpolator design, machine testing, advanced concepts in precision engineering.

ME 552 Micro-and Nanoscale Heat Transfer (3-0)3
Concepts of heat transfer at the micro- and nanoscale. Deviation from the macroscopic theory. Energy carriers: phonons, photons, electrons. Energy quantization. Energy states in solids. Statistical thermodynamics. Transfer of energy by waves. Particle description of transport processes: Liouville and Boltzmann equations. Size effects on conduction, convection and radiation. Selected topics of current interest in nanoscale energy transport.

ME 553 Technical and Economical Aspect of Nuclear Power Plants (3-0)3
Power cycles for nuclear power plants. Review of thermodynamics of power cycle. Gas turbines for nuclear power plants. Heat removal problems and thermal stresses. Design problems of a reactor. Fuel cycles and shielding. Fuel cycle costs, plant capital investment and maintenance costs, power generation costs.
Prerequisite: ME 427 or consent of the department. (R)

ME 560 Tribology (3-0)3
Surface topography and characterization of surface roughness. Static contact between rough surfaces and contact models. Friction between loaded surface and theories of friction. Contact temperature of rubbing solids. Wear of rubbing surfaces and wear mechanisms. Hydrodynamic lubrication: Generalized Reynolds equation, Hydrostatic bearings, Squeeze film bearings design, Air Bearings, Dynamically loaded journal bearings. Thermohydrodynamic lubrication. Elastohydro-dynamic lubrication.(S)

ME 570 Advanced Topics in Radiative Transfer (3-0)3
Fundamental transfer equations of radiative transfer. Radiative equilibrium. Singular eigenfunction-expansion technique and one group transport theory. Full and half-range completeness and orthogonality theorems. Introduction to two-group transport theory. Pre-radiative heat transfer. Interaction with other models of heat transfer. Transport problems in other areas of engineering applications.
Prerequisite: ME 508 or consent of the department. (R)

ME 575 Non-Traditional Production Processes (3-0)3
Classification of non-traditional production (machining and forming) processes. Ultrasonic Machining (USM), Abrasive Jet Machining (AJM), Chemical Machining, Electro-Chemical Machining (ECM), Electric Discharge Machining (EDM), Laser Beam Machinery (LBM), Electron Beam Machinery (EBM), Plasma Arc Machining (PAM).

Explosive forming. Electro-magnetic forming. Other non-traditional production processes. (S)

ME 581 Finite Element Analysis in Solid Mechanics (3-0)3
Hybrid-mixed formulation. Beam elements, plate elements, flat-shell elements. Modeling of laminated composites. Small-strain large deflection problems, rigid-plastic large deformation problems, large elastic-plastic deformation problems. (S)

ME 582 Finite Element Analysis in Thermofluids (3-0)3
Variational techniques, method of weighted residuals, Ritz method, Galerkins technique. Review of 2-D finite elements. Lubrication problems. Heat transfer problems. Inviscid incompressible flows, inviscid compressible flows, incompressible viscous flows without inertia and incompressible viscous flows with inertia. 3-D isoparametric finite elements. 3-D unsteady Euler equations.
Prerequisite: ME 413 or consent of the department. (R)

ME 583 Engineering Fracture Mechanics (3-0)3
Basic concepts: Failure criteria, mechanisms of fracture, stress intensity factor. Energy balance and stress intensity factor approaches to fracture. Plane strain and plane stress fracture toughness of materials. Fatigue crack growth. Elastic-plastic fracture, plastic zone models, J-integral. Fail-safe and safe-life design concepts, damage tolerances. Applications to practical problems. (F)

ME 584 Advanced Computational Fluid Dynamics (3-03
Governing equations, waves, scalar conservation laws, the Reimann problem, conservation and other basic principles, the CFL condition, upwind and adaptive stencils, artificial viscosity, linear and nonlinear stability, basic numeral methods for scalar conservation laws (Lax-Friedricks method, Lax-Wendroff method, first-order upwind methods, Beam-Warming second-order upwind method), basic numerical methods for Euler equations (flux approach, flux vector splitting, reconstruction-evolution), implementation of boundary conditions, introduction to parallel computing.

ME 586 Variational Principles in Elasticity (3-0)3
Cartesian tensors. Review of fundamental equations of elasticity. Basics of calculus of variations. First variation and Euler-Lagrange equations. Virtual work and complementary virtual work principles. Minimum potential energy, complementary energy, modified complementary energy and Hellinger-Reissner principles. Other derived principles. Application to bar, beam and plane stress problems. Introduction to finite element concepts. (S)

ME 587 Perturbation Methods in Engineering (3-0)3
Asymptotic sequences and series. Integrals, Laplace's method, method of stationary phase, method of steepest descent. Duffing equations, method of renormalization, method of rescaling, method of multiple scales. Vibration problems, linear oscillator, primary and subharmonic resonance. Mathieu equation. Boundary layers in fluid flow, matched asymptotic expansions. WKB approximation. (R/F)

ME 588 Impulsive Loading of Solids (3-0)3
Introduction. Dynamic properties of materials. One-dimensional elastic-plastic stress waves in bars. Impulsive loading of beams. Static and dynamic loading of rings and frames. Dynamic response of some axi-symmetric solids.

ME 590 Thesis Seminar (0-2)NC
M.S. student gives a seminar about the thesis work to a jury including the thesis supervisor. The seminar course is taken in the fourth semester of study at the latest. Evaluation is based on the seminar performance as well as attendance of the student to other seminars in the same field of study. (F&S)

ME 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters starting from their third semester at the latest while the research program or write-up of thesis is in progress. (F&S)

ME 7XX Special Topics in Mechanical Engineering (3-0)3
Courses not listed in the University Catalogue. Contents may vary from year to year according to recent scientific and technological developments and interest of students and instructor in charge. (R)

ME 8XX Special Studies (4-2)NC
Graduate students choose and study a special topic under the guidance of a faculty member, normally his/her advisor. (F&S)

ME 9XX Advanced Studies (4-0)NC
Graduate students as a group choose and study advanced topics under the guidance of a faculty member, normally his/her advisor. (F&S)

* F: Fall, S: Spring, A: Alternative Year, R: Upon request, WE: Wide elective.

MASTER OF SCIENCE IN MECHANICAL DESIGN AND MANUFACTURING

Compulsory Courses:

One of the following mathematic courses:

MDM	501	Advanced Engineering Mathematics	(3-0)3
MDM	502	Numerical Methods for Engineers	(3-0)3

One of the following courses:

MDM	503	Elasticity	(3-0)3
MDM	504	Advanced Dynamics	(3-0)3
MDM	505	Advanced Thermodynamics	(3-0)3
MDM	506	Advanced Fluid Mechanics	(3-0)3

8 approved elective courses (24 credits)

Total Minimum Credit :30
Number of Courses with credit (min.):10

List of Elective Courses:

MDM	507	Modern Control Systems	(3-0)3
MDM	508	Internal Combustion Engines	(3-0)3
MDM	509	Vibrations of Continuous Systems	(3-0)3
MDM	510	Optimal Control	(3-0)3
MDM	511	Metrology	(3-0)3
MDM	512	Viscous Flow	(3-0)3
MDM	513	Smart Materials	(3-0)3
MDM	514	Optimum Design Methods	(3-0)3
MDM	515	Computer Integrated Manufacturing	(3-0)3
MDM	516	Fatigue and Fracture	(3-0)3
MDM	517	Finite Element Analysis in Solids	(3-0)3
MDM	518	Mechatronics	(3-0)3
MDM	519	Advanced Heat Transfer	(3-0)3
MDM	520	Computational Fluid Dynamics	(3-0)3
MDM	521	Kinematic Synthesis	(3-0)3
MDM	522	Thin Walled Structures	(3-0)3
MDM	523	Robotic Manipulators	(3-0)3
MDM	524	Combustion	(3-0)3
MDM	525	Vibration Control and Isolation	(3-0)3
MDM	526	Machine Dynamics	(3-0)3
MDM	527	Continuum Mechanics	(3-0)3
MDM	528	Compressible Fluid Flow	(3-0)3
MDM	529	Design of Autonomous Machines	(3-0)3
MDM	530	Design of Advanced Composite Structures	(3-0)3
MDM	531	Non-conventional Machining	(3-0)3
MDM	532	Plasticity and Metal Forming	(3-0)3
MDM	533	Rocket Propulsion Technology	(3-0)3
MDM	534	Finite Element Analysis in Thermofluids	(3-0)3
MDM	535	Computer Aided Design and Manufacturing	(3-0)3
MDM	536	Advanced Machinery Vibrations	(3-0)3
MDM	537	Hydraulic Systems	(3-0)3
MDM	538	Energy Methods in Applied Mechanics	(3-0)3
MDM	539	Liquid Molding of Advanced Composites	(3-0)3
MDM	540	Impact of Solids	(3-0)3
MDM	541	Dynamic Loading of Simple Structures	(3-0)3
MDM	542	High Velocity Deformation of Materials	(3-0)3
MDM	599	Term Project	NC
MDM	892	Special Studies	(0-2)NC

DESCRIPTION OF GRADUATE COURSES

MDM 501 Advanced Engineering Mathematics (3-0)3

Review of ordinary differential equations; linear differential equation of the first order; linear differential equations with constant coefficients; particular solutions by variations of parameters. Power series solutions; method of Frobenius; Legendre's equation; Fourier-Legendre Series; Bessel's equation; modified Bessel equation. Fourier methods; Fourier series; Sturm-Liouville theory; Fourier integral; Fourier transformation. Partial differential equations; heat conduction equation; separation of variables; waves and vibrations in strings; wave equation; D'Alembert's solution; longitudinal vibrations in an elastic rod; two dimensional stress systems; solution of Navier's equations by the application of Fourier transforms; Laplace equation.

MDM 502 Numerical Methods for Engineers (3-0)3

Ordinary differential equations. Euler, Runge-Kutta, multi-step, predictor-corrector methods. Boundary value problems. Matrix and shooting methods. Partial differential equations. Finite difference, Crank-Nicholson, Gauss-Seidel methods.

MDM 503 Elasticity (3-0)3

Introduction; strength of materials approach; elasticity approach. Basics of tensor algebra and transformation; index notation; vector transformation; higher-order tensors; Gauss divergence theorem. Analysis of strain; displacement; strain and rotation tensors; geometric construction of small deformation theory; strain transformation; principal strains; strain compatibility. Analysis of stress; body and surface forces; traction vector; equations of equilibrium; stress transformation; principal stresses. Constitutive relations; generalized Hooke's law; symmetry properties of the elasticity tensor; planes of elastic symmetry; Lame's constants; engineering constants of isotropic materials. Formulation of problems in elasticity; boundary conditions and fundamental problem classifications; governing equations of elasticity; displacement based formulation (Navier's equations); stress based formulation (Beltrami-Michell compatibility equations); principle of superposition. Two-dimensional elasticity; plane strain; plane stress; Airy stress function; two-dimensional problem solution; stress function formulation with polar coordinates; thermoelasticity.

MDM 504 Advanced Dynamics (3-0)3

Three dimensional kinematics: Coordinate systems and transformations. Spatial rotations. Euler angles. Relative velocity and acceleration relationships. Basics of Newtonian mechanics. Inertia tensor. Rigid body dynamics. Gyroscopic effects. Rigid body systems. Analytical mechanics: Generalized coordinates and forces. Lagrange's equations. Holonomic and nonholonomic constraints. Lagrange multipliers and Lagrange's equations with constraints.

MDM 505 Advanced Thermodynamics(3-0)3

Elements of thermodynamics terminology. The First Law for closed systems. Work transfer. The First Law for open systems. The Second Law for closed systems. The Second Law for open systems. Lost available work. Cycles. Entropy generation and exergy destruction. Single-phase systems. Generalized exergy analysis.

MDM 506 Advanced Fluid Mechanics (3-0)3

Continuum properties of fluids. System-control volume concepts; Reynolds transport theorem; integral equations of fluid flow. Gauss divergence theorem; general differential equations of fluid mechanics; vorticity and Bernoulli theorem; Euler, Navier-Stokes, Crocco, and Bernoulli equations; potential, Couette, Stokes, and geostopic flows; Helmholtz’s vorticity transport, circulation, Kelvin’s theorems; concept and samples of flow instabilities.

MDM 507 Modern Control Systems (3-0)3

Introduction: State Space Approach to Control System Analysis, State Space Representation of Dynamic Systems; Analysis of Control Systems in State Space: Mathematical Tools in State Space Analysis, Transfer Matrix, Controllability, Observability, Canonical Forms, Liapunov Stability Analysis, Liapunov Stability Analysis of Linear Time-Invariant Systems, Linear Time Varying Systems Design of Control Systems in State Space: Pole Placement, State Observers, Design of Servo Systems, Optimal Control Systems, Model Reference Control Systems, Adaptive Control Systems.

MDM 508 Internal Combustion Engines (3-0)3

Engine types and their operation. Thermodynamic analysis and simulation of the engine cycles. Physics and chemistry of combustion. Mechanism of pollutant formation in I.C. engines. Properties of the working fluids and the fuels. Performance characteristics. Analysis of the fuel metering and

ignition systems, exhaust emissions and control systems, heat transfer, friction and lubrication systems.

MDM 509 Vibrations of Continuous Systems (3-0)3
Generalized coordinates and Hamilton's principle. Boundary value problem. The eigenvalue problem and generalized orthogonality. Vibration of strings, bars and membranes. Variational methods in vibration of plates. Approximate methods. Classical and variational methods in conjunction with finite difference technique. Modal analysis and response of undamped continuous systems. (R/F)

MDM 510 Optimal Control (3-0)3
Types of optimal control (OC) problems. Dynamic programming applied to OC. Hamilton - Jacobi - Bellmann equation. Extrema of functionals. Fundamental theorem of calculus of variations. Euler's equation. Piecewise smooth extremals. Constrained minimization of functionals. Variational approach to the OC problem. State, costate equations, Hamiltonian. Matrix Riccati equation. Pontryagin's minimum principle. Numerical solution techniques for OC problems.

MDM 511 Metrology (3-0)3
Precision measurement, its relationship to geometric tolerances, critical dimensions, and calibration. Statistical process control and quality assurance using manual and automated gauges, checking fixtures, non-destructive testing, and coordinate measuring systems. Use of vision, laser, and other non-contact measuring systems.

MDM 512 Viscous Flow (3-0)3
Outline of fluid motion with friction and boundary layer concept. Derivation of the equations of motion of a compressible viscous fluid (Navier-Stokes equations). General properties of Navier-Stokes equations, exact solutions of Navier-Stokes equations, creeping flow. Derivations of boundary layer equations, general properties of the boundary layer equations, exact solutions of the steady state boundary layer equations, approximate methods for the solution of the boundary layer flows. Boundary layer control. Stability of laminar flows. Transition. Fundamentals of turbulent flow.

MDM 513 Smart Materials (3-0)3
Design of Smart Structures. Modeling Mechanics of Smart Materials. Piezoelectric materials. Fiber optics. Shape memory alloys. Electrorheological and magnetorheological fluids. Magnetorheological elastomers. Carbon nanotubes. Control of structures. Active and semi-active vibration control. Structural health monitoring. Morphing of structures.

MDM 514 Optimum Design Methods (3-0)3
Optimum design problem formulation. Optimum design concepts. Linear programming. Unconstrained optimization. Constrained optimization. Discrete variable optimization. Genetic algorithms. Multiobjective optimization.

MDM 515 Computer Integrated Manufacturing (3-0)3
The production stages of parts in manufacturing (manufacturing cycle of a part). Use of microprocessor technology in manufacturing, microprocesssor-production process connection/ interface. Computer aided process planning (CAPP), manual and computer integrated process planning, variant and generative proses planning approaches. Group Technology (GT) in manufacturing. Flexible manufacturing syatems and cells. Information flow in manufacturing. Computer aided planning for machine requirement and machines layout in manufacturing companies.

MDM 516 Fatigue and Fracture (3-0)3
Introduction; conventional failure criteria; characteristic brittle failures; Griffith's work; fracture mechanics. Linear Elastic Stress Fields in Cracked Bodies; crack deformation modes and basic concepts; Westergaard method; crack tip stress and displacement fields; stress intensity factor solutions; three dimensional configurations. Small Scale Yielding; crack tip plastic zone; Irwin's model. Energy of Fracture; energy balance during crack growth; Griffith theory; energy release rate and stress intensity factor; crack stability. Critical Stress Intensity Factor Fracture Criterion; fracture criterion; fracture toughness; micromechanics of fracture; experimental determination of KIc; R-curves. Fatigue crack growth; constant amplitude loading; fatigue life prediction using stress intensity factor; variable amplitude loading; retardation; Wheeler's model; fatigue design philosophies; damage tolerance methodology; fatigue crack behavior in the presence of residual stresses; environmentally enhanced fatigue crack propagation (corrosion fatigue). Computational fracture mechanics.

MDM 517 Finite Element Analysis in Solids (3-0)3
Discretization and assembly concepts. Variational formulation. One, two and three dimensional finite elements. Multi-constraints. Dynamic problems. Stability problems. Thermal effects. Nonlinear problems.

MDM 518 Mechatronics (3-0)3
Basic applied concepts in mechatronic components and instruments. System integration via low- and high-level programming. Introduction of embedded and object oriented programming. Laboratory experiments on: identification and classification of mechatronic components, sensors and transducers, machine vision, actuating systems and mechatronic instrumentation.

MDM 519 Advanced Heat Transfer (3-0)3
Formulation of steady, unsteady, multidimensional conduction Methods of solution including separation of variables, integral transformations. Approximations and numerical means. Equations of motion. Formulation of laminar, free and forced convection including integral techniques. Methods of solution: Similarity, perturbation. Turbulent convection in terms of molecular and eddy diffusivities. Prandtl and Karman's theories. Analogy between heat and momentum transfer. Reynolds, Taylor, Prandtl and Martinelli analogies.

MDM 520 Computational Fluid Dynamics (3-0)3
Conservation laws and boundary conditions, finite volume method for diffusion problems, finite volume method for convection-diffusion problems, solution algorithms for pressure-velocity coupling in steady flows, solution of discretization equations, implementation of SIMPLE algorithm for steady flows, implementation of SIMPLE algorithm for unsteady flows.

MDM 521 Kinematic Synthesis (3-0)3
Introduction to synthesis, graphical and analytical methods in dimensional synthesis. Two, three and four positions of a plane. Correlation of crank angles. Classical transmission angle problem. Optimization for the transmission angle. Chebyshev theorem. Current topics in mechanism synthesis.

MDM 522 Thin Walled Structures (3-0)3
Stretching, bending and torsion of open, single-cell and multi-cell thin walled beams, kinematics of deformation, Vlasov beam theory, warping torque and bimoment, flexural-torsional buckling, lateral buckling, beam-columns.

MDM 523 Robotic Manipulators (3-0)3
Basics of spatial kinematics. Rotation matrices. Homogeneous transformation matrices. Hartenberg-Denavit convention. Direct and inverse kinematics. Velocity and acceleration analyses in the direct and inverse senses. Jacobian matrix. Static force analysis via virtual work method. Dynamic force analysis via Newton-Euler formulation. Trajectory planning. Basic control methods.

MDM 524 Combustion (3-0)3
Scope of combustion. Combustion thermodynamics. Basic transport phenomena. Chemical kinetics; reaction rate. Explosions in gases. Laminar and turbulent flames in premixed combustible gases. Structure of detonation. Diffusion flames; liquid droplet combustion. Theory of thermal ignition. Combustion of coal; burning rate of ash forming coal, fluidized bed combustion. Pollutant formation. Propellants and rocket propulsion.

MDM 525 Vibration Control and Isolation (3-0)3
Vibration control. Viscoelastic damping. Design of surface damping treatments. Design of dynamic vibration absorbers. Air-film damping. Piezoelectric shunt circuits. Impact dampers. Friction damping. Vibration isolation. Design of vibration isolators. Active and Semi-active vibration control and isolation. Design for structural dynamics behavior.

MDM 526 Machine Dynamics (3-0)3
Kinematic influence coefficients. Equation of motion and dynamic response of single degree-of-freedom machines: analytical and numerical solution methods. Shaking forces and moments. Balancing of a four-bar linkage. Dynamically equivalent mass systems. Analysis of unbalance in multi-cylinder engines. Kinetostatics: effects of dry friction, power flow in simple and planetary gear trains. Jump phenomenon in rigid cam-follower systems.

MDM 527 Continuum Mechanics (3-0)3
General aspects, basic assumptions about continuum idealization of real materials. Development of mathematical tools and tensors. Kinematics of continuum. Stresses. General principles including conservation of mass, linear and angular momenta, energy and second law of thermodynamics. Theory of constitutive equations. Basic material laws.

MDM 528 Compressible Fluid Flow (3-0)3
Isentropic flow, normal shock waves, flow in constant area ducts with friction, flow in ducts with heating and cooling, steady and two-dimensional supersonic flows, wave propagation, multi-dimensional equations of gas dynamics, flow with small perturbations, method of characteristics, solution of unsteady one-dimensional flows.

MDM 529 Design of Autonomous Machines (3-0)3
Introduction to the autonomy concept. Discuss structure and locomotion methods of autonomous machines focusing on autonomous vehicles. A semester project involves design of a vehicle by the use of which decision making and planning methods

used in autonomous machine applications are practiced.

MDM 530 Design of Advanced Composite Structures (3-0)3
Introduction to advanced composite materials: properties of constituent materials and fiber reinforced materials. Mechanics of laminated composite materials: 3D micromechanical models, macro-mechanical analysis tools. Hygro-thermal analysis of laminated composites. Design of laminates for in-plane and out-of-plane loads. Elastic tailoring. Experimental characterization of composite laminates. Failure of laminated composites. Optimum design of laminates for flexural and combined loading conditions. Use of stat-of-art technologies in the design of composite laminates.

MDM 531 Non-conventional Machining (3-0)3
A brief overview and evaluation of nontraditional manufacturing processes and their comparison to traditional manufacturing processes. Classification of nontraditional machining processes according to energy used in material removal and overview of process principles, equipment, machining parameters, process capabilities and applications. Mechanical energy: Ultrasonic machining; abrasive jet machining, water jet machining. Electrochemical energy: Electrochemical machining, electrochemical grinding, electrochemical honing. Chemical energy: Chemical machining. Thermal energy: Electric discharge machining (EDM) wire EDM, laser beam machining, plasma machining. Overall comparisons of nontraditional machining processes.

MDM 532 Plasticity and Metal Forming (3-0)3
Stress. Strain. Yield Criteria. Stress-Strain Relationships. Work Hardening. Plastic Anisotropy. Plastic Instability. Metal Forming Processes.

MDM 533 Rocket Propulsion Technology (3-0)3
Fundamentals of rocket propulsion. The ideal rocket. Rocket equation. Rocket performance parameters. Real rockets: classification of losses and efficiencies. Multi-stage rockets. Types of chemical rocket propulsion systems. Design and performance of rocket propulsion components and systems. Solid and liquid propellants. Classification of solid propellants and their ingredients. Propellant combustion mechanisms and models. Propellant burning-rate laws. Propellant grain configuration and grain design. Advanced rocket propulsion concepts.

MDM 534 Finite Element Analysis in Thermofluids (3-0)3
Variational techniques, method of weighted residuals, Ritz method, Galerkins technique. Review of two-dimensional finite elements. Inviscid incompressible flows, inviscid compressible flows, incompressible viscous flows without inertia and incompressible viscous flows with inertia. Three-dimensional isoparametric finite elements. Three-dimensional unsteady Euler equations.

MDM 535 Computer Aided Design and Manufacturing (3-0)3
In this course overview CAE systems, orthographic and perspective display transformations, parametric representation of curves and surfaces, elementary differential geometry; interactive graphics; bicubic surface paths, image generation. This course presents advanced mechanical design techniques using a CAD/CAM software. It explains advanced methods and techniques about assembly management and mechanism design, kinematic and dynamic analyses, structural analyses (FEA), and CNC manufacturing. The material is presented based on extensive hands-on examples. The CAM sections include practical examples with 3-4 axes Vertical Machining Centers and a Turning CNC center. Rapid Prototyping Methods, Automation in Manufacturing, Automatic Programming, Robots, CIM, Group Technology, Reverse Engineering

MDM 536 Advanced Machinery Vibrations (3-0)3
Proportionally and nonproportionally damped multidegree of freedom systems; viscously and structurally damped systems. Numerical methods; Rayleigh-Ritz method and transfer matrix methods. Rotor dynamics; whirl, critical whirl, gyroscopic effects, flexible bearings, geared shafts and branched systems. Condensation, structural coupling, structural modifications and modal synthesis. Experimental methods and modal testing; modal identification.

MDM 537 Hydraulic Systems (3-0)3
Introduction, Review of Fluid Mechanics, Fundamental Relations for the Flow Through an Arbitrary Turbo machine, Energy Relations Through an Arbitrary Turbomachine, Momentum Relations Through an Arbitrary Turbomachine, Theoretical Operational Characteristics of Turbomachinery, Dimensional Analysis and Similitude, Actual Operational Characteristics and Pump System Combinations, Hydraulic Pumps, Hydraulic Turbines, Centrifugal Compressors and Fans, Axial Compressors and Fans, Design Considerations, Positive Displacement Fluid Machinery.

MDM 538 Energy Methods in Applied Mechanics (3-0)3
Tensors. Strain. Stress. Constitutive Equations. Equations of Bars, Beams, Torsion and Plane Elasticity. Calculus of Variations. Virtual Work and Energy Principles. Stationary Variational Principles. Hamilton's Principle. Theory of Plates.

MDM 539 Liquid Molding of Advanced Composites (3-0)3
Processing methods for polymer-matrix, continuous fiber-reinforced composites; Transport phenomena for liquid molding; Single-phase flow through porous media; Constitutive laws and their characterization; Darcy law and permeability; Reinforcement types and characterization; Model simplifications; Manufacturing design, tooling, measurement and control in liquid molding techniques; Composite microstructure.

MDM 540 Impact of Solids (3-0)3
Stereomechanical impact: Stress waves in solids. Elementary elastic stress wave theory. Applications of elementary one dimensional elastic stress wave theory. Momentum traps. Spalling in bars and flat plates. Fractures with stress waves in bars.

MDM 541 Dynamic Loading of Simple Structures (3-0)3
Introduction. Dynamic properties of materials. One-dimensional elastic-plastic stress waves in bars. Impulsive loading of beams. Static and dynamic loading of rings and frames. Dynamic response of some axi-symmetric solids.

MDM 542 High Velocity Deformation of Materials (3-0)3
Introduction. Shock wave in air. Hypervelocity accelerators. Gurney model. High speed testing methods. Penetration and perforation. Hypervelocity impact. Experimentation and Instrumentation. Numerical simulations. Applications of high speed deformations of solids.

MDM 599 Term Project NC
A term project on mechanical engineering topics carried out under the supervision of a project advisor. Project topics are announced by the department at the beginning of each semester. Students are required to submit a written report at the end of a semester.

MDM 892 Special Studies (0-2)NC
Students choose and study a topic under the guidance of a faculty member.

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

PROFESSORS

AKDENİZ, Vedat: B.S., M.S., METU; Ph.D., Open University.
AYDINOL, Mehmet Kadri: B.S., M.S., Ph.D., METU.
BOR, Şakir: B.S., M.S., Ph.D., METU.
GÜR, Cemil Hakan ***(Department Chair)***: B.S., M.S., Ph.D., METU.
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KALKANLI, Ali: B.S., M.S., METU; Ph.D., Open University.
KARAKAYA, İshak: B.S., METU; M.Eng., Ph.D., McGill University.
KAYNAK, Cevdet: B.S., M.S., Ph.D., METU.
MEHRABOV, Amdulla: B.S.,M.S., Azerbaijan State University; Ph.D., Lomonosov Moscow State University.
ÖGEL, Bilgehan: B.S., M.S., Ph.D., METU.
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ÖZTÜRK, Abdullah *:* B.S., İTÜ.; M.S., Ph.D., University of Missouri-Rolla.
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ASSOCIATE PROFESSORS

DERİCİOĞLU, Arcan Fehmi ***(Vice Chair)***: B.S., M.S., METU; Ph.D., Tokyo University.
DURUCAN, Caner ***(Vice Chair)***: B.S., METU; M.S., Ph.D., Pennsylvania State University.
ÜNALAN, Hüsnü Emrah: B.S., METU, M.S., Ph.D. Rutgers University.

ASSISTANT PROFESSORS

EFE, Mert: B.S., METU; M.S., Ph.D., Purdue University.
İMER, Bilge: B.S., University of Pittsburgh; Ph.D. University of California Santa Barbara.
KALAY, Yunus Eren: B.S., M.S., METU; Ph.D. Iowa State University.
KURU, Yener: B.S., METU; M.S. Sabancı Univeristy; Ph.D. University of Stuttgart.

GENERAL INFORMATION: The Department of Metallurgical and Materials Engineering is concerned with the generation and application of knowledge on engineering materials. It comprises such aspects as the extraction and refining processes, synthesis and processing of materials, factors affecting the internal structure of solids, methods of altering the structure and properties of materials and factors affecting the materials behavior in service. Materials are crucial in all other fields of engineering, since innovations in materials often lead to improvements in design or sometimes to the emergence of brand new products. In short, most fields of work or study have a bit of metallurgy and materials in them!

Materials of concern are metals and alloys, ceramics, glasses, polymers and their composites. The undergraduate curriculum comprises a core program that emphasizes principles basic to all these classes of materials. It builds upon courses on physics, chemistry and certain aspects of solid mechanics with a series of courses on internal structure of solids covering both chemical and physical aspects and structure-property relations.

From the fifth semester on, the core curriculum addresses to career opportunities in metallurgical and materials engineering. These include the metal industries, ceramic industries and other small scale industries that normally deal with a variety of materials. Iron and steel plants, non-ferrous industries, rolling mills, foundries, heat treatment shops, glass industry, structural ceramics and electronic-magnetic ceramic industries, aerospace and their related small scale industries are only a few examples for the employment opportunities.

MISSION OF THE DEPARTMENT: METU-Metallurgical and Materials Engineering Department's mission is to carry out educational programs to graduate high quality, nationally and internationally recognized engineers with strong backgrounds in materials related scientific and engineering problem-solving methods.

PROGRAM OBJECTIVES: The general educational objective of the Materials and Metallurgical Engineering undergraduate program is to provide its graduates with fundamental knowledge to function effectively in materials related positions in industry, government and academics consistent with the mission of the Middle East Technical University. The following specific Program Educational Objectives were established for the graduates of the program to insure the accomplishment of this general objective. Accordingly, the graduates of the METU Metallurgical and Materials Engineering Department are engineering professionals who

1. are preferred in areas of new and conventional materials technology and/or materials product and process development,
2. work effectively and efficiently in the priority fields such as defense, energy and transportation
3. are preferred by leading/important private and public institutions as engineers and researchers,
4. follow graduate education in the prestigious universities' relevant engineering and science departments and have a successful academic career,
5. are distinguished in their careers as leaders and experts,
6. are engaged in appropriate professional societies and continuing education activities.

STUDENT OUTCOMES: METU Metallurgical and Materials Engineering Department aims its graduates to acquire the following knowledge, skills and behaviors

a. An ability to apply knowledge of mathematics, science and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. Ability to design a system, component, or process to meet desired needs.
d. An ability to function on multi-disciplinary teams.
e. An ability to identify, formulate, and solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in global and societal context.
i. A recognition of the need for, and an ability to engage in life-long learning
j. A knowledge of contemporary issues.
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

DEPARTMENT SPECIFIC OUTCOMES:

l. A knowledge of the scientific and engineering principles underlying the four major elements of the field; structure, properties, processing and performance related to material systems.
m. An ability to apply and integrate knowledge from each of the four major elements of the field to solve materials and/or process selection and design problems.

RESEARCH INTEREST AND FACILITIES: Research activities in Metallurgical and Materials Engineering Department cover a wide range of metallurgical and materials science and engineering applications. The Department has outstanding facilities for supporting teaching and research. The list of the laboratories are given below:

Service Laboratories: The equipment present serves the common needs of the department and of researchers from other departments of the university.

Instrumental Analysis and Wet Chemical Analysis Laboratories: Equipped with Bruker S8 Tiger wavelength dispersive X-ray fluorescence (WDXRF) spectrometer. Perkin-Elmer Atomic Absorption Spectrophotometer, Perkin-Elmer Gas Chromotograph, Satmagan magnetite analyzer, a spectrometer, two photometers, turbidimeters and Leco train for analysis of carbon, sulfur, oxygen, hydrogen and nitrogen in ferrous and non-ferrous alloys. The laboratory also has Eltra CS800 Analyser for carbon and sulfur.

X-Ray Laboratory: A Rigaku DMAX 2200, 3 kW rated output, vertical multi-purpose X-ray diffractometer with graphite diffracted-beam monochromator and high linearity scintillation counter equipped with thin film and pole figure attachments.

Metallography and Image Analysis Laboratory: Facilities for specimen cutting and mounting, mechanical and electrolytic polishing, macro and micro etching. Various optical microscopes namely Nikon,

Olympus and Vickers research microscopes with digital camera attachments. Knoop microhardness tester. Automated grain size, aspect ratio, volume fraction, nodule count and graphite size distribution with Clemex Image Analysis System. Darkroom facilities are also available.

Scanning Electron Microscope (SEM) Laboratory: FEI Nova Nano SEM 430 with a variety of detectors; Helix, vCD, STEM. This microscope is equipped with EDS analysis system and EBSD camera integrated to a common platform (PEGASUS) allowing local elemental analysis as well as phase analysis. A 40 kV Jeol 6400 scanning electron microscope equipped with Digital Imaging and Noran Inst. Series II x-ray microanalyser. A Cambridge stereoscan S4-10 microscope with a variety of accessories such as sputter coating and carbon evaporation units.

Transmission Electron Microscopy (TEM) Laboratory: Equipped with a field emission TEM: JEOL JEM-2100F UHR/HRP 200 kV Microscope with 0.19 nm resolution equipped with STEM, EDS spectrophometer and high resolution CCD camera. A 100 kV Jeol JEM-100 CX transmission electron microscope with 2A resolving power and up to 250000 magnification and with accessories including double tilt, heating/cooling and elongation specimen holders and various electropolishing facilities for thin film specimen preparation. Facilities for sample preparation for electron microscoby include disc cutter, dimpling grinder, automatic twin jet polisher as well as Ion Mill (Fichione) and Plasma Cleaner (Fischione).

Thermal Analysis Laboratory: Equipped with Setaram DSC 131 thermal analyzer for temperature range (-170 °C to 600 °C) and Setaram SETSYS TG-DTA/DSC thermal analyzer with facilities for simultaneous TG and DTA/DSC measurements for high temperature (ambient to 1650 °C) quantitative and qualitative calorimetric studies. The laboratory has also Neutromag Digital centrifugal casting machine for the development and preparation of novel alloys by means of induction melting and casting under controlled atmosphere.

Nondestructive Testing Laboratory: Equipped with facilities for liquid penetrant, magnetic particle methods, radiography with X-rays up to 200 kV and an isotope source of Ir 192 together with ultrasonic testing equipment with straight and angle beam probes in the frequencies of 2 and 4 MHz.

Mechanical Behaviour Laboratory: A 10 ton MTS and a 30 ton DARTEC Universal Testing Systems for testing under controlled load, deflection or strain for fatigue, creep and stress relaxation studies. A highly accurate acoustic emission equipment for fracture studies and an instrumented impact tester. A 10 ton Instron Universal Testing Machine for tension, compression and torsion tests equipped with an high-temperature furnace. Also the laboratory has several hardness testers and other facilities for creep and fatigue testing.

Extractive Metallurgy Laboratory: The facilities for raw material preparation, metal extraction and refining consist of the following individual laboratories.

(a) Mineral Dressing Laboratory: Equipped with jaw crushers, grinders, screens, microscopes, balances, tables, jigs, wet magnetic drum separator and flotation units.

(b) Hydrometallurgy Laboratory: Equipment for atmospheric leaching, autoclaves, pH meters, various types of filters, electrowinning equipment, solvent extraction and ion exchange units.

(c) Pyrometallurgy Laboratory: Semi-pilot scale equipment for extraction and refining. A pelletizing disc, fluidized bed roaster, Herreshoff roasting unit, various muffle and tube furnaces, a high frequency induction furnace and an electric arc furnace (Birlec-100 kVA).

Foundry: Foundry and Alloy Preparation Laboratory main hall has 390 m^2 working space. Two induction furnaces are used for heating and alloying. The large Inductotherm coreless induction furnace has a melting capacity of 10 kg aluminium alloy and 16-17 Kg cast iron. The other small melting furnace has a melting capacity of 4 kg aluminium and 5-6 Kg cast iron. Balzers-Elphiac vacuum induction furnace has 10-15kg ferrous alloy melting capacity and reaching a vacuum value of 10^{-5} Torr. The fuel fired furnaces have 5-150 kg nonferrous alloy melting capacity. Centrifugal casting machine having 13-16-17.5 mm dia and 20-28 mm height cylindrical cast iron moulds for tubes and sleeve castings. Sand casting flasks are available for castings up to 6-8 kg aluminium and 10 kg cast iron parts. Electro-slag remelting unit has 1 Ton capacity for steel refining.

Ceramic Engineering Laboratories: Equipped with ceramic ball mills for powder communition; facilities for processing of ceramics powders through chemical routes. Numerous rheological characterization units for the study of ceramic slurries and of the colloidal behavior. Slip casting, pressing, CIP and extrusion units. Vacuum or pressure sintering furnaces up to temperatures like 2500oC. Glass melting and crystallization facilities. Equipment for structural studies and for the characterization of thermal, mechanical, electrical, and magnetic properties.

Heat Treatment Laboratory: Various muffle and tube furnaces which can operate under controlled atmospheres and vacuum. Salt baths are available for different heat treatment applications.

Welding Technology Laboratory: Equipped with conventional welding process equipment for gas welding, manual metal arc welding, MIG/MAG, TIG and spot welding. There are facilities for hot cracking test (MVT-test) and cold cracking test (implant test).

Machine Shop: The machine shop serves to implement the research needs of faculty members and graduate students. The facilities available in the machine shop include lathes, a milling machine, a surface grinding machine, a shaping machine, various drills, and various welding equipment.

Laboratories for Specialized Research : These laboratories are belong to research groups and equipped with specific instruments to serve the needs of advanced research.

Thermochemical and Electrochemical Material Processing Laboratory: Equipped with high temperature furnaces, hot plates, gas mixing and analyzing equipment, a CAHN 1000 electrobalance, power sources for constant and pulse current applications and a Gamry 3000 potansiyostat for thermochemical and electrochemical measurements and processing of materials**.**

Alloy Preparation Laboratory: Equipped with a 45 kW medium frequency Balzers vacuum induction furnace of 10 kg capacity. The laboratory has a second 2 kg capacity smaller induction unit.

Powder Metallurgy Laboratory: Equipped with facilities to prepare metal powders by electrolytic, mechanical and chemical methods and by atomization. Various powder characterization equipment, double cone and Y-cone mixers, several hydraulic presses, controlled atmospheres sintering furnaces. Hot pressing of metallic powders under nitrogen atmosphere is also possible.

Novel Alloys Design and Development Laboratory: involves atomistic computer simulations and experimental studies for design and development of novel materials for various engineering applications. For this purposes Novalab equipped with Bühler Arc Melting System for melting up to 4000°C under vacuum (10-6 mbar) and/or inert gas atmosphere with a movable non-consumable electrode system; Neutromag Digital induction centrifugal casting machine for the preparation and casting of the alloys under controlled atmosphere. The lab equipped with various furnaces operating under controlled atmosphere up to 1700°C for the heat treatment of the alloys. Novalab has also equipped with Setaram DSC 131 (-170°C to 600°C) and Setaram SETSYS 1750 thermal analysers with facilities for simultaneous TG and DTA/DSC measurements for high temperature (ambient to 1650°C) thermal and ADE-EV9 Vibrating Sample Magnetometer (VSM) operating under magnetic fields > 2.6 Tesla in the temperature range of (-196°C to 700°C) for magnetic characterizations of materials.

Shape Memory Alloys Research Laboratory: Equipped with a laboratory type rolling mill, temperature dependent resistivity measurement set up, data acquisition system to capture time-temperature-strain data from custom-built testing units and various controlled atmosphere heat treatment tube furnaces for the production and characterization of Cu-Zn-Al, Cu-Al-Ni and TiNi shape memory alloys

Battery and Energy Storage Devices Laboratory: Equipped with a computer controlled multichannel potentiostat/galvanostat for electrochemical characterization of energy storage materials systems and for corrosion testing.

Metal-Hydrogen Research Laboratory: Equipped with facilities both for powder and thin film processing of metal hydrides. The facilities include a three target DC/RF sputter deposition unit suitable for high-throughput combinatorial studies. The laboratory is equipped with a glove-box with a gas purification system. A Sievert type apparatus capable of testing materials up to 70 bar.

Laboratory for Plasma Processing of Materials: Equipped with Tekna 30 kW induction plasma system, the laboratory is involved in the synthesis of nanopowder either as a direct modification of starting material or via reactive synthesis from solid, liquid or gas precursors. The laboratory is also equipped with alloy making facilities including induction melting of alloys under vacuum or pressure up to 10 bar and facilities for grinding and milling of powders. Activities are directed for nanopowder synthesis for energy application and surface coating

Surface Sciences Research Laboratory: Equipped with 3 vacuum coating units (a CVD unit, a thermal evaporator and a sputter coater) and chemical synthesis equipment (a spin coater, 3 hot plate/magnetic stirrers, an ultrasonic cleaner, a pH meter and a precision balance, microwave oven, homogenizator, a rotating evaporator) for thin film preparation and nano-particle production, a muffle furnace, three electronically controlled furnaces (a high temperature tube furnace, a standard chamber furnace and a low temperature oven) and various measurement units and recorders (including a superconductivity measurement apparatus and a nitrogen cryostat, and a ferroelectric tester) for the characterization of electrical properties.

Polymers and Nanocomposites Laboratory: Equipped with laboratory size twin-screw extruder for compounding, laboratory size injection and compression molding devices for shaping, together with various lab-scale chemical processing equipment such as mechanical and magnetic stirrers, ultrasonic bath and homogenizer, hot plates, precision balances, curing and drying ovens, oil and water baths, pH meter, etc.

Materials Chemistry Laboratory: A processing laboratory specializing in low-temperature materials synthesis by chemical routes suited for sol-gel processing of ceramics and glasses and coatings; hybrid bio-organic-inorganic materials. Equipped with spin/dip coaters, hot plates, Turbula mixer, centrifuges drying ovens, ambient and atmosphere controlled furnaces, ultra pure water system, UV-vis spectroscopy.

Electromagnetic Materials Laboratory (EML): The laboratory is equipped with powder preparation and classification units such as ball mills and vibratory sieves. Powder compaction units such as uniaxial and biaxial hydraulic presses of varying tonnage as well as a cold isostatic pressing (CIP) unit are also included. Furthermore, a laboratory type hot isostatic pressing (HIP) unit, an atmosphere controlled high temperature microwave sintering furnace as well as conventional sintering furnaces of various temperature capabilities and drying ovens are employed for processing.

Nanomaterials and Devices Laboratory : Involves the synthesis of nanomaterials and their utilization in optoelectronic devices such as light emitting diodes, photodetectors, transistors, solar cells, supercapacitors etc. Equipped with chemical vapor deposition (CVD) unit for the synthesis of nanowires, plasma enhanced chemical vapor deposition (PECVD) unit for the synthesis of nanotubes, photometer and spectrometer for the characterization of light emitting diodes, light source and integrated sphere setup for absorption/transmission/reflection measurements, a glove box for the storage and processing of organic materials, 2 voltage sources and a nanoamperemeter for electronic measurements and a physical vapor deposition unit for metallization, spin coaters, pH meters, precision balance, tip/bath sonicators, hot plates, centrifuges, drying oven, vacuum oven, high temperature furnace, ultra pure water system.

Structure and Dynamics in Metals Laboratory: involves the investigation of structural hierarchy, dynamical evolution and selection dynamics at various length scales to develop new alloy systems with remarkable properties. Laboratory equipped with several high and low temperature box furnaces, computer aided thermal shock instrument (-40 to +150 °C), glass sealing unit, light alloy production unit under controlled atmosphere and several specimen preparation tools.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MATH	119	Calculus with Analytic Geometry	(4-2)5
PHYS	105	General Physics I	(3-2)4
CHEM	111	General Chemistry I	(3-2)4
ME	105	Comp. Aided Eng.Grap	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	106	General Physics II	(3-2)4
CHEM	112	General Chemistry II	(3-2)4
METE	102	Introduction to Metallurgical and Materials Engineering	(2-0)2
ENG	102	English for Academic Purposes II	(4-0)4

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
CENG	230	Introduction to Computers and C Programming	(2-2)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
METE	201	Materials Science I	(3-0)3
METE	203	Thermodynamics of Materials I	(3-0)3
METE	215	Materials Processing Laboratory	(1-2)2

Fourth Semester

ES	223	Statics and Strength of Materials	(4-0)4
METE	202	Materials Science II	(3-0)3
METE	204	Thermodynamics of Materials II	(3-0)3
METE	206	Materials Laboratory	(1-2)2
METE	208	Chemical Principles of Material Production	(3-0)3
Restricted Elective *			
HIST	2202	Principles of Kemal Atatürk II	NC
HIST	2201	Principles of Kemal Atatürk I	NC

THIRD YEAR

Fifth Semester

METE	301	Phase Equilibria	(3-0)3
METE	303	Mechanical Behaviour of Materials	(3-0)3
METE	305	Transport Phenomena	(3-0)3
METE	307	Metallography	(2-2)3
Restricted Elective **			
Non-technical Elective			
METE	300	Summer Practice I	NC
TURK	303	Turkish I	NC

Sixth Semester

METE	302	Principles of Solidification	(3-0)3
METE	304	Fundamentals of Mechanical Shaping	(3-0)3
METE	306	Chemical Metallurgy I	(3-0)3
METE	308	Physical Metallurgy	(3-0)3
METE	310	Materials Characterization	(2-2)3
Non-technical Elective			
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester				Eighth Semester			
METE	401	Materials Eng. Design	(3-0)3	METE	402	Materials Eng. Design II	(1-4)3
METE	403	Phase Transformations	(3-0)3	Technical Elective			
METE	407	Chemical Metallurgy II	(3-0)3	Technical Elective			
METE	451	Ceramic Materials	(3-0)3	Technical Elective			
Technical Elective				Technical Elective			
Technical Elective				Free Elective			
METE	400	Summer Practice II	NC				

All elective courses are minimum 3 credits.

Restricted Elective* One of the following courses: ES 204, ES 303, ES 361

Restricted Elective** One of the following courses: CHEM 220, CHEM 229, CHEM 468

The Metallurgical and Materials Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org (in 1996, 2004 and 2009).

DOUBLE MAJOR PROGRAM IN METALLURGICAL AND MATERIALS ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the Department.

MINOR PROGRAM IN ENGINEERING METALS AND ALLOYS

Materials are critical to all fields of engineering since design is often constrained by their limited availability. Furthermore, innovations in materials may lead to new design criteria and result in emergence of new products. Thus, most programs within the Faculty of Engineering involve one or two courses on Materials Science and Engineering. The metals and their alloys constitute still the most widely used family of engineering materials. The current program addresses students who want to further develop their understanding of engineering metals and alloys. Courses offered in this program emphasize the structure-property relationships as well as factors that affect the materials behavior in service.

Compulsory Courses

METE	201	Materials Science I*	(3-0)3
METE	202	Materials Science II**	(3-0)3
METE	307	Metallography	(2-2)3
METE	303	Mechanical Behavior of Materials	(3-0)3

Three of the following Courses

METE	206	Materials Laboratory	(1-2)2
METE	302	Principles of Solidification	(3-0)3
METE	308	Physical Metallurgy	(3-0)3
METE	403	Phase Transformations	(3-0)3
METE	441	Melting and Casting	(3-0)3
METE	464	Heat Treatment of Metals	(3-0)3
METE	456	Surface Processing of Materials	(3-0)3
METE	466	Powder Metallurgy	(3-0)3
METE	467	Fracture of Engineering Materials	(3-0)3
METE	468	Welding Metallurgy	(2-2)3
METE	470	Composite Materials	(3-0)3
METE	472	Corrosion and Oxidation of Metals	(3-0)3
METE	474	Failure Analysis	(3-0)3
METE	476	Mat.Behavior at Elevated Temp.	(2-2)3

METE	477	Testing and Evaluation of Eng. Mat.	(2-2)3
METE	478	Nondestructive Evaluation of Mat.	(2-2)3

(*) In place of METE 201 any of the following courses can be accounted; METE 225, METE 227 or METE 230.

(**) In place of METE 202, METE 228 can be accounted.

MINOR PROGRAM IN CERAMIC MATERIALS

The current program addresses students who want to further develop their understanding of ceramic materials.

Compulsory Courses

METE	201	Materials Science I*	(3-0)3
METE	202	Materials Science II**	(3-0)3
METE	301	Phase Equilibria	(3-0)3
METE	451	Ceramic Materials	(3-0)3

Three of the following Courses

METE	303	Mechanical Behavior of Materials	(3-0)3
METE	307	Metallography	(2-2)3
METE	421	Glass Science and Technology	(3-0)3
METE	422	Structural Cer. and Ceramic Comp	(3-0)3
METE	423	Ceramic Engineering Laboratory I	(1-4)3
METE	424	Ceramic Engineering Laboratory II	(1-4)3
METE	425	Colloidal Behavior of Ceramics	(3-0)3
METE	434	Principles of Ceramic Processing	(3-0)3
METE	444	Electronic and Magnetic Ceramics	(3-0)3
METE	466	Powder Metallurgy	(3-0)3

(*) In place of METE 201 any of the following courses can be accounted ;METE 225, METE 227 or METE 230.

(**) In place of METE 202, METE 228 can be accounted.

DESCRIPTION OF UNDERGRADUATE COURSES

METE 102 Introduction to Metallurgical and Materials Engineering (2-0)2

Historical perspective of materials in the service of mankind and civilization. Development of metals, alloys, ceramics, polymers, and composites. Production, processing, properties and performance of conventional and modern materials. Domestic and international activities in metallurgical and material industries.

METE 201 Materials Science I (3-0)3

Classification of materials and properties. Atomic theory and atomic bonding in solids, the structure of crystalline and non-crystalline materials; atomic coordination and packing, structure types in crystalline solids, amorphous materials. Imperfections in solids, point, line and surface defects. Phase equilibria, one and two-component systems. Atom movements and diffusion. Phase transformations: concepts of driving force, nucleation, growth and TTT curves.

METE 202 Materials Science II (3-0)3

Introduction to properties of materials. Mechanical behavior of solids: Elasticity , theoretical strength, plastic deformation, fracture, creep, fatique, viscosity, viscoelasticity. Thermal properties of materials: Thermal conductivity, thermal expansion, thermoelectricity. Electronic properties, optical properties, magnetic properties and chemical properties.

Prerequisite: METE 201.

METE 203 Thermodynamics of Materials I (3-0)3

Concepts and definitions. First law of thermodynamics; internal energy, heat and work, heat capacities, enthalpy and applications to material processing. The second law of thermodynamics; heat engines Carnot cycle, entropy concept . The third law of thermodynamics. Auxiliary thermodynamic functions, Gibbs and Helmholtz energies, Maxwell relations. Equilibrium. Reaction equilibria in gas mixtures.

METE 204 Thermodynamics of Materials II (3-0)3
Reaction equilibria between condensed materials and a gaseous phase, Oxidation of metals and Ellingham diagram, Solution thermodynamics, partial and integral molar quantities, Gibbs-Duhem equation, relative partial and relative integral molar quantities. Microscopic examination of solutions, ideal non-ideal solutions, excess properties. Gibbs-Duhem integration. Applications to materials systems. Reaction equilibria in solutions.
Prerequisite: METE 203.

METE 206 Materials Laboratory (1-2)2
Mechanical testing; tensile testing, impact testing and hardness. Heat treatment and microstructures; annealing, quenching normalizing and hardening of steel. Crystallography and X-ray diffraction; phase identification. Temperature measurement. Calorimetry. Physical property measurement.
Prerequisite: METE 201.

METE 208 Chemical Principles of Material Production (3-0)3
Examples of common unit operations and unit processes in extractive metallurgy. Stoichiometric principles, charge calculations, and material balances. Heat balance; choice of reactions, application of thermochemical principles. Examples of material and heat balances from selected processes.

METE 215 Materials Processing Laboratory (1-2)2
Laboratory experiments and data analysis in materials processing. Particle size reduction and analysis, fabrication of ceramics by pressing and firing, sol-gel processing of ceramics, polymer compounding and shaping, roasting of a sulfide concentrate, leaching and electrowinning, solidification of materials and mechanical shaping of materials.

METE 225 Engineering Materials (3-0)3
The role of materials. Products and materials. Classification of materials. Materials properties. Extraction of metals: an atomic view of solids. The structure of perfect and imperfect solids. Mechanical properties of materials. Heat treatments of ferrous and nonferrous alloys. Mechanical properties for processing and use: achieving strength for service, ductility for processing. Chemical properties for processing and use: Environmental degradation.

METE 227 Basic Concepts in Materials Science (3-0)3
Introduction and classification of materials; Atomic bonding in solids; the structure of crystalline solids; diffusion and rate equation; mechanical properties of metals; failure; physical properties of materials; electrical, thermal and magnetic properties. Corrosion and degradation of materials.

METE 228 Engineering Materials (3-0)3
Designation of materials; phase and phase diagrams; iron-carbon system; phase transformations; thermal processing of metallic materials; metal alloys; structure and properties of ceramic, polymeric and composite materials; material selection.
Prerequisite: METE 227 or consent of the department.

METE 230 Fundamentals of Materials Science and Engineering (3-0)3
Introduction and classification of materials; structure of metals, ceramics and polymers, imperfections; diffusion; phase diagrams and microstructure; materials properties: mechanical, electrical, magnetic, optical and chemical; composite materials.

METE 300 Summer Practice I NC
Summer practice of at least 21 working days preferably carried out in a plant that will involve processing of materials in an integrated manner. Report prepared at the end of summer practice should reflect both the practical experience and the knowledge gained in the second year courses.

METE 301 Phase Equilibria (3-0)3
Phase diagrams of materials systems. Geometric relationship and thermodynamic fundamentals. Phase relations in unary systems, binary isomorphous systems, and binary systems containing invariant reactions. Ternary systems; projections of liquidus and solidus surfaces, Alkemade lines, compatibility relations, ternary invariant reactions, paths of equilibrium crystallization, isothermal and vertical sections. Applications.
Prerequisite METE 202 and METE 204.

METE 302 Principles of Solidification (3-0)3
Liquids and Solids. Solidification of pure metals. Homogeneous and heterogeneous nucleation. Solidification of alloys, undercooling, solidification of eutectics. Constitutional undercooling. Growth in pure metal and alloys. Distribution coefficient. Macrostructure development. Classification of alloys according to their freezing range. Centerline feeding resistance. The rate of solidification, heat

transfer in solidification. Segregation, single crystal growth, zone refining, rapid solidification.

METE 303 Mechanical Behavior of Materials (3-0)3
Micromechanics of deformation, slip, dislocations. Strengthening mechanisms: solid solution strengthening, particle strengthening, grain size strengthening, fiber strengthening. work hardening. Mechanical behavior at elevated temperatures. Micromechanics of fracture: brittle fracture, void initiation, growth and coalescence. Ductile-brittle transition temperature. Fatigue. Toughening mechanisms in materials. Mechanical behavior of composites.
Prerequisite METE 202

METE 304 Fundamentals of Mechanical Shaping (3-0)3
Macroscopic plasticity of engineering materials; yield criteria, plastic stress-strain relations, strain instability, strain rate and temperature. Plasticity analysis, ideal work, slab analysis, upper-bound analysis, slip line field theory, finite element analysis. Formability, workability, deformation processing of multiphase materials, control of microstructure through deformation processing.
Prerequisite: ES 223.

METE 305 Transport Phenomena (3-0)3
Fluid flow; energy balances, friction, types of flow, flow measurements. Heat transfer; conduction, convection, radiation. Mass transfer; homogeneous kinetics, diffusion, heterogeneous reactions, nucleation and bubble formation, metastable products.

METE 306 Chemical Metallurgy I (3-0)3
Thermodynamics of chemical reactions. Kinetics of chemical reactions; effects of concentration and temperature on rates of chemical reactions. Generalized treatment of thermodynamic and kinetic principles of pretreatment, reduction, smelting, matte smelting, refining, hydrometallurgical and electrometallurgical processes with selected examples on the metallurgy of copper, zinc, lead, iron and aluminum.
Prerequisite: METE 202 and METE 204.

METE 307 Metallography (2-2)3
Objectives and classification, modern metallographic methods, electron metallography: metallographic specimen preparation; cast structures and defects; cold deformed and annealed structures; ferrous alloys; cast iron and steels; tool steels and stainless steels; non-ferrous alloys.

METE 308 Physical Metallurgy (3-0)3
Alloy theory: primary solid solutions Intermediate phases, stability of alloys, ordering. Kinetic theory. Interfaces: classification, geometry and energy of interfaces, grain boundary segregation, Mobility of interfaces. Normal grain growth. Homogeneous and heterogeneous nucleation. Recovery and recrystallization.
Prerequisite: METE 202 and METE 204.

METE 310 Materials Characterization (2-2)3
Properties of X-rays and electron beams. Spectroscopy. Fundamentals of crystallography. Diffraction, direction of diffracted beam; diffraction under non-ideal conditions, crystal structure determination. Intensities of diffracted beam. Precise parameter measurement. Phase diagram determination. Order-disorder transitions. Characterization of amorphous materials. Design of material characterization procedures.

METE 388 Material Research I (0-2)1
A research activity of one term duration on selected topics in material science and engineering. The course aims to develop skills of performing basic experiments, reviewing the relevant literature and report writing.

METE 400 Summer Practice II (Non-credit)
Summer practice of at least 21 working days carried out in an establishment suitable with option courses followed in the third year. A comprehensive report is required which will combine the knowledge gained in the third year courses with the practical experience gained by the student.

METE 401 Materials Engineering Design I (3-0)3
Design process. Steps of design. Design tools. Designing against failure. Materials selection in design. Process selection in design. Case studies in materials and process selection. Economic decision making in design. Engineering ethics and discussions.

METE 402 Materials Engineering Design II (1-4)3
Capstone design project course. Design of devices, parts, processes or systems related to metallurgical and materials engineering. Ethics in engineering and design, professional safety issues and discussions..
Prerequisite: METE 401.

METE 403 Phase Transformations (3-0)3
Diffusion: phenomenological and atomistic approach. Precipitation: free energy-composition diagrams, precipitation transformations, solid-state

nucleation, precipitation kinetics, coarsening. Eutectoid transformation and discontinuous precipitation. Martensitic transformations: crystallography, thermodynamics and types of martensites, bainite transformation.
Prerequisite: METE 308.

METE 405 Metallic Materials in Engineering Applications (3-0)3
Concepts and criteria in materials engineering. General characteristics of metallic materials. Guidelines for selection of metallic materials. Introduction to standards. The properties of metals and alloys used in industrial applications: Light metals; copper and its alloys; White metals; Cast irons and steels; Refractory metals. Selection of materials for property requirements : Fabrication methods, availability and economics; high strength alloys; wear resistant alloys; tool materials; corrosion resistant alloys; heat resistant alloys; titanium and its alloys; materials for special applications.

METE 407 Chemical Metallurgy II (3-0)3
Generalised treatment of thermodynamic and kinetic principles of refining processes. Refining of lead, fire refining of copper, steelmaking. Gases and inclusions in metals, degassing, deoxidation, desulfurization, stirring and injection processes. Special refining processes. Thermodynamic and kinetic principles of electrochemical systems and processes. Reversible electrode potentials, polarization, recovery of metals from aqueous and fused salt solutions. Electrorefining, electroplating, electropolishing processes, anodizing and integral coloring. Melting, remelting and melt preparation.
Prerequisite: METE 306.

METE 411 Chemical Metallurgy of Steel (3-0)3
Introduction to iron and steelmaking processes. Blast furnace and its description. Reduction of iron oxides, bosh and hearth reactions, slag formation. Blast furnace operating practice, treatment of hot metal. Steelmaking; description of steelmaking processes, oxidation reactions, S, P, N, H in steelmaking. Alloy steelmaking. Deoxidation. Ladle metallurgy.

METE 412 Chemical Metallurgy of Non-ferrous Metals (3-0)3
General principles of the extraction and refining of non-ferrous metals. Copper: concentration, roasting and smelting of copper ores. Converting and refining of copper. Zinc: concentration, roasting, sintering and smelting of zinc ores. Leaching and electrolysis of zinc. Lead: sintering, blast furnace smelting and refining. Aluminum: ores, manufacturing of alumina by the Bayer Process and electrolysis of aluminum. Production of ferroalloys.

METE 414 Steels and Steel Production Technologies (3-0)3
Importance of steel: modern technological developments in the steel industry; clean steel production techniques; ladle metallurgy; continuous casting technology,. Classification of steels: structural steels; HSLA steels; dualphase steels; tool steels; high manganese austenitic steels; stainless steels. Steel selection process: selection according to properties. Hardenability and selection according to hardenability.

METE 416 Fuels and Furnaces (3-0)3
Classification of solid, liquid and gaseous fuels. Carbonization and coke making. Combustion of fuels and heat utilization. Classification of furnaces; ladle and laboratory furnaces. Classification, properties and testing of refractories. Interaction of refractories with gas, metal, and slag phases. Selection of refractories; blast furnace, steel plant, reverberatory furnace, converter, electric arc and plasma furnace refractories. Manufacture of refractories.

METE 417 Computer Applications in Metallurgy (2-2)3
A sampling of extraction metallurgical problems that are solved by computers. Scientific and research applications; analysis of metallurgical data, process simulation and control. The examination of selected examples of computer usage will suggest how other complicated time consuming problems can be solved.

METE 418 Unit Operations and Pretreatment Processes (3-0)3
Drying; principles of drying equipment. Calcination; principles of calcination, calcination furnaces. Roasting; thermochemistry, types of roasting, roasting furnaces and product control. Agglomeration processes; sintering, pelletizing, nodulizing, and briquetting. Theory of sintering and pelletizing. Description of industrial agglomeration processes. Solid state reduction processes; direct and indirect reduction.

METE 421 Glass Science and Technology (3-0)3
Structure of glass. Glass formation. Nucleation and crystallization in glasses. Oxide and chalcogenide glasses. Glasses for various applications. Viscosity of glasses. Glass melting. Principles of glass working. Forming processes in glass technology. Stresses and stress relaxation in glass; annealing and tempering. Corrosion and weathering of glasses

strengthening of glasses. Optical and elastic properties of glasses. Glass defects.

METE 422 Structural Ceramics and Ceramic Composites (3-0)3
Importance of structural ceramic materials. Constituent materials; oxides, non-oxides, fibers, whiskers. Forming of structural ceramics; slurry, plastic forming and pressing techniques. Composite fabrication and processing. Transformation toughened ceramics. Glass-ceramics. Non-oxide ceramics; carbides, nitrides, brides, etc.

METE 423 Ceramic Engineering Laboratory I (1-4)3
Ceramic raw materials. Batch preparation. Milling and screening. Slurry and slip preparation. Rheological property measurements. Forming (slip casting, jiggering, extrusion, and pressing) of clay-based ceramics. Drying and psychrometry. Measuring high temperature and basis of temperature measurement. Firing and shrinkage of clay bodies. Microstructures of classical ceramics. Glazing and decoration.

METE 424 Ceramic Engineering Laboratory II (1-4)3
Preparation of fine oxide and non-oxide ceramic powders via chemical routes. Calcination processes. Determination of surface area, particle size, and degree of agglomeration in green powders. Powder consolidation techniques. Densification; sintering experiments. Microstructures of as-fired bodies and grain size distribution. Effects of heating schedules on the final microstructures. Relationships between microstructures and mechanical properties.

METE 425 Colloidal Behaviour of Ceramics (3-0)3
Adsorption at solid-liquid interfaces. Basic fluid mechanical concepts relevant to colloid chemistry. Optical and electrical properties of colloids. Determination of isoelectric points and zeta potentials of ceramic particulate suspensions. Preparation and stability of colloids. Steric stabilization. Properties of gels, emulsions, foams, and aerosols relevant to ceramic powder science. Effect of colloidal parameters on the final properties of ceramic bodies.

METE 433 Materials for Organic Electronics (3-0)3
Fundamentals of organic semiconductors and their applications in electronic and photonics devices. Materials, manufacturing issues and applications in organic field effect transistors (OFETs), light emitting diodes (OLEDs), photovoltaic devices (OPVs), memory devices and smart windows.

METE 434 Principles of Ceramic Processing (3-0)3
Characterization of ceramic powders; size, surface area, density and porosimetry. Particle size and distribution, particle statistics. Particle packing. Methods of ceramic powder synthesis. Surface chemistry and rheology. Powder forming techniques; additives, pressing, slip casting, extrusion, injection molding. Densification of powder compacts; theory and practice of sintering processes, solid state sintering, liquid phase sintering, pressure sintering.

METE 435 Foundry Laboratory I (2-2)3
Thermal analysis, heating and cooling curves of alloys and pure metals, principles of temperature measurements, macroexamination of cast-ingot structures, growth of solid grains in pure metals and alloys. Production of nodular cast iron, magnesium addition and innoculation. Chill testing of cast iron.

METE 436 Foundry Laboratory II (2-2)3
Molding sands and sand casting, refractoriness test, mold making practice, carbon dioxide molding, core and mold making with organic binders, heat curing binders, core oils, core resins, methylene blue test.

METE 438 Waste Processing and Recycling in Metallurgical Industries (3-0)3
Sources of solid, liquid and gaseous wastes in metallurgical industries. Methods of handling solid, liquid and gaseous wastes. Arsenic and sulfur emission control. Detection and control of halides and nitrous fumes. Resource conservation and environmental technologies. Importance of recycling in metallurgical processes.

METE 439 Extractive Metallurgy Laboratory (1-4)3
Laboratory experiments on unit operations and unit processes of metal extraction and refining. Mineral processing; crushing, grinding, screen analysis, gravity concentration, thickener design, flotation. Pretreatment processes; roasting, drying, calcination, agglomeration. Simple smelting. Oxidation-reduction tests. Hydrometallurgical processing; leaching, solvent extraction, electrowinning.

METE 440 Total Quality Management in Metallurgical Industries (3-0)3
Introduction to quality, quality assurance, fundamentals of statistics, control charts for variables, fundamentals of probability, control charts for attributes, reliability, quality costs, product liability.

METE 441 Melting and Casting (3-0)3
Foundry sands, green sand concept, quartz-clay interface, clay-clay interface, Quartz-clay-water interface. Moulding mixtures, additives core concept; oil bonded cores. CO2 process, cold setting, core making. Casting processes; sand casting, die casting, centrifugal casting, investment casting, other processes. Melting methods, melting furnaces. Melting of cast iron in cupola. Non-ferrous industrial alloys; Al-alloy Cu-alloy, other non-ferrous alloys. Steel casting processes.

METE 442 Energy Storage Devices (3-0)3
Fundamentals of electrochemistry, electrochemical thermodynamics and transport. Energy storage and conversion devices such as primary and secondary batteries, fuel cells and solar cells. Principles of their operation, design concepts and materials considerations. Advances in secondary lithium batteries, cathode and anode materials, and hydrogen storage materials.

METE 443 Computer Modelling and Simulations in Mat. Sci. Eng. (3-0)3
Phenomenological computational modeling and simulation techniques in materials science and engineering. Mathematical and physical basis of modeling, methodology: definition of the physical problem, defining input and outputs, construction of the model, computer implementation, validation and visualization. Application of the methodology for materials behavior and processesing problems like creep, fatigue, phase transformations, sintering, electrochemical reactions, welding, plastic deformation, solidification, etc. Simulation methods of materials science related phenomena like diffraction, thermodynamics and kinetics of reactions, mass and heat transfer, etc.

METE 444 Electronic and Magnetic Ceramics (3-0)3
Interaction of ceramic materials with electromagnetic waves. Review of charge transfer and charge displacement processes. Electrical and ionic conduction in crystals and glasses. Dielectric behavior, ferroelectricity; piezoelecricity, and magnetic properties of ceramics. Effects of processing parameters on microstructure and properties. Examples on the manufacture of ceramic resistors, conductors, thermistors, capacitors, piezoelectrics, and magnets.

METE 445 Electrometallurgy (3-0)3
Electrochemical principles. Standard electrode potentials. Reference electrodes. Galvanic Cells. Thermodynamics of oxidation-reduction processes, Nernst equation. eH-pH diagrams. Overvoltage. Applications of electrochemical theory to industrial processes; electrowinning, electrorefining and electrodissolution, Fused salt electrolysis of aluminum and magnesium.

METE 450 Materials Selection and Design (2-4)4
Introduction to design process: The steps of design, Examples of conventional and fracture-based design. Decision making Optimization. Material selection and design. Evaluation methods for materials selection. Special Topics in materials selection and design: Failure analysis as a tool of materials selection. Term project in which the proper engineering design approach is the prime requirement.

METE 451 Ceramic Materials (3-0)3
Classification of ceramic products with respect to their functions. Classical and modern Ceramics. Methods of ceramic production: Natural and synthetic raw materials, shaping methods, drying and firing of ceramic articles. Effect of processing on the development of microstructures and properties. Examples of ceramics selected from the major groups of triaxial whitewares, electrical ceramics, magnetic ceramics, refractories, cements and mortars, abrasives, glasses and glass ceramics.

METE 455 Electrical, Magnetic and Optical Properties of Materials (3-0)3
Electron energy levels and bands. Free electron theory of metals. Fermi-Dirac statistics. Metals, semiconductors, insulators. Electronic transport, conduction in metals. Electrical resistivity of metals. Intrinsic and extrinsic semiconductors. Superconductors. Electrical properties of junctions. Techniques of making p-n junctions. Magnetic properties of materials: diamagnetic, paramagnetic materials, ferrites. Optical properties of materials.

METE 456 Surface Processing of Materials (3-0)3
Introduction to services and interfaces, structure and properties of interfaces. Different coating methods. Surface processing techniques that involve chemical and physical changes; special surface treatment techniques. Surface processing selection and controlling surface quality.

METE 458 Physical Modeling of Crystalline Structures (3-0)3
Interatomic interactions in metals and alloys: phenomenological theory; quantum-mechanical model. Energy of crystal structure: nearly-free electron model (NFE); orthogonalized plane wave method (OPW); pseudo potential method (PP);

Green function theory (GF); density functional theory (DFT). Application of these methods for the analysis such as crystal structure energy, phase stability, ordering processes, grain boundary energy, etc.

METE 460 Engineering with Polymers (3-0)3
Review of engineering polymers and their processes. Effects of compounding, reinforcing and processing on the behavior of engineering polymer components. Materials selection and design for strength, stiffness, toughness, resistance to fatigue, creep, hostile environments and wear. Advantages and deficiencies compared with metallic alloys.

METE 462 Residual Stresses in Materials Processing (3-0)3
Residual stresses. Their origin depending on the industrial processes. Measurement and evaluation. Effect of residual stresses on design, service performance and failure of components.

METE 464 Heat Treatment of Materials (2-2)3
Property changes due to heat treatment. Iron-carbon system. Austenitizing transformation of austenite, I-T and C-T diagrams, annealing, normalizing, hardening, critical cooling rate. Actual cooling rate, quenching media, size and mass effect. Hardenability and applications of hardenability data. Tempering. Secondary hardening, temper embrittlement, austempering. Case hardening. Residual stresses, martempering.

METE 466 Powder Metallurgy (3-0)3
Principles of the P/M process. Powder characterization, properties of metal powders and their testing. Methods of metal powder production. Precompaction powder handling. Compaction processes. Densification mechanisms. Sintering theory. Liquid phase and activated sintering. Sintering atmospheres and furnaces. Full density processing. Finishing operations. Compact characterization.

METE 467 Fracture of Engineering Materials (3-0)3
Microstructural aspects of fracture. Elements of fracture mechanics: linear elastic fracture mechanics (LEFM) parameters and their testing, elastic-plastic fracture mechanics parameters and their testing. Fracture mechanics concepts for crack growth under fatigue, creep and stress corrosion. Dynamic crack growth and crack arrest.

METE 468 Welding Metallurgy (2-2)3
Joints and welds, manual arc welding, electrodes and techniques. Gas welding and cutting, plasma arc and other cutting processes. Arc welding metallurgy. Testing and inspection. Welding of alloy and carbon steels. Welding of cast iron. Welding of non ferrous metals. Equipment and technique for TIG welding. Weld defects. Weld distortions.

METE 470 Composite Materials (3-0)3
Principles of composites and composite reinforcement. Fiber reinforced composites. Laminated composites. Role of fiber, matrix and fiber-matrix interface in composite behavior. Continuous and discontinuous fiber strengthening. Calculation of thermoelastic properties and strength. Tensile and compressive behavior. Fracture behavior and toughness. Corrosion and degradation of composites. Mechanical testing. Applications of composite materials.

METE 472 Corrosion and Oxidation of Metals (3-0)3
Electrochemical principles of corrosion; review of thermodynamic approach as related to corrosion tendency, polarization and its application to corrosion rates. Passivity. Types of corrosion damage. Corrosion in various environments. Principles of corrosion control: design; material selection, surface coatings, treatment of environment, anodic and cathodic protection. Oxidation and tarnish of metals.

METE 474 Failure Analysis (3-0)3
Objectives of failure analysis. General procedure of a failure investigation: Collection of background data, preliminary examination, nondestructive testing, destructive testing. Macro and micro inspection of fracture surfaces: Metallographic and fragtopraphic analyses, chemical analyses. Determination of fracture type. Application of fracture mechanics. Case studies that demonstrate various types of component failures and the preventive measures .

METE 476 Material Behavior at Elevated Temperatures (3-0)3
Mechanical behavior of pure metals and alloys above minimum recrystallization temperature. Creep mechanisms, deformation mechanisms maps, engineering aspects of creep design, superplasticity, high temperature fracture models, life predictions from short term tests, extrapolation procedures, application of fracture mechanics to creep, high temperature oxidation, hot corrosion. Materials for high temperature applications.

METE 477 Testing and Evaluation of Engineering Materials (2-2)3
Introduction to testing of engineering materials, data collection and evaluation. Load and strain measurements. Calibration of equipment. Hardness measurement. Testing under static tension, compression, torsion and bending. Fatigue, impact and fracture toughness testing. Testing for high and low temperature behavior. Stress corrosion cracking testing. Fractographic analyses. Examples of testing for conformance to product specification.

METE 478 Nondestructive Evaluation of Materials (2-2)3
General description of most common NDT methods. NDT detection of metallurgical properties of metals their composition and size differences, Application of nondestructive evaluation for metallurgical processes and products. NDT detection in service produced defects mainly caused by thermal shock, fatigue, creep, or by corrosion attack.

METE 480 Electron Microscopy in Materials Science (2-2)3
History of electron microscope, optical column and detection systems, concepts of signal and noise, resolution, depth of field, elastic and inelastic scattering, X-ray production, secondary electrons, back-scattered electrons, Auger electrons, contrast mechanisms, electron back-scattered diffraction, X-ray spectroscopy, miscellaneous scanning electron microscopy techniques, pseudo-coloring and image analyses.

METE 481 Special Topics in Metallurgical Engineering (3-0)3
This code number will be used for technical elective course which is not listed regularly in the catalog. The course content will be announced before the semester commences.

METE 482 Special Topics in Materials Science and Engineering (3-0)3
This code number will be used for technical elective course which is not listed regularly in the catalog. The course content will be announced before the semester commences.

METE 483 Special Topics in Ceramic Engineering (3-0)3
This code number will be used for technical elective course which is not listed regularly in the catalog. The course content will be announced before the semester commences.

METE 488 Material Research II (1-2)2
A research activity of one term duration on selected topics in material science and engineering. The course involves a systematic experimental program structured for a clearly defined objective and report writing.
Prerequisite: METE 388

METE 490 Graduation Project (0-2)NC
This is a one term short research project to give practical experience of engineering processes.

GRADUATE PROGRAMS AT THE DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

GRADUATE PROGRAMS: For the degree of Master of Science in Metallurgical and Materials Engineering, the students are required to take a minimum of seven courses apart from a Master's thesis. For the Ph.D. degree an additional seven courses and a Ph.D. thesis should be successfully completed. The Master's program involves 3 compulsory courses and a seminar. Remaining courses are restricted electives which are taken by the student in close cooperation with their advisors. These restricted electives permit the student to specialize in their respective fields in an orderly manner.

Graduate study in the Department of Metallurgical and Materials Engineering is designed to present the student with the systematic development of the fundamental scientific and engineering principles underlying materials phenomena and process operations.

EDUCATIONAL OBJECTIVES (M.S.): The graduates of METU Metallurgical and Materials Engineering Master's program:

- are preferred as doctoral candidates in a variety basic and applied science programs and they successfully complete their doctoral program in these programs.
- work distinctly in R&D orientated technical or management positions for development advanced materials.
-

PROGRAM OUTCOMES (M.S.): Upon graduation, alumni of the METU Metallurgical and Materials Engineering Master's program:

- can reach the general and specific knowledge/information, can analyze, crystalize and implement these in conducting scientific research in the field.
- have compressive knowledge on the up-to-date engineering practices and methods and their limitations.
- are equipped with the analytical characterization knowledge required in realizing observational/experimental work-based research activities in the field.
- can clearly define and formulate problems related to the field, and develop exceptional and novel procedures to solve such problems.
- can develop new and/or original ideas and methods; design complex systems or processes and invent novel/alternative solutions in his designs.
- can work effectively as a member of a team in his own field or interdisciplinary groups, he can be the leader in such formations and offer solutions in intricate cases; can also work independently and take responsibility.
- can communicate well in spoken and written English effectively.

EDUCATIONAL OBJECTIVES (Ph.D.): The graduates of METU Metallurgical and Materials Engineering doctoral program:

- are preferred as faculty by the prestigious institutes and retain solid, successful academic careers.
- work in executive management or high level technical staff positions in the premier/leading metallurgical and materials industrial organizations.

PROGRAM OUTCOMES (Ph.D.): Upon graduation, alumni of the METU Metallurgical and Materials Engineering Doctorate program:

- can clearly define scientific and/or technical problems/issues in metallurgical and materials engineering field; develops novel and systematic research methods and procedures in resolving these.
- develop new and/or original ideas and methods for developing advanced engineering materials; design complex systems or processes and invent novel/alternative solutions in his designs.
- have compressive knowledge on the up-to-date engineering practices and methodsand their limitations.
- have the ability and proficiency in following the up-to-date scientific literature in metallurgical and materials engineering field.
- are aware of interdisciplinary nature of metallurgical and materials engineering, and can develop basic and/or applied research projects with such characteristics and be the leaders in such groups.
- are equipped with the analytical characterization knowledge required in realizing observational/experimental work-based research activities in the field.

- are effective and successful in translating knowledge and educating new researchers, technical staff and engineers.
- can communicate well in spoken and written English effectively.

GRADUATE CURRICULUM

M.S. in Metallurgical and Materials Engineering

METE	500	M.S. Thesis	NC
METE	501	Thermodynamics of Materials	(3-0)3
METE	503	Mathematical Methods in Materials Research I	(3-0)3
METE	506	Kinetics of Processes in Materials	(3-0)3
METE	580	Prethesis Seminar	(0-2)NC
METE	590	Seminar	(0-2)NC

4 elective Courses

Total minimum credit : 21
No of courses with credit (min) : 7

Ph.D. in Metallurgical and Materials Engineering

If admitted with M.S. degree:

METE	580	Prethesis Seminar	(0-2)NC
METE	600	Ph.D. Thesis	NC

7 elective Courses *
* METE 501, METE 503 and METE 506 courses are compulsory if not taken previously while in M.S. program.

Total minimum credit : 21
No of courses with credit (min) : 7

If admitted with B.S. degree:

METE	501	Thermodynamics of Materials	(3-0)3
METE	503	Mathematical Methods in Materials Research I	(3-0)3
METE	506	Kinetics of Processes in Materials	(3-0)3
METE	580	Prethesis Seminar	(0-2)NC
METE	590	Seminar	(0-2)NC
METE	600	Ph.D. Thesis	NC

11 elective Courses

Total minimum credit : 42
No of courses with credit (min) : 14

GRADUATE COURSES

METE	500	M.S. Thesis	NC
METE	501	Thermodynamics of Materials	(3-0)3
METE	502	Diffusion	(3-0)3
METE	503	Mathematical Methods in Materials Research I	(3-0)3
METE	504	Mathematical Methods in Materials Research II	(3-0)3
METE	505	Fracture	(3-0)3
METE	506	Kinetics of Processes in Materials	(3-0)3
METE	507	Advanced Crystallography and Diffraction	(2-2)3
METE	508	Advanced Optical Techniques	(2-2)3
METE	509	Physics of Materials I	(3-0)3
METE	510	Physics of Materials II	(3-0)3
METE	511	Advanced Powder Metallurgy	(3-0)3
METE	512	Advanced Ceramic Engineering	(3-0)3
METE	515	Composite Materials	(3-0)3
METE	516	Production of Ferroalloys	(3-0)3
METE	517	Gas Metal Reactions	(3-0)3
METE	518	Physical Chemistry in Process Metallurgy	(3-0)3
METE	520	Process Analysis in Metallurgical Reaction Systems	(3-0)3
METE	521	Advanced Foundry Technology	(3-0)3
METE	522	Bioceramics	(3-0)3
METE	523	Molten Salt Electrolysis	(3-0)3

METE	524	Texture and Anisotropy in Metallic Materials	(3-0)3
METE	525	Extractive Metallurgy of Copper	(3-0)3
METE	526	Advanced Deformation Processing	(3-0)3
METE	527	Advanced Chemical Metallurgy	(3-0)3
METE	528	Computer Applications in Materials Science	(2-2)3
METE	529	High Strength Alloys	(3-0)3
METE	530	Ladle Metallurgy	(3-0)3
METE	532	Selection of Materials Against Corrosion and Oxidation	(3-0)3
METE	534	Phase Transformations in Metallic Systems	(3-0)3
METE	535	Transmission Electron Microscopy	(2-2)3
METE	536	Cement Plant Refractories	(3-0)3
METE	538	Advanced Solidification	(3-0)3
METE	539	Near Net Shape Processing	(3-0)3
METE	540	Phase Stability in Alloys	(2-2)3
METE	541	Point Defects in Solids	(3-0)3
METE	542	Advanced Structural Ceramics	(2-2)3
METE	543	Science and Technology of Ceramic Powder Synthesis	(2-2)3
METE	544	Properties of Glasses	(3-0)3
METE	545	Atomistic Modelling of Materials	(2-2)3
METE	546	Nanostructured Materials	(3-0)3
METE	550	Solar Cells	(3-0)3
METE	555	Processing and Properties Of Nanocomposites	(3-0)3
METE	560	Polymer Nanocomposites	(3-0)3
METE	565	Structure of Materials	(3-0)3
METE	580	Prethesis Seminar	(0-2)NC
METE	590	Seminar	(0-2)NC
METE	600	Ph.D. Thesis	NC
METE	7XX	Special Topics in Metallurgical and Materials Engineering	(3-0)3 or (2-2)3
METE	8XX	Special Studies	(4-2)NC
METE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

METE 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their first semester while the research program or write-up of thesis is in progress.

METE 501 Thermodynamics of Materials (3-0)3
Advanced treatment of the thermodynamic properties of inorganic materials. Laws of thermodynamics and their application to the chemical behavior of materials systems. Multicomponent systems, phase and chemical reaction equilibria. Thermodynamics of phase transformations. Introductory surface thermodynamics.

METE 502 Diffusion (3-0)3
Phenomenological theory of diffusion. Thermodynamic principles. Fick's laws. Chemical diffusion, Kirkendall effect, Up-Hill Diffusion, etc. Atomic theory of diffusion. Atom movements, Random Walk Diffusion in non-metallic and fluid systems. Diffusion with moving boundary.

METE 503 Mathematical Methods in Materials Research I (3-0)3
Review of ordinary differential equations, partial differential equations, solution techniques, special functions, separation of variables, transform techniques, approximate techniques.

METE 504 Mathematical Methods in Materials Research II (3-0)3
Linear algebra, matrices, variational and other numerical methods of differential equations, computer applications.

METE 505 Fracture (3-0)3
Engineering aspects of fracture. Fracture mechanics design philosophy. Case studies in brittle fracture, ductile fracture, environmental cracking, fracture under fatigue and creep.

METE 506 Kinetics of Processes in Materials (3-0)3
Scope of kinetics; Analysis of kinetic data; Chemical kinetics; Rate theories; Transport in solids, liquids and gases; Kinetics of homogenization, carburizing, decarburizing, gas-metal reactions, oxidation, internal oxidation and nitriding, dissolution processes in liquids and solids,

precipitation processes in liquids and solids, deformation.

METE 507 Advanced Crystallography and Diffraction (2-2)3
Advanced theory of diffraction. Matrix operations and their application to crystallography. Symmetry, space groups structure analysis, imperfect lattices, strain and texture. Diffraction in non-crystalline materials.

METE 508 Advanced Optical Techniques (2-2)3
Electron microscopy, electron microanalysis, electron and neutron diffraction (Theory and Application). Advanced techniques of spectroscopy (I.R., Raman, Atomic Absorption, Mössbauer etc.)

METE 509 Physics of Materials I (3-0)3
Theoretical basis of structure and properties of materials, quantum mechanical theory of bonding, quantum mechanical theory of metals and alloys (Free Electron Theory, Band Theory).

METE 510 Physics of Materials II (3-0)3
Electrical properties of insulators and semiconductors, optical properties of insulators and semiconductors. Magnetism (Quantum Mechanical Theory, Ferromagnetism, Domains, Anisotropy, Magnetostriction), Magnetic resonance techniques.

METE 511 Advanced Powder Metallurgy (3-0)3
Special topics in P/M. Tool and bearing materials, sintered friction materials. Electrical and magnetic materials. Nuclear application of P/M. Refractory materials. Laboratory experiments on model powder production, their testing and characterization; Mixing, compaction and sintering.

METE 512 Advanced Ceramic Engineering (3-0)3
Structure of ceramic materials. Characterization of particulate systems. Analysis of ceramic forming methods. Mechanisms and kinetics of densification (sintering). Property development through process and structure control.

METE 515 Composite Materials (3-0)3
Principles of composites and composite reinforcement. Micro-mechanics and fracture behaviour of composites. Static and time dependent behaviour of Composites.

METE 516 Production of Ferroalloys (3-0)3
Production of ferro-alloys by carbothermic reduction, with special emphasis on ferro silicon; Production of ferro alloys by metallothermic and vacuum reduction techniques; Detailed explanation of ferro- chromium, manganese titanium, vanadium, tungsten and molybdenum production; Halide metallurgy; Production of volatile metals especially zinc and magnesium.

METE 517 Gas Metal Reactions (3-0)3
Theory of reaction rates. Dissolution of gases in metals. Oxidation, sulphidation. Carburizing, decarburizing, nitriding, denitriding reactions. Determination of the reaction rates under different conditions. Stability of precipitates. The growth kinetics of precipitates and its dependence on environment.

METE 518 Physical Chemistry in Process Metallurgy (3-0)3
Advanced treatment of important metallurgical systems and processes. Structure and properties of liquid metals, alloys, mattes, and slags. Equilibrium and kinetic considerations in smelting and refining processes. Chemical and electrochemical interactions between melts, between melts and gases and between melts and refractories.
Prerequisite: METE 501

METE 520 Process Analysis in Metallurgical Reaction Systems (3-0)3
Equilibrium stages, calculations for staged operation. Continuous flow system. Similarity, modeling of reaction systems like copper smelting, iron ore reduction, steelmaking. Heat and mass transfer applications to packed and fluidized beds, sintering, reduction and smelting.

METE 521 Advanced Foundry Technology (3-0)3
Mathematical analysis of solidification. Heat transfer problem in ingot casting. Continuous casting process. Refined melting techniques. Metallurgy and casting of corrosion resistant and heat resistant alloys and special steels.

METE 522 Bioceramics (3-0)3
Synthesis, processing and characterization of ceramics and ceramic-based systems for applications in biomedical use. Calcium phosphate chemistry, calcium phosphate cements, sol-gel chemistry, glass formation, glass-ceramics and bioglass. Bioinert ceramics, alumina, zirconia, carbon-based coatings. Selected applications of bioceramics in medical use.

METE 523 Molten Salt Electrolysis (3-0)3
Physicochemical properties of melts; structure of melts. Thermodynamics of molten salt mixtures; activity models, melts with common ion, complex

formation, reciprocal salt systems. Galvanic concentration cells, membrane potential. Electrolysis in molten salts, Faraday's law, metal solubility, current efficiency, electrode kinetics. Industrial applications; Hall-Heroult process, magnesium electrolysis.

METE 524 Texture and Anisotropy in Metallic Materials (3-0)3
Texture, grain shape anisotropy, mechanical fibering. Description of texture; ideal indices, polefigures, orientation distribution functions. Experimental determination of texture. Texture development; castings, deformation, recrystallization transformation textures. Texture and properties; elastic and plastic anisotropy, magnetic anisotropy. Texture control in steel (deep drawing) and in aluminum sheets, grain oriented silicon iron.

METE 525 Extractive Metallurgy of Copper (3-0)3
Comminution and concentration of copper ores; Roasting of copper concentrates; Physical chemistry of copper smelting; Matte smelting, converting of copper matter and copper losses in slags; Continuous production of blister copper: Single-step and multi-step processes; Hydrometallurgical extraction of copper; Electrolytic refining and electrowinning of copper.

METE 526 Advanced Deformation Processing (3-0)3
Metalworking processes; equilibrium, slip-line, upperbound and visioplasticity methods of analysis applied to forging, rolling, extrusion, drawing, sheet forming, machining; deformation processing of powder and composite materials; material properties and characteristics under processing conditions, flow instability, drawability, ductile fracture; resulting properties and characteristics: structural size and anisotropy.

METE 527 Advanced Chemical Metallurgy (3-0)3
Gas-solid reactions in calcination, roasting and direct reduction. Physicochemical treatment of liquid metal solutions and solution models. Thermodynamic properties and property-structure relations of slag/glass forming systems. Slag-metal, slag-matte-metal reaction equilibria in high temperature unit processes. Electrochemical reaction in aqueous systems with applications to hydrometallurgical operations.

METE 528 Computer Applications in Materials Science (2-2)3
The numerical methods of solving engineering problems. Determinants, matrices, and linear simultaneous equations, and their evaluations by FORTRAN program. Roots of polynomial and algebraic equations, Lagrange's interpolation formula, method of Least Squares. Numerical Solutions of ordinary differential equations. Some examples from mechanical vibrations, dislocation dynamics, mass transport.

METE 529 High-Strength Alloys (3-0)3
Review of strengthening mechanisms. Particle hardened engineering materials; Microstructure and microstructural control. Mechanical behaviour of P.H. alloys yielding and work hardening behaviour, fracture. Re-evaluation of P.H. engineering alloys.

METE 530 Ladle Metallurgy (3-0)3
Review of basic chemistry of steelmaking. Scope and advantages of ladle metallurgy. Thermodynamic and kinetic aspects of deoxidation. Formation and removal of deoxidation products. Reoxidation. Desulfurization and sulfide inclusions in steel. Oxide and sulfide inclusion shape control. Degassing of steel. Stirring and injection processes. Ladle furnaces and processes.

METE 532 Selection of Materials Against Corrosion and Oxidation (3-0)3
Principles that apply to the selection of materials against corrosion. Alloying for corrosion resistance: Economic considerations in materials selection. Design principles for component and structures with better corrosion resistance. Aims of corrosion testing. Principles that apply to design of corrosion testing methods. A critical review of available methods and the related standards on corrosion testing.

METE 534 Phase Transformations in Metallic Systems (3-0)3
Classification of solid state phase transformations; Solid solutions, intermetallic phases and order-disorder transformations; Precipitate nucleation, growth, coarsening and dissolution; Spinodal decomposition; Eutectoid transformations and coarsening of lamellar structures; Ferrous and non-ferrous martensite transformations: stabilization, thermoelasticity, reversibility, shape memory effect. *Prerequisite: Consent of the department.*

METE 535 Transmission Electron Microscopy (2-2)3
Electron microscope: Specimen preparation. Reciprocal lattice concept and kinematical theory of electron diffraction. Diffraction pattern indexing

and evaluation of spot patterns. Geometry of formation and applications of Kikuchi patterns. Constants and its applications in faulted crystals. Introduction to nonconventional techniques (lattice imaging, convergent beam, stereomicroscopy, 21/2D imaging).

METE 536 Cement Plant Refractories (3-0)3
Introduction to refractory technology and refractories used in the rotary kiln cement plant. Major refractory systems in terms of constitutional members and related phase equilibria. Generalized refractory families alumino-silicates, basic refractories, magnesites and dolomites, bauxite and alumina based refractories, advanced products containing zirconia and silicon carbide. Bricks, mortars, and castables. Physical, mechanical, and thermal properties of refractories. Response of refractories to their environment; interaction with solid, liquid, and gaseous neighbors. Refractory erosion and corrosion, mechanisms of thermal degradation.

METE 538 Advanced Solidification (3-0)3
Atom transfer at the solid-liquid interface; conditions for nucleation, rate of nucleus formation, interface structure. Morphological instability of a solid-liquid interface, perturbation analysis. Solidification microstructures; cells and dendrites, eutectic and peritectic, diffusion coupled growth, competitive growth of dendritic and eutectic phases. Solute redistribution; mass balance in directional solidification, microsegregation. Rapid solidification processing; general characteristics, production methods, microstructural effects.

METE 539 Near Net Shape Processing (3-0)3
The methods for manufacturing small section products such as strip, fibre, flake, wire directly from molten metal. Spray rolling, the Taylor wire process, melt spinning, melt overflow, melt drag, melt extraction, double roll quenching, thin slab casting (belt drive) and laser glaze process. Mass and heat flow analysis. Alloy design, dimensional control. Alloy parameters such as melt delivery speed, viscosity and surface tension.

METE 540 Phase Stability in Alloys (2-2)3
Theoretical basis of structure of solid solutions; Quasi-chemical statistico-thermo dynamical and quantum mechanical theory of interatomic interactions in metals and alloys; theory of crystal-structure stability; Energy of phase boundaries; Ordered phases, their structure and existence conditions; Interatomic interaction in the fiber reinforced metal matrix composites.

METE 541 Point Defects in Solids (3-0)3
Point defects in stoichiometric crystals. Atomic mobility and diffusion. Nonstoichiometry and defect chemistry. Nonstoichiometric materials containing atoms of variable valence. Nonstoichiometry and conduction in materials containing ions of variable valence. The structures of nonstoichiometric phases.
Prerequisite : Consent of department .

METE 542 Advanced Structural Ceramics (2-2)3
Bonding theories to explain elemental combinations and ceramic structures. Ceramics with the Spinel, Perovskite, Garnet, Magnetoplumbite, Corundum, Rutile, Zircon, Diamond and Fluorite structures. Establishment of structure and property relations. Three cases of structures containing complex ions: Silicates, Germanates and Phosphates. A summary of single crystal growth processes in ceramic materials.

METE 543 Science and Technology of Ceramic Powder Synthesis (2-2)3
Formation and characterization of oxide powders. Formation and characterization of nonoxide and composite powders. Powderless processing. Ceramic shaping processes. Colloidal dispersions, rheology, and shaping processes. Densification and microstructural design. Processing-microstructure-property relations.

METE 544 Properties of Glasses (3-0)3
Composition-structure-property relations in glasses. Chemical properties, Physical properties, Thermal properties, Mechanical properties, Optical properties, Electrical properties; factors affecting these properties. Engineering the factors for specific glass applications. Testing of glassware.
Prerequisite: Consent of the department.

METE 545 Atomistic Computer Modelling of Materials (2-2)3
Theory and application of atomistic computer simulation methods to model, understand, and predict the properties of materials and simulate materials´ behaviour. Introduction to energy models, from emprical potentials to first-principles techniques. Deterministic, stochastic and static approaches for atomistic modelling; Molecular Dynamics (MD), Monte Carlo (MC) and energy minimization methods. Application of these methods to understand, phase transformations, stability, phase diagram determination, atomic transport, order-disorder, defects, interfaces and surfaces.

METE 546 Nanostructured Materials (3-0)3
Introduction to nanometer scale materials; visions in nanoscience and engineering. Different techniques of synthesis for nanostructured materials; Synthesis of nanoparticles, nanotubes/nanowires, nanoscale films and bulk nanoscale materials. Characterization of nanostructured materials by electron microscopy, x-ray diffraction and spectroscopical techniques. Properties of nanostructured materials.

METE 550 Solar Cells (3-0)3
Fundamentals of solar cells. Properties of sunlight, interaction of light with matter. Introduction to semiconductors for solar cell applications, fabrication routes and working principles. Theory of conventional pn junction and excitonic solar cells. Material issues and effect of nanostructures in silicon based, thin film, tandem, dye-sensitized and organic solar cells, including emerging solar cell concepts such as intermediate band and bio-inspired solar cells.

METE 555 Processing and Properties of Nanocomposites (3-0)3
Basic concepts in composite materials science. Fundamentals of nanomaterials and nanocomposites. Ceramic matrix nanocomposites. Metal matrix nanocomposites. Polymer nanocomposites. Processing of nanocomposite materials. Effect of interface on the properties of nanocomposites. Nanocomposites for surface applications. Application-specific nanocomposites. Natural nanocomposites. Biomimetic and bio-inspired nanocomposites.

METE 560 Polymer Nanocomposites (3-0)3
Definition of polymer nanocomposites. Comparison with micro-and macro-scale polymer composites. Types of polymeric matrix materials and nano-particulates used. Importance of interface between matrix and nano-phase. Problems and difficulties in the production methods of polymer nanocomposites. Characterization and testing of polymer nanocomposites. Mechanical behavior, thermal response, flame retardancy, chemical resistance, and electrical-magnetic-optical properties of polymer nanocomposites. Applications and future trends of polymer nanocomposites.

METE 565 Structure of Materials (3-0)3
Concepts of short, medium, long-range order; symmetry operations, symmetry elements, group theory, point groups, space groups, reciprocal lattice; nature and properties of powder diffraction, source of radiation(X-ray, neutron, and electron), powder diffraction data collection; crystal structure solution and refinement from powder diffraction data, Rietveld refinement; diffuse scattering, pair distribution function.

METE 580 Prethesis Seminar (0-2)NC
Students are required to give a seminar on their thesis subject and participate in the discussions of seminars given by others. The seminar should cover such aspects as; aim of the study, a comprehensive literature review and work plan to achive the aim.

METE 590 Seminar (0-2)NC
Each graduate student is required to present objective and scope of his/her thesis subject, and actively participate in the discussions of other students presentations. In addition, presentation of topics of general interest in materials and metallurgical engineering and related fields will be given by staff members and invited speakers.

METE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their first semester while the research program or write-up of thesis is in progress.

METE 7XX Special Topics in Metallurgical and Materials Engineering (3-0)3 or (2-2)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include Recent Advances in Materials Science, Topics in Chemical Metallurgy, Developments in Ceramic Materials, etc.

METE 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

METE 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

DEPARTMENT OF MINING ENGINEERING

PROFESSORS

AROL, Ali İhsan ***(Department Chair)***: B.S., ITU; M.S., Ph.D., University of Minnesota, Minneapolis.
ATALAY, M. Ümit: B.S., M.S., Ph.D., METU.
DÜZGÜN, H. Şebnem: B.S., M.S., Ph.D., METU.
HOŞTEN, Çetin: B.S., M.S., METU; Ph.D., University of California, Berkeley.
KARPUZ, Celal: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

ALTUN, N. Emre: B.S., M.S., Ph.D., METU
BAŞARIR, Hakan: B.S., ITU; M.S., Ph.D., METU
BİLGİN, H. Aydın: B.S., M.S., Ph.D., METU.
DEMİREL, Nuray**:** B.S., M.S., METU; Ph.D., Missouri University of Science and Technology.
ÖZTÜRK, Hasan: B.S., M.S., METU; Ph.D., University of Alberta, Edmonton
TUTLUOĞLU, Levend: B.S., METU; M.S., Ph.D., University of California, Berkeley.

GENERAL INFORMATION: The Mining Engineering at the METU was established in 1960 to promote the development of mineral resources of the country by providing training for the engineers required by the growing mining industry. The curriculum of the four-year bachelor's program in mining engineering is composed of sufficient parts to make the mining engineer be aware of all the facts of his/her job. The graduate program was started in 1960. The department offers both Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in mining engineering.

Mission Statement of the Department: The mission of the Department of Mining Engineering at the Middle East Technical University is to provide education, carry out research, and enlighten the society pertinent to the science and technology of mining engineering to the highest international standards so that the mankind can benefit from non-renewable mineral resources in a safe, economical, efficient, and environmentally and socially acceptable manner.

Vision Statement of the Department: The Department of Mining Engineering at the Middle East Technical University is committed to being an internationally reputable institution, using cutting-edge technologies in education and research; advancing cooperation and collaboration with national and international institutions through student, instructor and researcher exchange programs; strengthening the graduate programs to make the department a base for advance education; bolstering the strong ties with the mineral industry.

Program Educational Objectives: The Mining Engineering Program at METU prepares students for lifetime careers as productive and innovative engineers adaptive to new situations and emerging problems with utmost awareness of ethical, societal and environmental concerns so that, within three to five years after graduation, they will:

1. be preferably employed by leading institutions and companies in mining/mineral processing or related fields in technical, research, safety, or managerial positions,
2. work as leaders or members of teams engaged in multi-disciplinary projects,
3. pursue advanced education and professional training
4. participate in professional and societal activities to serve their profession and the society**.**

Student Outcomes: Upon graduation, the students are expected to acquire the following knowledge, skills, and behavior:

a. Graduates will have an ability to apply knowledge of mathematics, science and engineering.

b. Graduates will have an ability to design and conduct experiments, as well as to analyze and interpret data.
c. Graduates will have an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. Graduates will have an ability to function as leaders or members on multidisciplinary teams as well as to work independently.
e. Graduates will have an ability to identify, formulate, and creatively solve problems in mining engineering practice.
f. Graduates will have an understanding of professional and ethical responsibility
g. Graduates will have an ability to communicate effectively in both English and Turkish.
h. Graduates will have the broad education necessary to understand the impact of mining engineering solutions in a global, economic, environmental, and societal context.
i. Graduates will have recognition of the need for, and an ability to engage in life-long learning.
j. Graduates will have knowledge of contemporary issues related to mining engineering.
k. Graduates will have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ACCREDITATION: The mining engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

RESEARCH INTEREST AND FACILITIES: In order to surmount the mining conditions getting more difficult, and to keep-up with the very fast advancing technology, the graduate level education provided in the Mining Engineering Department is quite dynamic in nature. The graduate program also tends to reinforce the cooperation between the university and industry. In this respect, the engineers working in the industry are encouraged to attend to the graduate program. The research work that they carry out is usually oriented towards solving some of the problems existing in their own establishments.

The following presents a list of major research fields in the Department:

- Mining systems-innovative extraction methods for surface and underground mining of mineral deposits, mining equipment selection, system analysis in mining.
- Rock mechanics-fundamentals of rock mechanics and their application to the design and stability of surface and subsurface structures in rocks,
- Rock penetration and fragmentation,
- Mine mechanization,
- Safety and health management in mining engineering, mine atmosphere, ventilation of underground workings, dust, gas, fires, explosions and mine rescue,
- Mine economics-valuation and investment analysis of mineral properties, forecasting and econometric models of mineral markets,
- Mine closure and reclamation,
- Mineral processing fundamentals-comminution, agglomeration, physical and physicochemical methods of mineral particulate separation, solid-liquid separation methods, applied surface and colloid chemistry in mineral processing,
- Mineral process engineering-mathematical modeling, computer simulation of mineral processes,
- Coal cleaning,
- Solution (chemical) mining,
- Mine closure and reclamation, waste, tailings and effluent management.

Research facilities include the highly sophisticated computer hardware and software and the following laboratories:

Rock Mechanics Laboratory: In the rock mechanics laboratory, which has a close area of 258 m^2 in a separate building, all index and design experiments are conducted on rock material. The necessary test equipment for preparing the sample and conducting the tests are available in the laboratory. In addition to those laboratory test equipment, the laboratory has the necessary equipment for the determination of rock mass

properties such as seismic wave measurement device. The detailed information about the rock mechanics laboratory facilities can be reached from the main page of the department.

Mine Ventilation Laboratory: Mine ventilation laboratory serves in a closed area with 99 m^2 in a separate building to meet the experimental requirements of research and teaching in underground mine ventilation and occupational health and safety management in mining and graduate courses. The laboratory facilities also serve for determination of fan characteristics, psychometric properties of ambient air, calibration of air velocity measurement devices, industrial noise measurement, detection of poisonous gases and dust amount, and pressure drop measurements. The laboratory is equipped with various ventilation instruments such as a fan-testing apparatus with two fan units, conventional, electronic and thermal anemometers, anemometer calibration test unit, gas and dust measurement devices, manometers, and other auxiliary equipment such as pitot tube, altimeter, hygrometer, psychrometer, and counter microscope.

M**ine Surveying Laboratory:** The surveying laboratory has levels, theodolites, plane tables and a total station for field measurements.

Mine Mechanization Laboratory: Mine Mechanization Laboratory contains cone indenter, shore sclerescope, rock cutting set-up including planer, force dynamometer, carrier amplifier, U.V. recorder, precise electronic balance. These equipment are used for conducting cone indenter and shore sclerescope tests to estimate the compressive strength and the cuttability of rocks, direct cutting test to determine the cutting specific energy.

Mineral Processing Laboratory: This laboratory is housed in two separate buildings, namely, the mineral process unit operations building (245 m^2 floor space) and the instrumental analysis building (28 m^2 floor space). The laboratory serves for instruction and research. Experimental work relating to sampling, crushing, grinding, screening, classification, gravity separation, magnetic and electrostatic separations, flotation, filtration, agglomeration, and leaching is carried out in the unit operations laboratory. The instrumental analysis laboratory is equipped with chemical analysis and material characterization instruments such as wet chemical analysis equipment, atomic absorption spectrometer, XRF spectrometer, TGA/DTA, goniometer, surface tensiometer, viscometer, BET surface area instrument, zetameter, mineralogical microscope.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
MATH	119	Calculus with Analytic Geometry	(4-2)5	MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	105	General Physics I	(3-2)4	PHYS	106	General Physics II	(3-2)4
CHEM	111	General Chemistry I	(3-2)4	CHEM	112	General Chemistry II	(3-2)4
ME	105	Engineering Graphics	(2-2)3	MINE	102	Introduction to Mineral Industries	(2-0)2
ENG	101	English for Academic Purposes I	(4-0)4	ENG	102	English for Academic Purposes II	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC				

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
ES	225	Engineering Mechanics	(4-0)4
ECON	210	Principles of Economics	(3-0)3
GEOE	207	Principles of Mineralogy and Petrography	(2-2)3
GEOE	231	Elements of Geology	(3-0)3
MINE	201	Underground Mining	(3-0)3
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

ES	224	Strength of Materials	(3-0)3
CENG	230	Introduction to C Programming	(2-2)3
GEOE	215	Principles of Structural Geology	(2-2)3
MINE	202	Surface Mining	(3-0)3
ENG	211	Academic Oral Presentations Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC
Non-Technical Elective			

THIRD YEAR

Fifth Semester

ES	303	Statistical Methods for Engineers	(3-0)3
ME	351	Thermodynamics of Heat Power	(3-0)3
MINE	309	Mineral Processing I	(2-2)3
MINE	317	Introduction to Rock Mechanics	(2-2)3
TURK	303	Turkish I	NC
MINE	300	Summer Practice I	NC
Free Elective			
Non-Technical Elective			

Sixth Semester

CE	374	Fluid Mechanics	(3-0)3
MINE	302	Mine Power and Machinery	(2-0)2
MINE	310	Mineral Processing II	(2-2)3
MINE	312	Mine Surveying	(2-2)3
MINE	324	Rock Fragmentation	(3-0)3
MINE	332	Mine System Analysis	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

MINE	407	Mine Valuation	(2-2)3
MINE	417	Mine Ventilation	(2-2)3
MINE	419	Materials Handling and Mine Transport	(3-0)3
MINE	427	Mineral Processing Design	(2-2)3
MINE	400	Summer Practice II	NC
Technical Elective*			
Technical Elective			

Eighth Semester

MINE	416	Mine Design	(1-4)3
MINE	420	Mine Environment and Safety	(2-0)2
MINE	430	Ethics in Engineering	(1-0)1
Technical Elective			
Technical Elective			

All elective courses are minimum 3 credits.
* One of the technical elective courses will be taken in one of the other departments of faculty of engineering.

DOUBLE MAJOR PROGRAM IN MINING ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the consent of the department.

MINOR PROGRAM IN ROCK MECHANICS

In recent years, rock mechanics is widely utilized in various areas outside the mining engineering, such as tunneling, rock foundations, dam construction, highways, deep drilling, underground storage of nuclear waste, natural gas, underground civil and defense structures like parking areas, subway stations, sports center. The main purpose of this program is to provide the successful and motivated students with a broad knowledge of rock mechanics which will enable them to practice their profession in an interdisciplinary manner. The program is composed of rock mechanics principles and its application to surface and subsurface structures in rock.

Compulsory Courses

MINE	317	Introduction to Rock Mechanics	(2-2)3
MINE	324	Rock Fragmentation	(3-0)3
MINE	421	Applied Rock Mechanics: Surface Structures	(3-0)3
MINE	446	Applied Rock Mechanics: Underground Structures	(3-0)3

Two of the following courses

MINE	201	Underground Mining	(3-0)3
MINE	202	Surface Mining	(3-0)3
GEOE	215	Principles of Structural Geology	(2-2)3

MINOR PROGRAM IN MINERAL TECHNOLOGY

Use of mineral raw materials has been steadily increasing in quantity and quality since the beginning of the industrial revolution. This increase will continue in the foreseeable future with more emphasis on the quality because of the growing environmental concerns. This program will help the students to get an understanding of how minerals are produced and processed. With this understanding, students of other disciplines will become better equipped to evaluate ore deposits, to extract metals from ores, to safely dispose waste, etc.

Compulsory Courses

MINE	202	Surface Mining	(3-0)3
MINE	309	Mineral Processing I	(2-2)3
MINE	310	Mineral Processing II	(2-2)3
MINE	407	Mine Valuation	(2-2)3
MINE	417	Mine Ventilation	(2-2)3
MINE	419	Materials Handling and Mine Transport	(3-0)3

DESCRIPTION OF UNDERGRADUATE COURSES

MINE 102 Introduction to Mineral Industries (2-0)2
Basic concepts of the mineral industry. Mining terminology. Basic exploration, development, production and concentration methods. Mine valuation. A brief knowledge of mine haulage, mine explosives, mine supports, mine plants and equipment. Mine ventilation, lighting, drainage. Subjects are given to prepare the students for advanced courses.

MINE 201 Underground Mining (3-0)3
Mine development procedure and equipment. Factors affecting the choice of a method. Underground metal and coal mining methods. Supports and exploitation machinery. One or two visits to operating underground metalliferous or coal mines will be made and reports about visits will be prepared.

MINE 202 Surface Mining (3-0)3
Emphasis is given to surface mining methods applied to coal seams and metalliferous deposits. Cut-off limits. Factors affecting selection of mining methods. Types of machinery used in modern mining operations. Equipment selection techniques.

Sample problem solutions. One or two visits to operating surface metalliferous or coal mines will be made, reports about visits will be prepared.

MINE 300 Summer Practice I NC
A minimum of 4 weeks (20 working days) of practical training in an area where unit operations of mining engineering are performed. With the prior approval of the summer practice sites by the department, student complete their training at one of the following areas: Underground mining, surface mining, mineral processing or any related operations.

MINE 302 Mine Power and Machinery (2-0)2
Engineering principles and applications of electrical power, compressed air, hydraulic systems as utilized in mining with design of systems.
Prerequisite: PHYS106

MINE 309 Mineral Processing I (2-2)3
Objectives and scope of mineral processing, Preparation of ores for concentration (ore handling, comminution, screening and classification), Metallurgical accounting.

MINE 310 Mineral Processing II (2-2)3
Methods of separation. Principles and equipment used in the beneficiation processes such as ore sorting, gravity concentration, heavy medium separation, froth flotation, magnetic and electrostatic separation. Thickening and filtration. Visit to an operating concentration plant.

MINE 312 Mine Surveying (2-2)3
Measurement of horizontal distances, angles and directions. Theodolite surveying. Surface and underground traversing, triangulation. Correlation of surface and underground surveys. Differential and profile leveling. Cross-sections and volume calculations. Underground leveling. Area with planimeter. Setting out curves, direction and gradients. Dip and fault problems. Shaft pillar calculations.

MINE 317 Introduction to Rock Mechanics (2-2)3
Stress and strain analysis. Introductory elasticity. Mechanical behavior of rock and rock masses. Rock testing. Discontinuity deformation and slip. Failure; in-situ state of stress. Stresses around underground openings; rock mass classification. Support design.
Prerequisite: ES 224.

MINE 324 Rock Fragmentation (3-0)3
Principles of rock penetration. Rock-bit interactions. Indentation and dragging. Specific energy. Prediction of penetration rate. Types of drilling and drill-bits. Machine selection. Theory of rock fragmentation by explosives. Commercial explosives, properties and selection. Initiating systems. Surface and underground blast design. Estimation of costs. Environmental effects of blasting.
Prerequisite: MINE 317

MINE 332 Mine System Analysis (3-0)3
An introduction to the system analysis. Concepts and methods of system analysis organized around decision-making situations encountered in the mining industry.
Prerequisite: MATH 219

MINE 400 Summer Practice II NC
This is a complementary course to MINE 300. Students are required to complete MINE 400 in a professional area not covered in MINE 300. A minimum of 4 weeks (20 working days) of practical training in an area where unit operations of mining engineering are performed. With the prior approval of the summer practice sites by the department, students complete their training at one of the following areas: underground mining, surface mining, mineral processing or any related operations.

MINE 407 Mine Valuation (2-2)3
Concept of mine valuation, appraisal and feasibility. Mineral inventory and reserve estimation. Revenue and cost concepts and procedures in the mineral industry. Economic evaluation techniques and depletion, taxation, inflation and finance for mining investment proposals.

MINE 413 Tailings and Effluent Management (3-0)3
Introduction to legal requirements for tailings and effluent disposal. Characterization of tailings. Tailings disposal methods. Tailings embankment design. Effluent treatment methods, acid mine drainage management.

MINE 415 Beneficiation of Industrial Minerals (3-0)3
Uses, specifications, preparation and benefication of industrial minerals and rocks. Development of flowsheets and equipment used in the beneficiation processes.

MINE 416 Mine Design (1-4)3
Each group of students will be given a metallic or nonmetallic deposit and requested to characterize the deposit, estimate the reserves, select a mining method, determine a mining layout, schedule the production, select the equipment, design the

support, blasting, transportation, ventilation, and water drainage systems, prepare a layout for surface plants, and conduct an economic feasibility analysis. *Prerequisite: MINE201, MINE202, MINE324, MINE407, MINE417, MINE419.*

MINE 417 Mine Ventilation (2-2)3
Purpose and historical review of mine ventilation. Review of some elementary thermodynamics. Brief information about psychrometry. Airflow through roadways and ducts. Mechanical ventilation, fans. Natural ventilation, ventilation layout and network analyses. Ventilation surveys and measurements. Auxiliary ventilation. Planning and economics of mine ventilation.

MINE 419 Materials Handling and Mine Transport (3-0)3
Mass transport systems in mining. Fundamentals of pressurized fluid flow. Slurry transportation and design concepts. Principles of in-pit crushing-conveying systems; mine locomotives, hoists, rope haulage systems and their design.

MINE 420 Mine Environment and Safety (2-0)2
Classification, causes and prevention of mine accidents. Mine fire, coal and gas explosions. Mine dust and gases. Occupational diseases. First aid and rescue operations. Safety organization and training. Noise, illumination, radiation, diesel emission, and heat in mines. Methane drainage.

MINE 421 Applied Rock Mechanics: Surface Structures (3-0)3
Discontinuity survey and hemispherical projection. Kinematic analysis. Shear behavior of joints. Rock slope stability analysis for plane, wedge and toppling failures. Stability of blasted rock and waste dumps. Slope monitoring and stabilization. Surface loads on discontinuous rocks and bearing capacity.

MINE 424 Project Management in Mining (3-0)3
Basic economical concepts in investment projects. Planning, Project statistics, Forecast for demand, computation of project cost. Quick means of calculation of capital investment cost. Determining the cost of materials to be produced. Project implementation (time planning, CPM, PERT). Management decision making, the executive roles of manager, managerial economics.

MINE 425 Reclamation and Mine Closure (3-0)3
The need for protection of lands disturbed by mining. Planning of a reclamation program. Laws and regulations. Techniques of reclamation. Public opinion. Monitoring and control. Cost of reclamation. State of mine-environmental protection and reclamation in Turkey. Guidelines for successful reclamation practices, mine closure plan technology and management.

MINE 427 Mineral Processing Design (2-2)3
A course concerned with the appraisal of ores and the methods of separation in terms of technical and economic requirements. Ore testing procedures. Development and quantification of process flowsheets. Equipment selection and sizing. Cost estimation and economic evaluation. Laboratory and classroom studies on specific problems will be carried out as individual or group projects.
Prerequisite: MINE309, MINE310.

MINE 430 Ethics in Engineering (1-0)1
Engineering ethics and philosophy, theories about morality, dilemmas, codes of ethics. Mining law.

MINE 432 Mine Management (3-0)3
The theory and practice of mine management, including the managerial functions, organization, MIS, decision making.

MINE 438 Introduction to Coal Technology (3-0)3
Origin of coal. Composition and origin of mineral matter in coal. Classification of coals. Coal petrography. Physical properties of coal. Fine and coarse size cleaning of coal. Physical desulphurization of coal. Coal blending. Agglomeration of coal fines. Analysis of coal.

MINE 446 Applied Rock Mechanics: Underground Structures (3-0)3
Field tests and measurements. Numerical modeling techniques. Discontinuities and underground structures. Rock bursts. Stability of stopes, pillars, mine roadways, and longwall faces. Rock-support interaction analysis. Rock support and reinforcement. Subsidence.

MINE 447 Occupational Health and Safety (3-0)3
Legal aspects of labor protection, safety laws and regulations. Ergonomics approach to health and safety. Industrial environment. Statistical and economical analyses using accident injury experience data, cost of accident, modern accident preventing techniques, human factor in health and safety, industrial training.

MINE 448 Life Cycle Assessment in Mining Engineering (3-0)3

Introduction to the concept of Life Cycle Assessment (LCA) in Mining Engineering; History and development of LCA methodologies and standards; Stages of LCA analysis: goal definition, scoping, inventory assessment, impact analysis, improvement analysis, reporting; Sources of data, boundary selection and uncertainty; Relationship between LCA, mining design for environment and other environmental management tools.
Prerequisites: ES 303.

MINE 490-498 Special Topics in Mining Engineering (3-0)3

These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF MINING ENGINEERING

GRADUATE CURRICULUM

M.S. in Mining Engineering

MINE	500	M.S. Thesis	NC
MINE	590	Graduate Seminar	(0-2) NC

7 elective courses*

Total minimum credit: 21
No of courses with credit (min): 7

Ph.D. in Mining Engineering

MINE	600	Ph.D. Thesis	NC

7 elective courses**

Total minimum credit: 21
No of courses with credit (min): 7

* At least 4 of them should be MINE graduate courses

** At least 3 of them should be from graduate courses outside the department

GRADUATE COURSES

MINE	500	M.S. Thesis	NC
MINE	501	Advanced Mining Practice I	(3-0)3
MINE	502	Advanced Mining Practice II	(3-0)3
MINE	505	Advanced Mine Environment	(2-2)3
MINE	507	Air Conditioning and Refrigeration	(3-0)3
MINE	508	Tunneling	(3-0)3
MINE	509	Use of Bacteria in Mineral Processing	(2-2)3
MINE	510	Mineral Processing Plants of Turkey	(3-0)3
MINE	513	Advanced Flotation	(3-0)3
MINE	514	Advances in Mineral Processing	(3-0)3
MINE	515	Particle Characterization	(3-0)3
MINE	516	Coal Preparation	(3-0)3
MINE	517	Mineral Process Engineering Analysis	(3-0)3
MINE	518	Interfacial Phenomena in Mineral Systems	(3-0)3
MINE	519	Theory of Rock Penetration and Fragmentation	(3-0)3
MINE	520	Occurrence, Flow and Drainage of Methane	(3-0)3
MINE	521	Chemistry of Mineral-Water Systems	(3-0)3
MINE	522	Chemical Mining	(3-0)3
MINE	524	Design of Underground Rock Structures	(3-0)3
MINE	525	Field Measurements in Rock Mechanics	(2-2)3
MINE	526	Fundamentals of Theoretical Rock Mechanics	(3-0)3
MINE	527	Rock Mechanics for Civil Engineers	(3-0)3
MINE	528	Instrumental Tech. in Mineral Processing	(2-2)3
MINE	533	Advanced Theoretical Rock Mechanics	(3-0)3
MINE	536	Rock Mechanics Instrumentation	(2-2)3
MINE	537	Strata Control Engineering	(3-0)3
MINE	538	Rock Slope Stability	(3-0)3
MINE	539	Stereographic Project Meth. in Rock Mechanics	(3-0)3
MINE	543	Monitoring and Control in Mining Engineering	(3-0)3
MINE	545	Dynamic Rock Mechanics	(3-0)3
MINE	551	Int. to O.R. Tech. for Mining Engineers	(3-0)3
MINE	552	Numerical Methods in Rock Mechanics	(2-2)3
MINE	555	Advanced Mine Safety and Health Management	(3-0)3
MINE	556	Economic Analysis for Mineral Industries	(3-0)3
MINE	565	Mining Geostatistics	(3-0)3
MINE	567	Probabilistic O.R. Models in Mining	(3-0)3
MINE	568	Mine Systems Simulation	(3-0)3
MINE	578	Mineral Economics	(3-0)3
MINE	590	Graduate Seminar	(0-2)NC
MINE	600	Ph.D. Thesis	NC
MINE	7XX	Special Topics in Mining Engineering	(3-0)3

MINE 8XX Special Studies (4-2)NC MINE 9XX Advanced Studies (4-0)NC

DESCRIPTION OF GRADUATE COURSES

MINE 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their **first** semester while the research program or write-up of thesis is in progress. (F&S)*

MINE 501 Advanced Mining Practice I (3-0)3
A detailed study of mining methods, rock mechanics approaches for underground mining. Rock failure. Rock bursts. Supports. Ground control. Development and stope planning. (F)

MINE 502 Advanced Mining Practice II (3-0)3
Recent developments in underground and surface mining. Mine design. Equipment selection. Mine planning and scheduling. Case studies. (S)

MINE 505 Advanced Mine Environment (2-2)3
Advanced study of network analysis techniques, computer programming applications. Mine ventilation planning and economics. Remote control system in mine ventilation. Sources of heat and moisture in mines. The physiological and psychological effects of heat acclimatization, heat stress, heat stroke etc. (F)

MINE 507 Air Conditioning and Refrigeration (3-0)3
Study of properties of air and vapor mixtures. Psychrometric charts. Graphical representation of psychrometric processes. Thermodynamic approach to mine ventilation. The complete ventilation cycle. Refrigeration in mines. Refrigeration systems, cooling towers. (F)

MINE 508 Tunneling (3-0)3
Design approaches in tunneling. Support systems. Rock-support interactions. Excavation methods. Portal design. Pressure tunnels in porous rocks. Highway, mine and railroad tunnels; case histories. (S)

MINE 509 Use of Bacteria in Mineral Processing (2-2)3
Bacterial leaching. Preparation of ores, growing and inoculation of bacteria, leaching techniques, parameters in bacterial leaching. Recovery of metals from leach liquors. Seminars on selected topics by students. (F)

MINE 510 Mineral Processing Plants of Turkey (3-0)3
Selected mineral processing plants in Turkey. History of development, feasibility studies, flowsheets of the plants. Field trips to the plants sites. Problems of industrially operated mineral processing plants. (S)

MINE 513 Advanced Flotation (3-0)3
Phases in flotation. Binding, adsorption at solid and liquid surfaces. Electrical properties of surfaces in relation to flotation. Classification of flotation reagents and their uses. Detailed information for the flotation of sulfides, oxides, silicates and non-polar minerals. (F)

MINE 514 Advances in Mineral Processing (3-0)3
Development of new methods and equipments for treatment of ores; e.g., selective flocculation and flotation, progress in magnetic separation. Seminars by students on selected topics in advanced treatment of ores. (S)

MINE 515 Particle Characterization (3-0)3
Discussion of the methods of particle size measurements. The measurement of the surface area of particulate assemblages. The characterization of particle shape. (F)

MINE 516 Coal Preparation (3-0)3
Properties of coal and impurities in relation to preparation. Sampling of coal. Coal characteristics and their relationship to utilization. Washability studies and evaluation of coal for different uses. The economics of coal preparation. Raw coal handling, breaking and crushing. Screening, wet concentration methods of coarse coal. Dry concentration. mechanical and thermal dewatering. (F)

MINE 517 Mineral Process Engineering Analysis (3-0)3
Statistical techniques for process analysis. Development and analysis of empirical and mechanistic models of unit operations in mineral processing. Material balancing. Process analysis by computer simulation. (F)

MINE 518 Interfacial Phenomena in Mineral Systems (3-0)3
Application of surface and colloid chemistry to mineral processing systems. Surface and interfacial tensions, thermodynamics of surfaces, adsorption from solution, wetting. The electrical double layer

and electrokinetic phenomena. Colloidal systems, van der Waals attraction, mechanisms and kinetics of coagulation and flocculation. (S)

MINE 519 Theory of Rock Penetration and Fragmentation (3-0)3
An advanced study of the theories of rock penetration including percussion, rotary and rotary-percussion drilling and rock fragmentation including explosives and the theories of rock blasting practice in mines, pits and quarries. (F)

MINE 520 Occurrence, Flow and Drainage of Methane (3-0)3
The origin of occurrence of methane in coal measures. Theories on the retention and flow of methane in porous permeable media. Internal structure of strata around working coal seams and the effects of mining and geological factors on methane flow. Theories and methods on the prediction of methane flow and applications of methane drainage; sudden outburst of gas. (S)

MINE 521 Chemistry of Mineral-Water Systems (3-0)3
A review of chemical thermodynamics. Ionic activity coefficient. Equilibrium constants. Hydrolysis, precipitation and dissolution in mineral process aqueous systems. Principles of electrochemistry construction and use of Eh-pH diagrams. Aqueous corrosion. (F)

MINE 522 Chemical Mining (3-0)3
Theoretical and practical aspects of extracting ores under in-situ environments regarding mining economics and ore evaluation. Elements of leaching phase, including mining preparation of ores. Practical aspects of in-situ leaching. Reagents and their regenerations and recovery of metals from leach liquor. Classroom studies on specific problems as individual or group projects. (S)

MINE 524 Design of Underground Rock Structures (3-0)3
Basic design concepts. Design of tunnels and large underground excavations such as underground rooms, water treatment plants, civil defense chambers, hydraulic power stations, sports and public facilities and factories. (S)

MINE 525 Field Measurements in Rock Mechanics (2-2)3
In-situ strength, deformation and stress, measurement of permeability, ground water. Pressure instrumentation and monitoring techniques used in tunneling. Large underground excavations, Slopes, open pits and underground mines. measurement of accelerations due to large blasts or earthquakes. (F)

MINE 526 Fundamentals of Theoretical Rock Mechanics (3-0)3
Direction cosines and stresses on discontinuity planes from geological data. Boundary value problems and elasticity solutions in rock mechanics. Anisotropic elasticity and determination of elastic constants for discontinuous rocks. Computer applications in determining stresses and deformations around underground openings in discontinuous rock. (S)

MINE 527 Rock Mechanics for Civil Engineers (3-0)3
Rock properties and constitutive behaviour. Anisotropy and rock strength. Constitutive behaviour of rock discontinuities. Analytical and numerical modeling of mechanical behaviour of rock and discontinuities. Failure around large underground chambers and tunnels. Effects of rock discontinuities and pore pressure. Rock foundations, stability of foundations on jointed and bedded rock. (F)

MINE 528 Instrumental Tech. in Mineral Processing (2-2)3
Principles, methods and applications of several instruments of mineral processing. Electrophoresis, goniometer, surface tensiometer, Hallimond tube, BET apparatus, specific surface area measurements. (S)

MINE 533 Advanced Theoretical Rock Mechanics (3-0)3
Analysis of stress and strain. Linear elasticity. Hollow cylinders of rock with internal and external pressure. Stresses around circular holes. Theory of rock stress and deformability measurements in boreholes. Stresses applied to the surface of a solid cylinder. Surface loads on a semi-infinite region. Strain energy, energy release theories and rock bursts; mechanics of hydraulic fracturing in rock. (F)

MINE 536 Rock Mechanics Instrumentation (2-2)3
Mechanical measuring systems. Electrohydraulic testing machine. Electronic measuring systems.

Mechanical and electromechanical transducers. Signal conditioning and readout systems. Basic, analog and digital data monitoring systems. Design and calibration of load and deformation measuring devices. Design of underground measuring systems. (S)

MINE 537 Strata Control Engineering (3-0)3
Strata control practice and design. Evaluation of rock mass behaviour in underground openings; design of mine shafts and mine pillars, support design in mine roadways and longwall faces. Design projects and presentations. (F)

MINE 538 Rock Slope Stability (3-0)3
Economic and planning considerations. Basic mechanics of slope failure. Geological data collection and graphical presentation of this data. Shear strength of rock. Ground water flow, permeability and pressure. Plane failure. Wedge failure. Toppling failure. Miscellaneous topics. (S)

MINE 539 Stereographic Project. Meth. in Rock Mech. (3-0)3
The principle of stereographic projection. Polar and equatorial projection. Basic procedures using stereographic projection. Analysis of borehole data. Analysis of rigid blocks by inclined stereographic projection methods. Analysis of the stability of rigid blocks. (F)

MINE 543 Monitoring and Control in Mining Eng. (3-0)3
Sensing and transducers. Development and transfer functions. Microprocessor sensors-analysis, design and specifications. Signal conditioning and processing.. Data and voice communication; process control in mineral processing plants. Strata control monitoring systems. Ventilation and environmental monitoring systems. Artificial intelligence and robotics; case studies. (S)

MINE 545 Dynamic Rock Mechanics (3-0)3
Propagation of elastic waves in a medium; mechanics of drilling and blasting. Determination of dynamic rock properties. Theoretical and experimental results.(F)

MINE 551 Introduction to O.R. Tech. for Mining Engineers (3-0)3
An introduction to basic operational research methodology through a survey of basic models such as linear programming. Applicability of these models to mining engineering problems. (F)

MINE 552 Numerical Methods in Rock Mechanics (2-2)3
Elasticity and singular solutions. Fictitious stress method, displacement discontinuity method, direct boundary integral method. Program modules for inhomogeneous and anisotropic rocks, crack propagation in rock fragmentation, and bearing capacity analysis. Mohr-Coulomb elements and simulation of discontinuity slip and separation. (S)

MINE 555 Advanced Mine Safety and Health Management (3-0)3
History and overview of mine health and safety; industrial hygiene in mining; control of respirable dust; noise; ground control issues for safety professionals; mine fires and explosions; mining with explosives; haulage; electrical safety; emergency preparedness and response; job safety analysis, task analysis and observation; safety communications; incident reporting and analysis; management strategy and system for education and training and engineering for health and safety in mining. (R)

MINE 556 Economic Analysis for Mineral Industries (3-0)3
Methods for short and long term forecasting applied to mineral industries. Trend analysis. Simple econometric models. Exponential smoothing and input-output analysis. Case studies. (S)

MINE 565 Mining Geostatistics (3-0)3
The theory of spatially correlated random variables and variogram functions. Minimum variance unbiased estimation (kriging) to solve decision making problems in exploration, resource evaluation, and production. Each student is given a simulated deposit and required to calculate the reserves and prepare a production plan using geostatistics. (F)

MINE 567 Probabilistic O.R. Models in Mining (3-0)3
Queuing theory, inventory theory, Markovian decision processes, reliability, decision analysis and introduction to simulation. Application in mining. (F)

MINE 568 Mine Systems Simulation (3-0)3
Systems, models, and nature of simulation. Discrete-event, continuous, combined discrete-continuous, and Monte Carlo simulation. Simulation languages. Simulation of inventory and single-server queuing systems. Extension to multi-server systems in mining. Selecting input probability distributions. Output data analysis. Validation. (S)

MINE 578 Mineral Economics (3-0)3
Mineral supply, mineral industry demands and general market equilibrium, functions and structure of the mineral industry, international trade of minerals, economics of the important minerals of Turkey. (S)

MINE 590 Graduate Seminar (0-2)NC
Papers prepared and presented by graduate students on topics of general interest in their fields. Each paper is followed by a round table discussion participated by students and members of faculty. (F&S)

MINE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their first semester while the research program or write-up of thesis is in progress. (F&S)

MINE 7XX Special Topics in Mining Engineering (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include mining systems, rock mechanics, mine environment, mine mechanization, mine economics, mineral processing. (R)

MINE 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor. (F&S)

MINE 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor. (F&S)

* F: Fall, S: Spring A: Alternate years, R: Upon request, WE; Wide elective.

DEPARTMENT OF PETROLEUM AND NATURAL GAS ENGINEERING

PROFESSORS

AKIN, Serhat: B.S., M.S., Ph.D., METU.
KÖK, V. Mustafa: B.S., M.S., Ph.D., METU.
MEHMETOĞLU, M. Tanju ***(On Leave)***: B.S., METU; M.S., Manchester University; Ph.D., Mc Gill University.
PARLAKTUNA, Mahmut ***(Department Chair):*** B.S., M.S., Ph.D., METU.

ASSISTANT PROFESSORS

DURGUT, İsmail ***(Vice Chair)***: B.S., M.S., Ph.D., METU.
SINAYUÇ, Çağlar ***(Vice Chair)***: B.S., M.S., Ph.D., METU.

GENERAL INFORMATION: In the development of primary sources for energy, petroleum and natural gas occupy an important place. The engineering field concerned with exploration, drilling and production of oil and gas requires knowledge of basic sciences (physics, mathematics, chemistry and geology), and rapidly growing technology forces engineers to become acquainted with recent subjects such as shale gas, shale oil, gas hydrates. In the Petroleum and Natural Gas Engineering Department, undergraduate education is aimed at equipping the students with the knowledge of basic sciences as well as with the tools of rapidly growing technology.

MISSION OF THE DEPARTMENT: The mission of Petroleum and Natural Gas Engineering Department is to educate students for the practice of their profession in drilling, production and reservoir engineering topics for underground fluid resources and, for the advancement of knowledge and technology that form the basis of petroleum engineering as well as for finding solutions to the national, international, societal and environmental issues related to petroleum industry.

PROGRAM EDUCATIONAL OBJECTIVES: The following program objectives are expected to be achieved within a few years after graduation by the graduates of Middle East Technical University Petroleum and Natural Gas Engineering program. They:

- are preferred by major national and international companies as successful Petroleum Engineers to take part in development and production activities of underground energy sources including oil and natural gas, geothermal, shale gas and coal gas.
- reach the managerial positions in the national and international organizations where they serve at active and policy-maker positions.
- have successful academic career at Petroleum Engineering departments in the academia.
- carry on successful tasks at the other sectors of the industry such as research and development, transportation, supervising, marketing and sales.

STUDENT OUTCOMES: The following outcomes are expected to be gained by the graduates of Middle East Technical University Petroleum and Natural Gas Engineering program upon their graduation:

- Having knowledge of basic mathematics and physical sciences up to the mark of professing engineering.
- Having knowledge of Petroleum Engineering up to the mark of professing any of the three main branches of the Petroleum Engineering which are Reservoir Engineering,Production Engineering and Drilling Engineering.
- Reaching to a critical reasoning level at which s/he can apply,analyse and evaluate the basic engineering and petroleum engineering knowledge that s/he has.
- Having the sufficient knowledge for recognizing and portraying the possible problems that s/he may face during professing and having skills of improving stratgies to handle with these problems.

- Possessing of reaching to new information, interpretation of that information and self perpetuation ability that is required by their ever-growing, changing job and by disciplinary and interdsiciplinary studies in which they can be included.
- Self-perpetuation by continuous learning habit upon their strong basic engineering knowledge that they gained during their education.
- Being at the professional perfection for self-working as well having an ability of working with a team harmonazingly.
- Having necessary qualifications for taking responsibility individually or as a member of a team, guiding and collimating when a task is assigned or when needed.
- Consciousness of necessity of sharing the acquired craft knowledge and experience with others and being up to use communication methods and instruments for actively sharing that knowledge and experience.
- Regarding not only the professional marks and earnings but also the society and environment during solving of professional problems.
- Paying attention to ethical values and codes of conduct both in professional and social life.
- Evaluating the encountered problems not only from engineering perspective but also from social,environment and ethical perspectives and searching for and applying realistic solutions to them by these criterias into account.

RESEARCH INTERESTS AND FACILITIES: Research activities in Petroleum and Natural Gas Engineering Department may be broadly categorized as follows: rheological modeling of drilling fluids; environmental effects of drilling and production activities; geo statistical methods, fractal mathematics and artificial intelligence methods, underground storage of natural gas; CO_2 sequestration, enhanced oil recovery techniques; geothermal reservoir engineering; natural gas hydrates; bioremediation; scaling in geothermal waters; reservoir modeling.

The Petroleum and Natural Gas Engineering Department has the following laboratories for training and research as well as a machine shop.

- Undergraduate Laboratories:
    - Rock Properties Laboratory: This laboratory is intended to familiarize students with the fundamental properties of reservoir rock such as porosity, permeability, fluid saturation, electrical properties and mechanical properties.
    - Fluid Properties Laboratory: Fluid properties such as API gravity, viscosity, surface and interfacial tension, pH, refractive index, and vapor pressure analysis are performed in this laboratory. Distillation of crude oil, chromatographic analysis of natural and condensates are also studied.
    - Drilling Fluid Laboratory: Evaluation of the yield points of the various bentonites, filtration properties, solids analysis, drilling fluid contamination and property changes, viscosity and rheological properties are the main items studied in this laboratory.
    - Fluid Mechanics Laboratory:
- Graduate Laboratories:
    - PVT Laboratory: Pressure, volume, and temperature relations of field hydrocarbons can be studied in this laboratory for graduate level research. Hydrocarbon properties such as bubble and dew point curves, critical temperature and pressure, and viscosity as a function of temperature or pressure are determined and flash vaporization analysis can be performed.
    - Thermal Characterization Laboratory: Combustion and pyrolysis behavior of various hydrocarbons are investigated in this laboratory.
    - Flow Loop
    - Enhanced Oil Recovery Laboratory: This laboratory is equipped with linear and three-dimensional fluid injection models for undergraduate and graduate level researches. Different techniques of steam injection, in-situ combustion reaction kinetics and microbial EOR can be investigated for heavy crude oils or oil shales. In addition, CO_2 flooding, polymer injection, surfactant and micellar flooding fundamentals and applications to different crude oils in carbonate rocks are investigated.

Department has two computer laboratories which include over 20 personal computers connected to the Department LAN. The students are introduced to the use of computers in their first year through Computer Aided Engineering Graphics (ME 105) and Information Technologies (IS 100) courses, and are constantly involved in computer oriented education and practice throughout their undergraduate study. Several commercial softwares with their educational licenses are available.

UNDERGRADUATE PROGRAM: The four year undergraduate education program is designed so that the first two years are devoted to basic engineering courses while the courses related to petroleum engineering are mainly taught during the senior year. Two compulsory cap-stone design courses (PETE 417 and 418) are the culminating feature of the program. Groups of five students tackle with design problems which include reserve estimation, well design, enhanced oil recovery applications, storage and transportation system designs as well economic analysis.

A total of eight weeks of summer practice is obligatory to fulfill the requirements for the B.Sc. degree. The first 4 weeks are preferred to be in drilling operations after the second year, while the second half is for production and for reservoir engineering after the third year of undergraduate education.

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAMS: Like all the other engineering disciplines, Petroleum and Natural Gas Engineering Undergraduate Education can only provide the students with the fundamental knowledge, selected from a wide range of subjects, all of which are highly important in Petroleum and Natural Gas Engineering practice. It is quite unfortunate that later in their professional life, graduates from petroleum engineering departments all over the world have to cope with problems with this limited knowledge which is often in the form of fundamental theory. Graduate programs are very useful not only for the specialization necessary to handle specific problems that are encountered in industry, but also for providing the skills that are required to follow the technological innovations in the field of Petroleum and Natural Gas Engineering.

In the light of these necessities, the objectives of the graduate program in Petroleum and Natural Gas Engineering can be summarized as providing the specialization in the fields of Drilling, Production and Reservoir Engineering, Enhanced Oil Recovery, Natural Gas Engineering and Geothermal Energy, and also developing the skills of analysis and synthesis necessary for initiating and conducting research and development activities. The latter is of primary importance for a country like Turkey who wants not only to catch-up with the technological developments in the modern world but also to produce know-how.

CAREER OPPORTUNITIES: The graduates of the department are employed in various public and private companies as well as in universities both in Turkey and abroad.

The Petroleum and Natural Gas Engineering undergraduate program was accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

CURRICULUM

FIRST YEAR

First Semester

MATH	119	Calculus with Analytic Geometry	(4-2)5
PHYS	105	General Physics I	(3-2)4
CHEM	111	General Chemistry I	(3-2)4
ME	105	Computer Aided Engineering Graphics	(2-2)3
ENG	101	English for Academic Purposes I	(4-0)4
IS	100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH	120	Calculus for Functions of Several Variables	(4-2)5
PHYS	106	General Physics II	(3-2)4
CHEM	112	General Chemistry II	(3-2)4
PETE	110	Introduction to Petroleum Engineering	NC
ENG	102	English for Academic Purposes II	(4-0)4
CENG	230	Introduction to C Programming	(2-2)3

SECOND YEAR

Third Semester

MATH	219	Introduction to Differential Equations	(4-0)4
ES	202	Mathematics for Engineers	(3-0)3
PETE	220	Reservoir Rock Properties	(2-2)3
ES	221	Engineering Mechanics I	(3-0)3
GEOE	201	General Geology	(3-2)4
HIST	2201	Principles of Kemal Atatürk I	NC

Fourth Semester

ES	224	Strength of Materials	(3-0)3
CHE	204	Thermodynamics I	(4-0)4
PETE	211	Introduction to Fluid Mechanics	(3-2)4
PETE	218	Reservoir Fluid Properties	(2-2)3
ENG	211	Academic Oral Presentation Skills	(3-0)3
HIST	2202	Principles of Kemal Atatürk II	NC

THIRD YEAR

Fifth Semester

ES	303	Statistical Methods for Engineers	(3-0)3
ES	361	Computing Methods in Engineering	(3-0)3
PETE	321	Drilling Engineering I	(3-2)4
PETE	331	Petroleum Production Engineering I	(3-0)3
PETE	300	Summer Practice I	NC
PETE	343	Petroleum Reservoir Engineering I	(3-0)3
Non-technical Elective			
TURK	303	Turkish I	NC

Sixth Semester

GEOE	410	Petroleum Geology	(2-2)3
PETE	322	Drilling Engineering II	(3-0)3
PETE	332	Petroleum Production Engineering II	(3-0)3
PETE	344	Petroleum Reservoir Engineering II	(3-0)3
PETE	352	Well Logging	(3-0)3
ECON	210	Principles of Economics	(3-0)3
TURK	304	Turkish II	NC

FOURTH YEAR

Seventh Semester

PETE	411	Petroleum Property Valuation	(3-0)3
PETE	417	Petroleum Engineering Design I	(2-0)2
PETE	461	Natural Gas Engineering	(3-0)3
Technical Elective			
Technical Elective			
Non-technical Elective			
PETE	400	Summer Practice II	NC

Eighth Semester

PETE	418	Petroleum Engineering Design II	(2-2)3
Technical Elective			
Technical Elective			
Technical Elective			
Free Elective			

All elective courses are minimum 3 credits.

DOUBLE MAJOR PROGRAM IN PETROLEUM AND NATURAL GAS ENGINEERING

The program consists of all courses in the undergraduate curriculum. The equivalency of the courses will be determined by the Department.

DESCRIPTION OF UNDERGRADUATE COURSES

PETE 110 Introduction to Petroleum Engineering NC
This course is designed to familiarize the first year students with the fundamental aspects of petroleum engineering: introduction to engineering, petroleum exploration, major concepts of drilling, production and reservoir engineering, historical backround of petroleum industry, worldwide sources of petroleum, companies and societies in petroleum industry as well as relevant environmental, health, safety and ethical issues.

PETE 211 Introduction to Fluid Mechanics (3-2)4
Definitions and fluid properties. Fluid statics. Fluid-flow phenomena. The Bernoulli equation. Laminar and turbulent pipe flows. Transportation and metering of fluids.

PETE 218 Reservoir Fluid Properties (2-2)3
Properties of fluids encountered in petroleum engineering. Phase bahaviour, density, viscosity, interfacial tension, and composition of oil, gas, and brine systems. PVT relationships of hydrocarbon gas and liquid systems. Thermodynamic behavior of naturally occurring hydrocarbon mixtures; evaluation and correlation of physical properties of petroleum reservoir fluids, including laboratory and empirical methods. Interpreting lab data for engineering applications. Flash calculations.

PETE 220 Reservoir Rock Properties (2-2)3
Petrophysical properties of reservoir rocks and measurement procedures: Coring and core handling; sanstone and carbonate reservoir rock and pore types; fundamental porosity, grain density, permeability and saturation properties; special core analysis such as mechanical, acoustic and electrical properties; multiphase rock and fluid interactions, interfacial tension, capillary pressure, wettability and relative permeability properties.
Prerequisite: PETE 110

PETE 300 Summer Practice I NC
A minimum of four weeks (20 working days) of Summer Practice is obligatory to fulfill the requirements for the B.Sc. degree. The first practice is preferred to be in drilling operations after the second year. The training is based on the content of the summer practice manual.

PETE 310 Petroleum Legislation (3-0)3
Historical development of petroleum legislation. General principles in petroleum law. Rules and regulations in the Middle Eastern countries.

PETE 321 Drilling Engineering I (3-2)4
Drilling machinery: hole and equipment. Drilling fluids and hydraulics. Cementing and hydraulics. Drill off tests (bit performances). Pressure control.
Prerequisites: ES 224 and PETE 211

PETE 322 Drilling Engineering II (3-0)3
Directional drilling (Tangential, ROC and Minimum Curvature Methods). Drill string design (neutral point of tension and compression, neutral point of bending, Lubinski's stresses, margin of over pull). Casing design (biaxial, triaxial). Casing setting (buckling and well head loads).
Prerequisite: PETE 321

PETE 331 Petroleum Production Engineering I (3-0)3
Drill stem testing, well completion methods, completion fluids and sand control. Perforating, well head equipment and flow control devices, production packers, oil and gas separators. Flowing well performance, sucker rod pumping, submersible electrical centrifugal pumping, well stimulation techniques; acidizing, hydraulic fracturing.
Prerequisite: PETE 218 and PETE 220

PETE 332 Petroleum Production Engineering II (3-0)3
Methods of artificial lifting. Selection of equipment and artificial lift methods. Preparation of tubing intake curves for artificial lift systems. Design of electric submersible, gas lifting, hydraulic, jet, beam and plunger lift pumps. Pumping methods for unloading of gas wells.
Prerequisite: PETE 331

PETE 343 Petroleum Reservoir Engineering I (3-0)3
Estimation of hydrocarbon pore volume and recovery factor. Classification of oil reservoirs. Reservoir performance prediction for solution gas drive, water drive, gas-cap drive, drainage and combination drive reservoirs using material balance approach. Decline Curve Analysis. Water influx theory. Water and gas coning in oil producing formations. Characterization of fractured reservoirs.
Prerequisites: PETE 218, PETE 220, MATH 219

PETE 344 Petroleum Reservoir Engineering II (3-0)3
Steady and unsteady state single phase flow equations through porous media, steady and unsteady superposition. Multiphase flow through porous media. Reservoir characterization in homogeneous and heterogeneous reservoirs by pressure and tracer testing.

Prerequisite: PETE 343

PETE 352 Well Logging (3-0)3
Principles and operation of gamma ray, self potential, caliper, resistivity (micro and focused), density neutron, sonic, cement bond and variable density, dipmeter and production well logging tools. Interpretation of well log and their crossplotting techniques. Determination of formation properties such as porosity, hydrocarbon saturation, lithology, zone thickness, shaliness, etc. Guidelines to select proper logs in given field conditions.
Prerequisite: PETE 220

PETE 400 Summer Practice II NC
A minimum of four weeks (20 working days) of summer practice is obligatory to fulfill the requirements for the B.Sc. degree. The second practice is for production and/or reservoir engineering after the third year of undergraduate education. The training is based on the content of the summer practice manual.

PETE 411 Petroleum Property Valuation (3-0)3
Estimation of reserves. Optimization of production rate. Maximizing the oil recovery within economic limits. Investment required for exploration and development of oil gas fields. Investment required for improved recovery processes. Operating cost. Taxes, prices and depreciation. Profit analysis.

PETE 414 International Petroleum Economics and Politics (3-0)3
Review of petroleum industry from l859 when it was discovered by Drake in Pennsylvania, USA, up to and including early 1980's when the world economic structure survived the "second oil price shock." Role of oil in international economics and politics, its vital importance in the Middle East and North Africa for the Western and Eastern economical and political systems. Economical and political results of developments. A brief survey of the structure of oil market.

PETE 417 Petroleum Engineering Design I (2-0)2
Development and use of design methodology, formulation of design problem statements and specifications, consideration of alternate solutions, feasibility, considerations. Development of student creativity by using open ended problems. Project engineering and management of engineering projects. Design of drilling projects.
Prerequisites: Three of the following courses: PETE 322, PETE 331, PETE 343 and PETE 352

PETE 418 Petroleum Engineering Design II (2-2)3
Development and use of design methodology, formulation of design problem statements and specifications, consideration of alternate solutions, feasibility considerations. Development of student creativity by using open ended problems. Project engineering and management of engineering projects. Design of oil, natural gas or geothermal reservoir production systems. Design of reservoir development strategies.
Prerequisite: PETE 417

PETE 422 Pressure Control (3-0)3
Origin and detection of abnormal formation pressures. Principles of pressure control: behavior of gas in drilling fluids, mechanics of bubble rise. Pressure control methods: driller, engineer, concurement and low choke pressure methods. Prediction methods for fracture pressure gradient. Drilling and completion concepts in overpressured formations. Pressure control equipments. Special problems.

PETE 424 Special Operations in Drilling (3-0)3
Coring; core barrel types. Fishing; differential sticking, freepoint detection, string-shot back-off taps and die collars, spears and overshots, washover pipe, cutters. Measurement while drilling.

PETE 426 Drilling Fluid Engineering (3-0)3
Clay mineralogy and colloid chemistry of muds. Rheology and filtration properties of drilling fluids. Annual performance calculations. Composition of water base muds. Inhibitive and low solid muds. Theory of emulsion and foam. Composition of oil base and pneumatic drilling fluids. Solids control. Hole stability. Problems related to drilling fluids. Differential sticking, lost circulation and corrosion.

PETE 434 Well Stimulation (3-0)3
Acidizing: carbonate and sandstone acidizing. Diverting agents: history and application. Fracturing; principles of hydraulic fracturing, planning a fracturing treatment (data gathering), fluid design, perforation design, breakdown design, design of a fracturing treatment, post-job evaluation. Re-fracturing. Fracture acidizing.

PETE 436 Reservoir Characterization (3-0)3
Definition of petroleum reservoir heterogeneity using conventional methods and possible improvements to these methods. Review of basic statistical concepts and methods. Reservoir Rock and Fluid Property Evaluation by Statistical Methods. Scale-up and Simulator Data Preparation.

Emerging Methods in Petroleum Reservoir Characterization. Case studies from oil industry.

PETE 440 Well Test Analysis (3-0)3
Analytical solution to diffusivity equation and basis for pressure transient test analysis. Skin and wellbore storage concepts. Pressure buildup and flow tests. Estimating average drainage area pressure. Type curves as diagnostic tools and as an analysis technique. Analysis of well tests in hydraulically fractured wells. Well test behavior in naturally fractured reservoirs. Multiple well testing, interference and pulse tests. Well test design.

PETE 443 Enhanced Oil Recovery Methods (3-0)3
Immiscible fluid displacement mechanisms. The fractional flow formula. The rate of advance formula. Stabilized zone concept. Mechanisms and performance calculations of waterflooding and immiscible gas injection. Improved waterflooding methods. Miscible injection methods. Thermal methods: Hot water, steam and in-situ combustion. Field design parameters.

PETE 444 Mathematical Modeling of Hydrocarbon Reservoirs (3-0)3
Basic principles of mathematical modeling. Finite difference/finite element form of equations that govern single and multiphase flow through porous media. Characteristics of finite difference/finite element equations. Solution strategy techniques of originating matrix problems. Data evaluation in simulation problems. Case studies.
Prerequisites: ES 305 and PETE 343

PETE 445 Transport Phenomena in Geosystems (3-0)3
Applications of mass, heat and momentum balances to fluid flow problems. Shell balances. Non-Newtonian fluids. Transport processes in porous media.

PETE 446 Thermal Recovery Methods (3-0)3
Fluid flow and heat transport through porous media. Definition of thermal EOR methods. Hot water injection, steam injection, steam override, steam additives, case histories. Insitu combustion, wet combustion, superwet combustion. Combustion reaction in porous media. Case histories.

PETE 448 Miscible EOR Processes (3-0)3
Definition of miscibility in hydrocarbon reservoirs. Phase behavior and miscibility, ternary diagrams, methods of determining miscibility conditions. Condensing gas drive, vaporizing gas drive processes. Design considerations and predictive methods.

PETE 450 Introduction to Geothermal Reservoir Engineering (3-0)3
Classification of geothermal reservoirs, distribution and characteristics of geothermal resources. Physical aspects of hydrothermal systems. Assessment of geothermal resources. Well completion and warm-up, measurements during drilling; temperature log, the completion tests, pressure log. Flow testing. Well performance.

PETE 452 Chemistry of Geothermal Systems (3-0)3
The chemical nature of geothermal systems; water, steam, origin and age of water, origin of chemicals in geothermal fluids, deposits from waters. Physical properties, chemical geothermometers, isotope geothermometers. Sampling and data collection; collection of samples of water and steam, analytical techniques for geothermal fluids. Gaseous components in geothermal processes, distribution of gases between liquid and vapor, gas pressures. Mineral deposition.

PETE 460 Natural Gas Technology (3-0)3
The origin and characteristics of natural gas. The purification and liquefaction of natural gas. Natural gas transmission and distribution.

PETE 461 Natural Gas Engineering (3-0)3
Properties of natural gases, hydrate formation. Estimation of gas reserves. Gas well testing. Estimation of gas deliverability. Gas flow measurement. Natural gas deliverability. Natural gas transmission, design of gathering systems. Field treating and processing of natural gas. Compressor horsepower requirement.

PETE 462 Underground Gas Storage (3-0)3
Aspects of energy related to gas storage, degree day concept, base load, peak load. Properties of gas storage reservoirs, aquifer storage, salt cavern storage. Design, development and operation of storage fields.

PETE 490 Petroleum Engineering Research (1-4)3
A research activity of one semester duration on selected topics in petroleum and natural gas engineering. Each student, as a member of project group is assigned a project topic which involves experimental and/or mathematical modeling (analytical or numerical) studies.

PETE 491-498 Special Topics in Petroleum Engineering (3-0)3
These code numbers will be for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

GRADUATE PROGRAMS AT THE DEPARTMENT OF PETROLEUM AND NATURAL GAS ENGINEERING

The University requirements governing the M.S. and Ph.D. degrees are described in Academic Rules and Regulations (Graduate Programs) of this catalog.

The Department offers graduate programs in Drilling, Production, Reservoir, Natural Gas, Enhanced Oil Recovery and Geothermal Engineering. A candidate is expected to take at least one course from each of the two predetermined course-groups, namely, Mathematics (group 1); Thermodynamics/Physical Chemistry/Strength of Materials and Transport Phenomena (group 2) for an M.S. study. For a Ph.D. study, an additional course is required from predetermined Economics course (group 3).

All students admitted to graduate programs are required to designate their supervisor and thesis topic by the end of their first semester.

GRADUATE CURRICULUM

M.S. in Petroleum and Natural Gas Engineering

PETE	500	M.S. Thesis	NC
PETE	590	Seminar	(0-2) NC

7 elective courses*

Total minimum credit: 21
No of Courses with credit (min): 7

* at least 2 of which are PETE courses

For M.S. two courses from predetermined course groups

Ph.D. in Petroleum and Natural Gas Engineering

PETE	600	Ph.D. Thesis	NC

7 elective courses *

Total minimum credit: 21
No of Courses with credit (min): 7

* at least 2 of which are PETE courses

For Ph.D. three courses from predetermined course groups

GRADUATE COURSES

PETE	500	M.S. Thesis	NC
PETE	501	Drilling Hydraulics	(3-0)3
PETE	502	In-situ Combustion	(3-0)3
PETE	503	Steam Flooding	(3-0)3
PETE	505	Surface Production Operations	(3-0)3
PETE	506	Hot-fluid Injection	(3-0)3
PETE	507	Numerical Reservoir Simulation I	(3-0)3
PETE	508	Geothermal Drilling	(3-0)3
PETE	509	Modeling of Geothermal Reservoirs	(3-0)3
PETE	510	Pilot Field Test Design	(2-2)3
PETE	512	Fluid Flow Through Porous Media	(3-0)3
PETE	513	Water Drive Reservoirs	(3-0)3
PETE	514	Shale Oil Recovery	(3-0)3
PETE	515	LIFT and Micellar Flooding	(3-0)3
PETE	516	Numerical Reservoir Simulation II	(3-0)3
PETE	517	Hydrocarbon Phase Behavior	(3-0)3
PETE	518	Advanced Topics in Production Optimization	(3-0)3
PETE	519	World Energy Sources	(3-0)3
PETE	520	Drilling Case Studies	(3-0)3
PETE	521	Chemicals from Petroleum	(3-0)3
PETE	523	Carbon Dioxide Flooding	(3-0)3
PETE	526	Well Stimulation	(3-0)3
PETE	552	Measurements in Petroleum Engineering	(3-0)3
PETE	553	Current Problems in Geothermal Production	(3-0)3
PETE	555	Numerical Reservoir Simulation III	(3-0)3
PETE	556	Analysis of Porous Media Flow Equations I	(3-0)3
PETE	557	Analysis of Porous Media Flow Equations II	(3-0)3
PETE	560	Optimization of Petroleum Recovery Processes	(3-0)3
PETE	561	Well Testing	(3-0)3
PETE	562	Advanced Natural Gas Engineering	(3-0)3
PETE	563	Reservoir Management	(3-0)3
PETE	590	Seminar	(0-2)NC
PETE	600	Ph.D. Thesis	NC

PETE	7XX	Special Topics in Petroleum and Natural Gas Engineering	(3-0)3	PETE	8XX	Special Studies	(4-2)NC
				PETE	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF GRADUATE COURSES

PETE 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their fall/spring semester while the research program or write-up of thesis is in progress. (F&S)*

PETE 501 Drilling Hydraulics (3-0)3
Review of basic concepts related to Newtonian fluid flow. Rheology of drilling fluids. Introduction to non-Newtonian fluid flow. Hydraulic design. Conventional and polymer muds. Maximum hydraulic horse power and maximum hydraulic impact concepts in bit hydraulic optimization. (AF)

PETE 502 In-situ Combustion (3-0)3
Fundamentals of in-situ combustion processes. Formation and reservoir evaluations. Flow and process equations. Laboratory simulation of combustion process. Spontaneous ignition and reaction kinetics of oil in porous medium. Oil displacement by combustion process. Heat distribution in combustion process. Project analysis. Equipment selection in oil-field applications. (R)

PETE 503 Steam Flooding (3-0)3
Fundamentals of the steam flooding processes. Phase relationships of steam, water and hydrocarbons. Gravity override and methods to overcome this. Case histories. (R)

PETE 505 Surface Production Operations (3-0)3
Investigation of field processing, transmission and storage of petroleum. Multi-stage, low temperature and desiccant processes of separation of gas, oil and two-phase flow systems. Petroleum fluid storage and allied problems. (AF)

PETE 506 Hot-fluid Injection (3-0)3
Need for hot-fluid injection, review on physical and mathematical description of heat and mass transfer in porous media. Heating the reservoir. Heat losses from surface and subsurface lines. Evaluation of reservoirs for hot-fluid injection. Pilot testing. (R)

PETE 507 Numerical Reservoir Simulation I (3-0)3
Differencing schemes for the partial differential equations which govern single phase flow in porous media. Grid design, type and boundary conditions. Solution methods. (F)

PETE 508 Geothermal Drilling (3-0)3
Principles of geothermal drilling. Special equipment drill bits and BOP withstanding high temperature and use of cooling towers. Temperature gradient surveys. Composition and properties of high temperature drilling fluids. Turbo-drilling in the geothermal area. Cementing and casing design for geothermal wells, lost circulation control. Blowout prevention. Corrosion control. The drilling problems related to high temperature. (R)

PETE 509 Modeling of Geothermal Reservoirs (3-0)3
Classification of geothermal systems. Physical process and conceptual models. Equations of motion and energy. Equations of state. Modeling methods; decline-curve analysis, lumped-parameter models, distributed-parameter models. Natural-state modeling. Exploitation modeling. Injection modeling. (AF)

PETE 510 Pilot Field Test Design (2-2)3
Pilot tests. Well patterns for field development. Well spacing. Waterflood pilot design. Selection of potential flooding patterns. Injection rates. Estimation of waterflood performance. In situ combustion pilot design. Evaluation of pilot performance. Steam injection pilot design. CO2 injection pilot design. (S)

PETE 512 Fluid Flow Through Porous Media (3-0)3
Structure and properties of porous materials, steady and unsteady flow of homogenous fluids. Simultaneous flow of immiscible fluids. Flow with change of phase. Miscible flow. (F)

PETE 513 Water Drive Reservoirs (3-0)3
Hydrodynamic factors which influence underground water movement, particularly with respect to petroleum reservoirs. Evaluation of oil reservoirs located in major water containing formations**.** (AF)

PETE 514 Shale Oil Recovery (3-0)3
Chemical and physical properties of oil shales, occurrence of oil shales and bituminous sands. Insitu or surface recovery methods for extracting oil. (R)

PETE 515 LIFT and Micellar Flooding (3-0)3
Review of basic principles of surface chemistry. Reservoir wettability and properties affected by wettability. Distribution of residual oil. Use of low interfacial tension flooding as a tertiary recovery method. Micellar polymer flooding to recover residual oil. (R)

PETE 516 Numerical Reservoir Simulation II (3-0)3
Mathematical analysis of multiphase flow in porous and permeable media. Case studies. Recent developments.
Prerequisite: PETE 507 or consent of department
(S)

PETE 517 Hydrocarbon Phase Behavior (3-0)3
Pressure-volume-temperature relationships for liquid and gas hydrocarbons. Laboratory results and empirical correlations. Phase behavior of field hydrocarbons with CO2, N2 and other cases. (F)

PETE 518 Advanced Topics in Production Optimization (3-0)3
Inflow relationships for oil and gas wells. IPR curves for fractured wells. Multiphase flow in pipes. Nodal system analysis applied to injection wells, gravel packed oil and gas wells and standard perforated well. Production optimization to a complete field-integrated oil production systems. Production optimization for a complete ocean-floor optimization. (S)

PETE 519 World Energy Sources (3-0)3
Energy in the rest of the century. Mapping the critical gap between supply and demand. Decline in the oil area, world wide petroleum supply limits. Review of other sources of energy, coal, nuclear, hydroelectrical, geothermal, solar, other renewable, and unconventional sources. Environment and climate. Energy conservation and pricing. (F)

PETE 520 Drilling Case Studies (3-0)3
Consideration of all aspects of a given field problem. Bit selection, DP and DC selection, casing and casing setting, depth selection, DLRL. Hydraulic and cementing designs. (R)

PETE 521 Chemicals from Petroleum (3-0)3
Concept of crude oil as raw material in petro-chemical industry. Testing of crudes. Separation of petroleum into fractions by physical methods. Thermal cracking and catalytic cracking of petroleum crudes. Classification of petroleum chemicals according to source: C1,C2, C3, C4, C5 and higher hydrocarbon derivatives. Derivatives of synthesis gas. (AF)

PETE 523 Carbon Dioxide Flooding (3-0)3
Overview of conventional and enhanced oil recovery methods. Factors affecting displacement behavior. Principles of phase behavior and miscibility. Carbon Dioxide process. Carbon Dioxide sources. Assessment of Process. Guidelines for identifying reservoirs with carbondioxide miscible flooding potential. Recovery prediction methods and model validation. Project economics and design. (R)

PETE 526 Well Stimulation (3-0)3
Acidizing; carbonate acidizing, sandstone acidizing. Diverting Agents-History and Application. Fracturing; Principles of Hydraulic Fracturing, Planning a Fracturing Treatment (Data Gathering), Fluid Design, Perforation Design, Breakdown Design, Design of a Fracturing Treatment, Post-Job Evaluation. Re-Fracturing. Fracture Acidizing. (S)

PETE 552 Measurements in Petroleum Engineering (3-0)3
Fundamentals in instrumental techniques based on electromagnetic radiation, electrochemistry and diffusion. Modern methods of engineering measurements as applied to petroleum engineering. (R)

PETE 553 Current Problems in Geothermal Production (3-0)3
Problems related to well productivity; deposition of solids within casing and surface installations, corrosion, two-phase flow calculations. Decline in reservoir productivity; pressure maintenance, reinjection strategies, tracer testing. Environmental aspect of geothermal utilization; geothermal fluid, noise, chemical composition and pollution. (AF)

PETE 555 Numerical Reservoir Simulation III (3-0)3
Compositional simulation. Case studies. Recent developments
Prerequisite: PETE 516 or consent of department.
(R).

PETE 556 Analysis of Porous Media Flow Equations I (3-0)3
Development and application of mathematical techniques to solve partial differential equations of steady state flow in porous media. (S)

PETE 557 Analysis of Porous Media Flow Equations II (3-0)3
Application of mathematical techniques to solve partial differential equations of unsteady state flow in porous media.
Prerequisite: PETE 556 or consent of department. (F)

PETE 560 Optimization of Petroleum Recovery Processes (3-0)3
Optimum search methods, linear programming, nonlinear programming, dynamic programming application to history matching. (AS)

PETE 561 Well Testing (3-0)3
The theory and applications of oil well testing. Pressure buildup and flow tests. Analysis of well tests in hydraulically fractured wells. Reservoir description using well tests, analysis of well tests in naturally fractured reservoirs. Injection well testing. Well test design. Extensive review of technical papers**.** (F)

PETE 562 Advanced Natural Gas Engineering (3-0)3
Material balance techniques for volumetric gas reservoirs. Geo-pressured gas reservoirs. Flow of natural gas in pipelines. Gas flow measurement. Gas well testing, pseudo-functions, buildup and
flow tests. Gas well deliverability testing. Flow after flow, isochronal and modified isochronal tests. Long term performance prediction for gas wells**.** (S)

PETE 563 Reservoir Management (3-0)3
Analysis of an oil field using all Petroleum Engineering tools. Reservoir description and analysis using field data. Prediction of future performance for solution gas drive reservoirs.
Material balance techniques with field examples**.** (AF)

PETE 590 Seminar (0-2) NC
Papers are prepared and presented by graduate students on scientific topics of general interest in their fields. Each paper is followed by a round table discussion participated in by the students and members of Faculty. (F/S)

PETE 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their fall/spring semester while the research program or write-up of thesis is in progress. (F&S)

PETE 7XX Special Topics in Petroleum and Natural Gas Engineering (3-0)3
These courses will be for technical elective courses which are not listed regularly in the catalog. The course contents and course titles will be announced before the semester commences. Contents vary from year to year according to interest of students and instructor in charge**.**(R)

PETE 8XX Special Studies (4-2) NC
M.S. Students choose and study a topic under the guidance of a faculty member, normally him/her supervisor**.** (F&S)

PETE 9XX Advanced Studies (4-0) NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor**.** (F&S)

* F: Fall, S: Spring A: Alternative year, R: Upon request, WE; Wide elective.

DEPARTMENT OF TURKISH LANGUAGE

UYSAL (DEMİRTAŞ), Güllüzar ***(Department Chair)***: B.A., Ankara University.

FULL-TIME INSTRUCTORS

DAYIOĞLU, Hatice: B.A. Boğaziçi University; M.A. Montclair State University.
DEMİR, MERYEM: B.A. İstanbul University; M.A. Marmara University.
KÖRKUYU, Serhat Adem: B.A. Hacettepe University; M.A. Ankara University.
EMECAN, Neşe: B.A., M.A., Ph. D., Ankara University.
ÜNSAL, S. Nevin: B.A. İstanbul University.
DARICI, Esra: B.A. Ankara University.
YILMAZ Sibel: B.A., M.A., Gazi University
SITKI Banu: B.A., M.A., Ankara University, M.A. Muğla University
BİNDAL Tuğba: B.A.Anadolu University, B.A. Dumlupınar University
ÜNLÜ Yücel: B.A., M.A. Gazi University

PART-TIME INSTRUCTORS

ÇELEBİ, Tülay: B.A. Ankara Üniversity.
DEMİRDİREK, Aynur: B.A. Ankara University.

GENERAL INFORMATION: Turkish Language department involves in teaching the compulsory Turkish Language courses. The students follow these courses two hours a week, for one year. The program concentrates on teaching the correct and effective use of the Turkish Language.

The courses are given in Turkish.

DESCRIPTION OF COURSES

TURK 101 Turkish I (2-0) NC*
The course will cover the following: the importance of language as a social institution in the life of a nation; relations between culture and language; the Turkish languages and their geographical distribution; history of the Turkish language; phonology of the Turkish language; rules of punctuation. The rule of inflection (declension and conjugation) and derivation in the Turkish language. General rules of composition; various forms of written expression.

TURK 102 Turkish II (2-0) NC*
Reading from literature; exercises in composition. Errors in sentence structure and their correction, writing research papers; development of students' ability to speak and write well through the use of selected texts from world literatures.
Prerequisite: TURK 101 or Consent of the Department.

TURK 103 Oral Communication (2-0)2**
Written expression; composition and punctuation rules; types of written expression; colloquial, literary, scientific and official language; criticism; researching and using sources; classroom exercises and discussions concerning all the subjects.

TURK 104 Written Expression (2-0)2**
Language, its definition and importance, relations between speaking and thinking, developing the comprehension and expression ability; language and culture relations, listening and its importance, effective listening; reading, its importance and functions; reading types; expression and its rules, expression units, types, forms and means; oral expression and types of oral expression; fluent, correct and effective speaking, body language; classroom exercises and discussions.
Prerequisite: TURK 103.

TURK 105 Turkish I (2-0)NC***
The characteristics, rules and basic grammar is given in this course. Practical work is carried to improve the students' comprehension, writing and speaking skills.

TURK 106 Turkish II (2-0) NC***
With contemporary script examples, improvement of students vocabulary is achieved. By working on

terminology and classroom exercises using scripts in their relevant educational areas, reading and comprehension improvement is aimed.
Prerequisite: TURK 105 or Consent of the Department.

TURK 107 Turkish Language I
(2-0)2******

The characteristics, rules and basic grammar is given in this course. Practical work is carried to improve the students' comprehension, writing and speaking skills.

TURK 108 Turkish Language II
(2-0)2******

With contemporary script examples, improvement of students vocabulary is achieved. By working on terminology and classroom exercises using scripts in their relevant educational areas, reading and comprehension improvement is aimed.
Prerequisite: TURK 107.

TURK 111 Effective and Correct Use and Pronunciation of Turkish Language
(4-0)3(Elective)

Communication, the elements of communication; characteristics of oral communication; special features of Turkish pronunciation; corrects pronunciation; Turkish phonology; affective pronunciation; body language; affective and correct usage of Turkish.

TURK 112 Applience of Effective and Correct Use of the Turkish Language and the Dram
(4-0)3(Elective)

Appliance of communication, affective pronunciation; body language, usage of dramatic language; facial expressin, improvisation and appliance of all these princibles to a chosen Turkish dram.
Prerequisite: TURK 111

TURK 113 Selective Writers From Turkish And World Literature I
(4-0)3(Elective)

The pieces of literature chosen from different periods of Turkish and world literature are going to be studied, analysed and discussed. These pieces of literature are going to be chosen according to certain subjects and themes. On this course, the students are going to analyse novels and short stories.

TURK 114 Creative Writing
(4-0)3(Elective)

Within the scope of creative writing courses will be informed about the methods of observation , connotation, portrayal, character, standpoint and create dialogue. Participants' experiences and dreams to be reinterpreted. Issues that concern the individual and society inspired by the new text will be created.

TURK 115 Critical Reading
(4-0)3(Elective)

This lesson aims to give to student analyzing, interpreting, criticising and to evaluate skills on oral-written -visual texts. A secondary objective is to analyze the literary, humorous and visual texts, will be chosen different cultures.

TURK 116 Culture Society and Literacy Criticism
(4-0)3(Elective)

This lesson is successive of "Critical Reading" which is lectured fall semester. İt will be criticized some texts with litarary, culture and society theory. Expected that the creative,individual ideas from partipicant.

TURK 117 Selective Writers From Turkish and World Literature II
(4-0)3(Elective)

Culture-Society and Literary Criticism.This lesson is successive of "Critical Reading" which is lectured fall semester. İt will be criticized some texts with litarary, culture and society theory. Expected that the creative,individual ideas from participant.

TURK 118 Turkish Sign Language
(4-0) 3(Elective)

This course covers the definition of hearing impaired or deaf people; the culture of deaf and hearing impaired people; difficulties in education and social life; the importance of Turkish Sign Language; methods of communication with hearing impaired and deaf people

TURK 201 Elementary Turkish
(4-0) NC**

Designed to instruct foreign students in the rudiments of the Turkish language in terms of grammar, syntax and vocabulary. Basic characteristics of Turkish language: sounds, vowel and consonant harmonies, changes in consonants, nominal compounds, possessive suffixes, cases, the verb "*imek*", basic tenses and modes, comparative and superlative, numerals, compound tenses.

TURK 202 Intermediate Turkish
(4-0) NC**

Designed to increase students' knowledge of Turkish language. Compound sentences, voices,

compound verbs, written and oral expression of ideas within the limits of a paragraph, written and oral translation.
Prerequisite: TURK 201.

TURK 203 Intermediate Level Turkish (4-0)3(Elective)

Basic start-up in Turkish language: Basic oral expressions (how to get acquainted with new people, how to use greeting expressions & survival words necessary for daily life). Grammer studies: the present continuous, simple past and past continuous tenses. Cases (locative, ablative, dative, accusative, instrumental) are taught using various materials. The first aim of this course is to make the students able to communicate with the outside world and to make them able to read & interpret articles in simple linguistic structures.
Note: The content of this course may vary according to the Turkish language level of the students.

TURK 204 Turkish Folk Culture (4-0)3(Elective)

Turkish folk culture with the introduction of basic elements such as, language, literature, archeology, history, geographical features and natural beauty, architecture and technology, music, crafts, performing arts, culinary arts, thinkers, traditions, beliefs and clohting.

TURK 301 Advanced Turkish I (4-0)4***

Designed as a transition to introduce Turkish Literature through comparatively simple texts on folk poetry and short stories from twentieth century Turkish Literature.
Prerequisite: TURK 105, 106, 107, 108, 201 and 202

TURK 302 Advanced Turkish II (4-0)4***

Designed to introduce journalistic Turkish based upon news and comments in Turkish newspapers.
Prerequisite: TURK 301.

TURK 303 Turkish I (2-0)NC****

Language; the elements of language, the use of language in oral communication; the use of language in written communication; native language; the elements of Turkish language, the present state of Turkish language; official communication.

TURK 304 Turkish II (2-0)NC****

Oral and written expression; types of oral and written expression; general rules of official communication; writing research papers; classroom exercises and discussions.
Prerequisite: TURK 303 or Consent of the Department.

TURK 305 Oral Communication (2-0)2*****

Language, its definition and importance, relations between speaking and thinking, developing the comprehension and expression ability; language and culture relations, listening and importance, effective listening; reading, its importance and functions; reading types; expression and its rules, expression units, types, forms and means; oral expression and types of oral expression; fluent, correct and effective speaking, body language; classroom exercises and discussions.

TURK 306 Written Expression (2-0)2*****

Written expression; composition and punctuation rules; types of written expression; colloquial literary, scientific and official language; criticism; searching and using sources; classroom exercises and discussions concerning all the subjects.
Prerequisite: TURK 305

* All the first grade students of the Faculty of Economic and Administrative Sciences, Faculty of Arts and Sciences and Technical Vocational School of Higher Education are required to take TURK 101 and TURK 102.

** Only the ECE, CEIT and FLE Departments' students of the Faculty of Education students are required to take TURK 103 and TURK 104.

*** The students who are, Azerbaijan, Bashkiria, Bosnia-Herzegovina, Dagestan, Circussian, Cassack, Crimea, Macedonia, Mongolia, Moldovia, Nahcivan, Uzbek, Tajikistan, Tatary, Turkoman nationalities and Albania, Bulgaria, Georgia, Iraq, Iran, Yugoslavia, Greek nationalities who have Turkish origin certificates and are paying fees and tuitions like the Turkish nationalities or who are graduated from Turkish schools will take 6420105 Turkish Language I in the first semester and 6420106 Turkish Turkish Language II in the second semester of the first grade (first year) without any exception of Faculty or Department.

* The Turkish national students who were living abroad and having inefficiency in Turkish are also required to take this course.

**** All non-Turkish speaking foreign students are required to take TURK 201 and 202.

***** Only the foreign students who successfully completed TURK 105, TURK 106, TURK 107, TURK 108, TURK 201 and TURK 202 are allowed to take TURK 301 and TURK 302.

****** The third grade students of the Faculty of Architecture, Faculty of Engineering and Science Departments' of Faculty of Arts and Sciences are required to take TURK 303 and TURK 304.

******* Only the third grade students of ESE, EME, PHED and CHED Departments of the Faculty of Education are required to take TURK 305 and TURK 306.

******** The students of Faculty of the Education who are, Azerbaijan, Bashkiria, Bosnia-Herzegovina, Dagestan, Circussian, Cassack, Crimea, Macedonia, Mongolia, Moldovia, Nahcivan, Uzbek, Tajikistan, Tatary, Turkoman, nationalities and Albania, Bulgaria, Georgia, Iraq, Iran, Yugoslavia, Greek nationalities who have Turkish origin certificates and are paying fees and tuitions like the Turkish nationalities or who are graduated from Turkish schools will take 6420107 Turkish Language I in the first semester and 6420108 Turkish Language II in the second semester of the first grade (first year).

DEPARTMENT OF MUSIC AND FINE ARTS

FULL TIME INSTRUCTORS

ÖZGENEL, Lale *(Assoc.Prof. Dr.)* ***(Department Chair)***: B.Sc., METU; M.Sc., METU, Ph.D., METU
SANSA, Tayfun *(Vice Chair)*: B.A., H.U. Ankara State Conservatory; M.A., Gazi University.
UYSAL, Mehmet Ali *(Assoc. Prof. Dr.):* B.Sc., METU. MFA., Ph.D., Hacettepe University.
IŞITMAN, Ödül *(Dr.)*: B.A., MFA, Ph.D., Hacettepe University.

PART-TIME INSTRUCTORS

ACAR, Mine: B.A. Ankara University.
ARGAT, Diler *(Assist.. Prof. Dr.):* B.A., Ankara State Conservatory, Hacettepe University.
BALKENHOL, Thomas: B.S., Hochschule für Fernsehen und Film München.
BAŞEĞMEZLER, Betil *(Prof. Dr.)* B.A., H.U. Ankara State Conservatory;
Ph.D., Hacettepe University.
BAŞEĞMEZLER,Nejat: B.A., Ankara State Conservatory, Hacettepe University.
ÇAPLI, Yeşim: B.S., Hacettepe University, M.S., METU.
ÇIKIGİL, Necla *(Assoc. Prof. Dr.)*: B.A., M.S., Hacettepe University; M.A., Birmingham University;
Ph.D., Ankara University
DOĞU, Tuncay: B.A., Gazi University; M.A., California State University-Northridge Music Faculty.
EROĞLU, Ümit: Ankara State Conservatory, Hacettepe University.
EROL, İsmail Lütfü *(Dr.):* B.A., Gazi University; M.A., Gazi University, Ph.D., Hacettepe University
ERTAŞ, Tangör: *(Dr.):* B.A., Ankara State Conservatory, Dokuz Eylul University. M.A., Bilkent University,
Ph.D., Bilkent University.
GENCE, Durul: B.S., Military School.
GERDANLI, Zafer: B.S., Anadolu University.
GÖKÇEBAĞ, Yalçın: B.A., Gazi University.
GÜNÇER, Fethi: B.A., H.U. Ankara State Conservatory; M.A., Accademia Musicale Chigana.
GÜRDAMAR, Emre: B.S., METU. M.S., METU.
İBRAHİMOVA, DİNÇER, Yıldız: B.A., Sofia State Academia of Music
İDİL, Suat: B.S., METU.
KARAAĞAÇ, Ebru: B.A., Ankara State Conservatory, Hacettepe University; M.A., Hacettepe University;
Ph.D., Hacettepe University.
KOCADERE, Serkan: B.A., Ankara State Conservatory, Hacettepe University.
KOCAYIGIT, Tahir: B.S., Ankara University; M.S., METU.
ONARAN, Oğuz *(Prof. Dr.)*: B.A., Ph.D., Ankara University.
ÖZTÜRK, Ruken *(Prof. Dr.)*: B.S., M.A., Ph.D., Ankara University.
POROY, Ayşegül Ö. : B.S., METU; M.A., Hacettepe University; Ph.D., Hacettepe University.
SANCAR, Aycan: B.A., Ankara State Conservatory, Hacettepe University.
SANSA, Engin*(Prof. Dr.)*: B.A., Ankara State Conservatory, Hacettepe University;
Ph.D, Hacettepe University.
SİPAHİOĞLU, Selçuk: B.A., Ankara University.
SÖZMEN, Cüneyt: B.S., Ankara University.
ŞENTÜRK, Ali: B.A., M.A, Hacettepe University
TAÇOY, Alpkağan: B.S., METU.
TALİP, Naile: Bülbüladına High Music School.
TEK, CİHAN, Gök Çiçek: B.A., Ankara State Conservatory, Hacettepe University.
TÜRKDOĞAN, Tansel *(Prof. Dr.)*: B.A. Gazi University; MFA, Ph.D. Hacettepe University.
YALDIZ, Ahmet: B.A., Ankara State Conservatory, Hacettepe University.
YAZICI, Fatih: B.S., METU.
YILDIRIM, Adnan: B.A., Ankara State Conservatory, Hacettepe University.
YILMAZ, Mehmet *(Prof. Dr.)*: B.A. Gazi University; MFA, Ph.D. Hacettepe University.
YÜKSEL, Kaan *(Dr.):* B.Sc., METU; M.Sc., Hacettepe University, Ph.D, Gazi University.

RESEARCH ASSISTANT

ERDAL, Berrak: B.Sc., METU; M.S., METU.

GENERAL INFORMATION: The Department of Music and Fine Arts was founded in l989 in order to offer to the METU students the opportunity to broaden their cultural understanding and increase their skills and appreciation of music and fine arts. The Department operates under the authority of the University President and offers (3-1)3 credits (5.0 Credits According to the European Credit System) elective courses for the moment. The main objective of the Department is to offer elective courses in music, performing arts and visual arts on a theoretical and practical basis. The courses also provide students with a cultural and artistic alternative to fulfill their requirements.

COURSES OFFERED

MUS 651 0101- 0102- 0201- 0202- 0301- 0302- 0401- 0402	Classical Turkish Music	(3-1)3
MUS 651 0111- 0112- 0211- 0212- 0311- 0312- 0411- 0412	University Chorus	(3-1)3
MUS 651 0121- 0122- 0221- 0222- 0321- 0322- 0421- 0422	Voice	(3-1)3
MUS 651 0141- 0142	History of Instrument	(3-1)3
MUS 651 0151- 0152- 0251- 0252- 0351- 0352- 0451- 0452	Jazz Orchestra	(3-1)3
MUS 651 0161- 0162- 0261- 0262- 0361- 0362- 0461- 0462	Performing Jazz	(3-1)3
MUS 651 0171- 0172- 0271- 0272- 0371- 0372- 0471- 0472	Drum	(3-1)3
MUS 651 0181- 0182- 0281- 0282- 0381- 0382- 0481- 0482	Bass Guitar	(3-1)3
MUS 651 0191- 0192	Solfeggio	(3-1)3
MUS 651 0231- 0232- 0331- 0332	History of Jazz	(3-1)3
MUS 651 0241	History of Music	(3-1)3
MUS 651 0341- 0342	Music Appreciation	(3-1)3
MUS 651 0242	Art and Science Culture	(3-1)3
THEA643 0101- 0102	International News	(3-1)3
THEA643 0111- 0112-0211- 0212- 0311-0 312- 0411-0412	Painting	(3-1)3
THEA643 0113	Drawing	(3-1)3
THEA643 0121- 0122- 0221- 0222- 0321- 0322- 0421- 0422	Glass	(3-1)3
THEA643 0131- 0132- 0231- 0232- 0331- 0332- 0431- 0432	Sculpture	(3-1)3
THEA643 0141- 0142- 0241- 0242- 0341- 0342- 0441- 0442	Ceramics	(3-1)3
THEA643 0151- 0152- 0251- 0252- 0351- 0352- 0451- 0452	Introduction to Video Production	(3-1)3
THEA643 0161- 0162- 0261- 0262- 0361- 0362- 0461- 0462	Theater	(3-1)3
THEA643 0171- 0172- 0271- 0272- 0371- 0372- 0471- 0472	Cinema and Reality	(3-1)3
THEA643 0181- 0182	Museums and Masterpieces	(3-1)3
THEA643 0201- 0202	History of Theater	(3-1)3
THEA643 0301- 0302	Media Economics	(3-1)3
THEA643 0401	History of Art	(3-1)3
THEA643 0402	Modernism and Postmodernism in Art	(3-1)3
THEA643 0281- 0282	Film Analysis	(3-1)3
THEA643 0291- 0292	Genres in Arts	(3-1)3
INST 682 0101- 0102- 0201- 0202- 0301- 0302- 0401- 0402	Piano	(3-1)3
INST 682 0111- 0112- 0211- 0212- 0311- 0312- 0411- 0412	Flute	(3-1)3
INST 682 0121- 0122- 0221- 0222- 0321- 0322- 0421- 0422	Violin	(3-1)3
INST 682 0131- 0132- 0231- 0232- 0331- 0332- 0431- 0432	Viola	(3-1)3
INST 682 0141- 0142-0241- 0242- 0341- 0342- 0441- 0442	Violoncello	(3-1)3
INST 682 0151- 0152- 0251- 0252- 0351- 0352- 0451- 0452	Classical Guitar	(3-1)3
INST 682 0161- 0162- 0261- 0262- 0361- 0362- 0461- 0462	Saxophone-Clarinet	(3-1)3
INST 682 0171- 0172- 0271- 0272- 0371- 0372- 0471- 0472	Trumpet	(3-1)3
INST 682 0181- 0182- 0281- 0282- 0381- 0382- 0481- 0482	Trombone	(3-1)3
SLTP 644 0111- 0112	Topics in Art	(3-1)3

DESCRIPTION OF COURSES

MUS 651 0 101-102- 201-202-301-302-401-402 Classical Turkish Music (3-1)3

The purpose of this course is to give the students an idea about the history of Turkish classical music; the fundamentals of music notation, rhythms and "makams"; basic techniques of vocal emission, concepts of breathing and articulation-pronunciation.

MUS 651 0 111-112-211-212- 311-312-411-412 University Chorus (3-1)3

Basic techniques of vocal development, both as an individual and as an ensemble. To create awareness about different styles of music, with emphasis on the various historical and culture. Performance of a repertoire representing a wide range of historical periods and styles.

MUS 651 0 121-122-221-222-321-322-421-422 Voice (3-1)3

Studies on individual vocal development (breath management, range, control, tone, vocalization) to gain an understanding of vocal technique, to increase musicality, musical skills and awareness of classical and contemporary repertoire.

MUS 651 0 141-142 History of Instrument (3-1)3

History of Instrument is also history of technology. And evolution of instrument mirrors evolution of cultures. According to this point of view, the instruments which realize musical expression are one of the indicators of human development ad thought.

MUS 651 0 151-152-251-252-351-352-451-452 Jazz Orchestra (3-1)3

This course aims to make improvement of playing an instrument and gain harmonic abilities in an orchestral arrangement. While teaching how to play an instrument appropriately in accordance with others, also make students know jazz music and its subgenres and improve their musical abilities.

MUS 651 0 161-162-261-262-361-362-461-462 Performing Jazz (3-1)3

With this course, students gain a general knowledge of history of vocal performing and Jazz music while learning how to use their voices like an instrument by the help of diaphragm breathe also studied. By the end of the semester, students will perform a jazz song together with the chorus or solo accompanied by jazz orchestra.

MUS 651 0 171-172-271-272-371-372-471-472 Drum (3-1)3

With this course, students can gain the theoretical knowledge of Modern music and opportunity for application and learn how to play drum appropriately with the necessary knowledge of solfeggio for rhythms.

MUS 651 0 181-182-281-282-381-382-481-482 Bass Guitar (3-1)3

Bass Guitar course introduces students to international, modern music while teaching how to play the instrument as much as providing a general knowledge of solfeggio to perform efficiently.

MUS 651 0 191-192 Solfeggio (3-1)3

The course aims to improve the skills of vocalizing and animating musical compositions, written by universal notes system, in internal ear by the help of theoretical awareness; of recording any music heard as universal notes system. Accompanied by piano, practice and performances will be supported by theoretical analysis till the end of semester.

MUS 651 0 231-232- 331-332 History of Jazz (3-1)3

The purpose of this course is to teach the art of jazz by giving main examples or studies of classic or modern jazz.

MUS 651 0 241 History of Music (3-1)3

The adoption, in the 4th century A.D., of Christianity, a celestial religion coming from the Eastern Mediterranean and based on the Jewish liturgy, as an official doctrine in the Greco-Roman world where a specific urban culture had already set its roots, provoked ideological clashes that were going to last throughout the next millennium and beyond. The church authorities, emulating the ban on music in Wudaism's liturgy the ban on music in Judaism's liturgical practices, strived, in vain, to ban or restrict music from their activities, or at least, to strictly define the "acceptable" types of music so that others could be kept out. Nevertheless, under strong pressure from the congregations a series of social changes were implemented to incorporate music within the Christian ideology. Starting from the l5th century, a new social structure where a more liberal Christian tradition, proper to Europe, tolerating and even supporting a wide variety of musical tastes, appeared. Music examples from Medieval and Renaissance Europe will be presented and analyzed from both musical and social viewpoints. Students are required to conduct

research and make class presentations. Grading is based on class presentations and a term paper.

MUS 651 0 341-342
Music Appreciation (3-1)3

This course aims to develop the musical aesthetic of the students, by means of research of some topics related with the transition of music from primitive to modern ages, the genres in music, techniques which have been used to compose music and presumptions about the future of classical music.

MUS 651 0 242
Art and Science Culture (3-1)3

The course aims to create awareness in aesthetic, technical and intellectual genuineness of the field of "art". At the end of the semester, students are expected to be equipped with the connection between science and art and to develop creative motivation in her/his professional field as a result of the new formation derived from the course.

THEA 643 0 101-102
International News (3-1)3

This course attempts to provide a basic grounding in international news media as they constitute, represent and influence international relations. The course introduces the field of international communication, news media diplomacy and news media practice during times of war and crisis with visual and written press coverage examples.

THEA 643 0 111-112- 211-212-311-312-411-412 Painting (3-1)3

The purpose of this course is to give information about materials, basic rules and techniques (drawing, watercolor, oil on canvas, etc.) of painting in studio.

THEA 643 0 113 Drawing (3-1)3

To teach drawing is to encourage you to see it as a creative process. Therefore, the thought and commitment you put into your drawings, and the enjoyment you derive from doing them, is more important than the finished work. You on the other hand, will most likely want to draw a photo realistic likeness of any subject matter the first time out. If you could already do that.... why would you be here? Just as we learn to read and write, drawing skills are acquired and developed by doing. This doesn't require genius or even innate talent and does not require fancy tools, but rather, requires time, patience and the willingness to practice, make "mistakes" and persevere.

THEA 643 0 121-122-221-222-321-322-421-422 Glass (3-1)3

The course aims to introduce the techniques of glass molding. Throughout four-year syllabus, different techniques for glass moldings are experienced and practiced with support of related literature and theoretical discussions. Every year is independent from other years and students are evaluated according to their works at the end of the year.

THEA 643 0 131-132-231-232-331-332-431-432 Sculpture (3-1)3

This course is an introduction to sculpture. In the studio the student will explore various approaches to contemporary sculptural problems by working with a variety of media. Each week there are eight scheduled hours in the studio during which time you will be able to work in consultation with the instructor. In addition, this time will be used for lectures and to critique work in progress. During the first few weeks a number of sculptural projects will be assigned, and critiqued as they are completed. The projects are designed to develop hands-on experience with diverse materials and methods. While working on these initial projects students will, in conference with the instructor, begin a major sculptural project.

THEA 643 0 141-142-241-242-341-342-441 442 Ceramics (3-1)3

This course is intended as a continued exploration of ceramic media with emphasis on the artistic possibilities of clay. Early pieces will provide review and guides into different hand-building techniques (Pinching, coil building, additive sculpture, slab building and combinations etc.). The course provides an exploration of the properties of clay and an introduction to basic ceramic processes, including studio responsibilities, hand building and glazing techniques. Later projects will combine these techniques to realize more complex artistic objects. The projects will further develop an appreciation of techniques, concepts behind and aesthetic of ceramic forms a greater sense of clay, glaze and firing will be developed. Group discussions will introduce students to the contemporary ceramic artists and illustrate how clay has been used as an artistic medium. The broad diversity within ceramic styles, techniques, functional possibilities and subject matter will be investigated. Ceramics history and appreciation is also included in the course.

THEA 643 0 151-152- 251-252-351-352-451-452 Introduction To Video Production (3-1)3

Students will study and produce experimental films. An experimental film is a film that explores new ways of seeing, storytelling, shooting, editing. While it is the task of Documentary or fiction film, to observe or reenact reality, experimental film is not bound to reflect "truly" the surface of "reality" like a

mirror. It is free to create a new reality, a piece of art open for all kind of interpretation by the audience.
In this course a wide range of films utilizing experimental modes are screened. Through the examination of cinematographic approaches across the various experimental films or experimental parts in conventional films students will get an idea of possible alternative ways of filmmaking.
Some hints to modern art and music will help to imagine other ways of audiovisual art. Beginning with alternative screenplay writing up to different ways of editing, students will explore step-by-step experimental worlds. They will develop, shoot and edit short experimental films.

THEA 643 0 161-162- 261-262-361-362-461-462 Theater (3-1)3
The purpose of this course is to give students an introduction to the theater. Topics will encompass the history and development of the theatrical arts, including acting, directing and the various elements of stagecraft and production, as well as major theatrical works. The contemporary Turkish theater will be emphasized.

THEA 643 0 171-172- 271-272-371-372-471-472 Cinema and Reality (3-1)3
This course is on film editing. This course will introduce into the development of this 'grammar of editing' by viewing and analyzing history of editing. To learn the ways of editing students will edit first specific scenes of film history to a little essay for presentation, and then they will edit footage available at GİSAM to a short film. The editing will contain documentary editing, fiction film decoupage editing and use of effects for special content.

THEA 643 0 181-182 Museums and Masterpieces (3-1)3
This art course is structured upon two main parts; while the first part consists the history of the art movement and important contributions of artists to art, the second consists examples of contemporary art with the explanations and examples of events of contemporary art fairs and biennals.

THEA 643 0 201-202 History of Theater (3-1)3
201/This course will cover the beginnings of theatre, the ancient rituals, and the theatrical nature of the ancient rituals. Then, the Ancient Greek and Roman Theatres will be introduced. While surveys of the Ancient Greek and Roman Theatres are given, the famous genres of the period will be introduced such as *comedy, tragedy*. The representative playwrights of both periods will also be introduced. Following this, the Medieval Theatre and the theatrical activities of the period will be observed. After this, the Renaissance Period will be studied with its contribution to the theatre and the theatrical events. Finally, the Elizabethan Theatre and Shakespeare's significance as a man of theatre will be observed.
202/This course covers the 17th, 18th, 19th, 20th Century theatres. In addition to the theatre history of these periods, famous directors of 20th and 21st Centuries are introduced. During the period study, the focus is on theatre buildings, acting areas, performance styles, famous actors and actresses, famous playwrights, the period events and their influence on theatre, social class changes and how they affect theatre. Since theatre is a shared experience, observation of this concept is inevitable. Furthermore, the nature of theatre is emphasized.

THEA 643 0 301-302 Media Economics (3-1)3
The course will explore the history and current practices of media systems both in Turkey and abroad. The students will be acknowledged by examining the particular strengths and weaknesses of broadcast television and print industry, media corporations, and audience research and therefore will able to evaluate and analyze the current trends in mass media and how the media market is operated and consumed.

THEA 643 0 401 History of Art (3-1)3
This course surveys the history of art in western and non-western traditions from 14th century to the last decades of 20th century. The course emphasizes the connections among historical, political, social, religious and artistic developments, showing how artists are influenced by the culture and time in which they live. It aims to identify the major art movements from 14th century to the last decades of 20th century. The students are supposed to recognize the works and contributions of the major artists in each movement. It searches how past art movements and styles influence today's art. The course encourages the students to develop their vocabulary of art terms.

THEA 643 0 402 Modernism and Postmodernism in Art (3-1)3
The course is focused on modern and contemporary art tendencies in context of modernism and postmodernism. It includes certain issues such as birth and evolution of the modern idea; historical limits of modern art, modernism, modernization; the basic concepts and methods of modern art; the arguments about culture in the late capitalist society; the end of grand narratives and history; the

basic concepts, tendencies and methods of postmodern art; curatorship and biennials. Related artists, tendencies and works of art will be instructed during the course.

THEA 643 0 281-282
Film Analysis (3-1)3
Students will learn to analyze major films of world cinema from the point of esthetics and social points of view. They will attain an understanding of the history of world cinema and an ability to build relations between cinema and social, political and economic facts and events of the epoch. Such topics as classical Hollywood cinema, Italian neo-realism, French new wave, major filmmakers, etc. will be studied during these courses.

THEA 643 0 291-292
Genres in Arts (3-1)3
The purpose of this course is to give information about genres in arts.

INST 682 0 101-102-201-202-301-302-401-402
Piano (3-1)3
Philosophy of the piano course is to teach the students how to play the instrument by passing from some different stages in which they can learn what universal music is, by experiencing it in theoretical and practical courses. Moreover, the aim of the course is to encourage the students to understand the quality of their music by teaching them what bad and simple music is. In a broad perspective the instructors of the course also aim to grow such students who can support the cultural development of our country.

INST 682 0 111-112-211-212-311-312-411-412
Flute (3-1)3
Philosophy of the flute course is to teach the students how to play the instrument by passing from some different stages in which they can learn what universal music is, by experiencing it in theoretical and practical courses. Moreover, the aim of the course is to encourage the students to understand the quality of their music by teaching them what bad and simple music is. In a broad perspective the instructors of the course also aim to grow such students who can support the cultural development of our country.

INST 682 0 121-122-221-222-321-322-421-422
Violin (3-1)3
Philosophy of the violin course is to teach the students how to play the instrument by passing from some different stages in which they can learn what universal music is, by experiencing it in theoretical and practical courses. Moreover, the aim of the course is to encourage the students to understand the quality of their music by teaching them what bad and simple music is. In a broad perspective the instructors of the course also aim to grow such students who can support the cultural development of our country.

INST 682 0131-132-231-232-331-332-431-432
Viola (3-1)3
Philosophy of the viola course is to teach the students how to play the instrument by passing from some different stages in which they can learn what universal music is, by experiencing it in theoretical and practical courses. Moreover, the aim of the course is to encourage the students to understand the quality of their music by teaching them what bad and simple music is. In a broad perspective the instructors of the course also aim to grow such students who can support the cultural development of our country.

INST 682 0 141-142- 241-242-341-342-441-442 Violoncello (3-1)3
Philosophy of the violoncello course is to teach the students how to play the instrument by passing from some different stages in which they can learn what universal music is, by experiencing it in theoretical and practical courses. Moreover, the aim of the course is to encourage the students to understand the quality of their music by teaching them what bad and simple music is. In a broad perspective the instructors of the course also aim to grow such students who can support the cultural development of our country.

INST 682 0 151-152- 251-252-351-352-451-451
Classical Guitar (3-1)3
Philosophy of the classical guitar course is to teach the students how to play the instrument by passing from some different stages in which they can learn what universal music is, by experiencing it in theoretical and practical courses. Moreover, the aim of the course is to encourage the students to understand the quality of their music by teaching them what bad and simple music is. In a broad perspective the instructors of the course also aim to grow such students who can support the cultural development of our country.

INST 682 0 161-162-261-262-361-362-461-462
Saxophone-Clarinet (3-1)3
Saxophone and clarinet lecture targets introduce students to international music with the first step of playing a wind instrument which is learning how to use diaphragm to increase their breathe volume, then, showing how to play a saxophone and/or clarinet.

INST 682 0 171- 172-271-272-371-372-471-472 Trumpet (3-1)3

By the help of this course, students learn general solfeggio knowledge and how to use their diaphragm to increase their breath volume necessary to play appropriately a trumpet with a general music culture.

INST 682 0181- 182-281-282-381-382-481-482 Trombone (3-1)3

By the help of this course, students learn general solfeggio knowledge and how to use their diaphragm to increase their breath volume necessary to play appropriately a trombone with a general music culture.

SLTP 644 0111- 0112 Topics in Art (3-1)3

In spring semesters of 2013-2014 and 2014-2015 academic years, the course is planned to be open as “Introduction to Korean Art” specifically. Therefore, throughout these semesters, the course aims to familiarize students with the main issues in Korean art by surveying the key episodes in the development of material and visual culture on the Korean peninsula, through a selection of thematic topics ranging from the Three Kingdoms period to the first half of the twentieth century.

GRADUATE SCHOOLS

Graduate education serves to explore and advance the limits of knowledge and therefore has a preeminent role in a university. With various bodies of a university being under pressure to attend to a variety of issues, a separate unit is needed which primarily focuses on academic concerns at the graduate level. The responsibility for planning, implementing and evaluating graduate programs, and setting out new policies in search of excellence in graduate education rests with four Graduate Schools at the Middle East Technical University (METU).

The primary responsibilities of each Graduate School are to maintain high standards and quality in graduate programs and to coordinate the various graduate programs.

The Graduate Schools provide a qualified student with education which may be required for the full development of scholarly and professional capacities, subject to the criteria developed by graduate departments jointly.

ADMINISTRATIVE ORGANIZATION

The main administrative body of each Graduate School is the Graduate School Board. On this board, each department is represented by its chairman as a Graduate School Department (GSD). In addition, GSDs of interdisciplinary nature, to carry out graduate programs by contributions of various departments, may also be established by the Higher Education Board. These are also represented by their appointed chairperson on the Graduate School Board. The GSD structure of the Graduate School of Marine Sciences is independent of faculty departments. Each GSD may carry out more than one graduate program.

The Graduate School Board makes decisions on policies and procedures regarding admissions, graduate courses, qualifying examinations and thesis requirements within that particular graduate school, consistent with the Rules and Regulations for Graduate Studies at METU, which are common to all five graduate schools.

Each graduate school functions through two executive bodies: the Director and Associate Directors of the Graduate School and the Administrative Board of the Graduate School, which consists of the Director, Associate Directors and three members elected by the Graduate School Board. These two executive bodies are charged with the duty of implementing the policies and procedures established by the Graduate School Board.

Entrance requirements for graduate programs and admission of international students to graduate programs are mentioned on page xxxi and xxxii, Academic Rules and Regulations concerning graduate period of study, examinations and assessment are mentioned on page xliv and xlv.

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

Director : ÖZGEN, Canan; Prof. Dr.;
B.S., M.S., Ph.D., METU.
Associate Director: TURAN, Gürsevil; Prof. Dr.;
B.S., M.S., Ph.D., METU.
Associate Director: DURAL, Gülbin; Prof. Dr.;
B.S., M.S., METU; Ph.D., The Ohio State University.

GENERAL INFORMATION: The Graduate School of Natural and Applied Sciences organizes programs and research and offers degrees at graduate level in the following fields:

Programs	**Degree**
Aerospace Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Architecture	M.Arch (1) / Ph.D. / Ph.D. on B.S.
Building Science	M.S. (1). / Ph.D. / Ph.D. on B.S.
Restoration	M.S. (1) / Ph.D. / Ph.D. on B.S.
Computational Design and Fabrication Technologies in Architecture (with Delft University of Technology)	M.S. (4)
Biology	M.S. (1) / Ph.D.
Chemical Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Chemistry	M.S. (1) / Ph.D. / Ph.D. on B.S.
City and Regional Planning	Ph.D. / Ph.D. on B.S.
City Planning	M.CP.(1)
Urban Design	M.CP.(1)
Regional Planning	M.RP.(1)
Civil Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Hydrosystems Engineering	M.S. (3)
Structural Mechanics	M.S. (3)
Computer Education and Instructional Technology	M.S. (1) / Ph.D. / Ph.D. on B.S.
Computer Engineering	M.S. (1,3) / Ph.D. / Ph.D. on B.S.
Software Engineering	M.S. (3)
Electrical and Electronic Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Engineering Sciences	M.S. (1) / Ph.D. / Ph.D. on B.S.
Environmental Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Food Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Geological Engineering	M.S. (1) / Ph.D.
Industrial Design	M.S. (1) / Ph.D. / Ph.D. on B.S.
Design Research for Interaction (with Delft University of Technology)	M.S. (4)
Industrial Engineering	M.S. (1,4) / Ph.D. / Ph.D. on B.S.
Engineering Management	M.S. (3)
Mathematics	M.S. (1,2) / Ph.D. / Ph.D. on B.S.
Mechanical Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Mechanical Design and Manufacturing	M.S. (3)
Metallurgical and Materials Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Mining Engineering	M.S. (1) / Ph.D.
Petroleum and Natural Gas Engineering	M.S. (1) / Ph.D.
Physics	M.S.(1) / Ph.D. / Ph.D. on B.S.
Secondary Science and Mathematics Education	M.S. (1,2) / Ph.D. / Ph.D. on B.S.
Statistics	M.S. (1) / Ph.D. / Ph.D. on B.S.

Interdisciplinary Programs	**Degree**
Archaeometry	M.S. (1,2) / Ph.D. / Ph.D. on B.S.
Biochemistry	M.S. (1) / Ph.D.
Biomedical Engineering	M.S. (1) / Ph.D. / Ph.D. on B.S.
Biotechnology	M.S. (1) / Ph.D. / Ph.D. on B.S.

Cement Engineering	M.S. (1,2)
Earth System Science	M.S. (1,2) / Ph.D. / Ph.D. on B.S.
Earthquake Studies	M.S. (1)
Geodetic and Geographic Information Technologies	M.S. (1) / Ph.D. / Ph.D. on B.S.
Micro and Nanotechnology	M.S. (1) / Ph.D. / Ph.D. on B.S.
Occupational Health and Safety	M.S. (1,2)
Operational Research	M.S. (1) / Ph.D. / Ph.D. on B.S.
Polymer Science and Technology	M.S. (1) / Ph.D. / Ph.D. on B.S.

(1) With thesis
(2) Without thesis
(3) Evening program without thesis
(4) Joint (International) master's program with thesis

ARCHAEOMETRY PROGRAM

PROFESSORS

ATALAY, Ümit (***Department Chair***): B.S., M.S., Ph.D., METU.
BULUR, Enver: B.S., M.S., Ph.D., METU.
DOĞAN, Musa: B.S., Ankara University; M.S., Ph.D., Edinburgh University.
ERCİYAS, Burcu: B.A., Bilkent University; M.A., Ph.D., University of Cincinnati
GÖKTÜRK, Hale: B.S., M.S., Ph.D., METU.
KALKANLI, Ali: B.S., M.S., METU; Ph.D.,Open University of Milton Keynes, UK.
ÖZENBAŞ, Macit: B.S., M.S., Ph.D., METU.
TOGAN, İnci: B.S., METU; M.S., John Hopkins University; Ph.D., METU.
TOPAL, Tamer: B.S., M.S., Ph.D., METU
TÜRKER, Lemi: B.S., M.S., METU; Ph.D. University of East Anglia.
TÜRKMENOĞLU, Asuman G.: B.S., M.S., METU; Ph.D. University of Cincinnati.

ASSISTANT PROFESSORS

BİRAND, Ayşegül : B.S., M.S., METU ; Ph.D., New Mexico State University.
ERTAŞ, Gülay : B.S., M.S., Ph.D., METU.
KALAYLIOĞLU, Zeynep I.: B.S., METU; M.S., Ph.D., North Carolina State University.
ÖZACAR, Arda: B.S., M.S., METU; Ph.D., University of Arizona.
SOMEL, Mehmet: B.S., M.S., METU ; Ph.D., University of Leipzig.

INSTRUCTOR

ERGENEKON Begümşen: B.S, METU,Cand. Polit., University of Bergen; Ph.D.; Ankara University

GENERAL INFORMATION: Archaeometry is an interdisciplinary program leading to M.S. and Ph.D. degree by providing education and research activities to the graduates. The main purpose of the program is to qualify the graduates who will be able to bring solutions to the problems of interdisciplinary nature in the application of scientific methods of natural and applied sciences to the archaeological research, or in short to Archaeometry.

Archaeometrical studies are of great help to archaeology and of great value in many ways for the achievement of more correct and extensive interpretations of ancient cultures.

The study and understanding of history will acquire a new dimension by the collaboration between people from various disciplines who will be gaining improved skills in formulating, analyzing and solving archaeological problems through this program.

The program is so designed that the students with archaeology or social science background will learn scientific methods of natural and applied sciences applicable to Archaeometry, and the students with science and engineering background will learn the methods of archaeology.

GRADUATE CURRICULUM

M.S. in Archaeometry (Thesis)

ARME	500	M.S. Thesis	NC
ARME	501	General Archaeometry	(3-0)3
ARME	502	Analysis of Data in Archaeometry	(2-2)3
ARME	511	Basic Science in Archaeometry *	(2-2)3
ARME	531	General Archaeology*	(3-0)3
ARME	540	Conservation and Restoration of Archaeological Objects	(2-2)3

ARME	541	Archaeological Materials and Their Properties	(3-0)3
ARME	590	Summer Practice	NC
ARME	591	Seminar in Archaeometry I	(0-2)NC
ARME	592	Seminar in Archaeometry II	(0-2)NC

3 electives

Total minimum credit : 24
Number of Courses with credit (min) : 8

*ARME 511 Basic Science in Archaeometry; for social science basis students
*ARME 531 General Archaeology;for science basis students

M.S. in Archaeometry (Without Thesis)

ARME	501	General Archaeometry	(3-0)3
ARME	502	Analysis of Data in Archaeometry	(2-2)3
ARME	541	Archaeological Materials and Their Properties	(3-0)3
ARME	591	Seminar in Archaeometry I*	(0-2)NC
ARME	599	Term Project	NC

6 electives

Total minimum credit: 27
Number of Courses with credit (min): 9

*or ARME 592 Seminar in Archaeometry II (0-2) NC

Ph.D. in Archaeometry

If admitted by M.S. degree in Archaeometry

ARME	600	Ph.D. Thesis	NC
ARME	601	Seminer in Archaeometry III	(0-2)NC
ARME	602	Seminer in Archaeometry IV	(0-2)NC
ARME	603	Summer Field Research	NC

7 electives

Total minimum credit: 21
Number of courses with credit (min): 7

If admitted by M.S. or M.A. degree in a field other than Archaeometry

ARME	501	General Archaeometry	(3-0)3
ARME	511	Basic Science in Archaeometry	(2-2)3
ARME	540	Conservation and Restoration of Archaeological Objects	(2-2)3
ARME	541	Archaeological Materials and Their Properties	(3-0)3
ARME	600	Ph.D. Thesis	NC
ARME	601	Seminar in Archaeometry III	(0-2)NC
ARME	602	Seminar in Archaeometry IV	(0-2)NC
ARME	603	Summer Field Research	NC

6 electives

Total minimum credit: 30
Number of courses with credit (min): 10

If admitted by B.S. degree:

ARME	500	M.S. Thesis	NC

ARME	501	General Archaeometry	(3-0)3
ARME	502	Analysis of Data in Archaeometry	(2-2)3
ARME	511	Basic Science in Archaeometry*	(2-2)3
ARME	531	General Archaeology*	(3-0)3
ARME	540	Conservation and Restoration of Archaeological Objects	(2-2)3
ARME	541	Archaeological Materials and Their Properties	(3-0)3
ARME	590	Summer Practice	NC
ARME	591	Seminar in Archaeometry I	(0-2)NC
ARME	592	Seminar in Archaeometry II	(0-2)NC
ARME	600	Ph.D. Thesis	NC
ARME	601	Seminar in Archaeometry III	(0-2)NC
ARME	602	Seminar in Archaeometry IV	(0-2)NC
ARME	603	Summer Field Research	NC

10 electives

Total minimum credit: 45
Number of courses with credit: 15

*****ARME 511 Basic Science in Archaeometry; for social science basis students
*ARME 531 General Archaeology; for science basis students

GRADUATE COURSES

ARME	500	M.S. Thesis	NC
ARME	501	General Archaeometry	(3-0)3
ARME	502	Analysis of Data in Archaeometry	(2-2)3
ARME	511	Basic Science in Archaeometry	(2-2)3
ARME	515	Spectroscopic Analysis in Archaeometry	(2-2)3
ARME	521	History of Technology	(3-0)3
ARME	531	General Archaeology	(3-0)3
ARME	540	Conservation and Restoration of Archaeological Objects	(2-2)3
ARME	541	Archaeological Materials and Their Properties	(3-0)3
ARME	543	Methods and Techniques in Archaeometry	(2-2)3
ARME	550	Ancient Mining and Metallurgy	(3-0)3
ARME	553	Human Population Biology	(3-0)3
ARME	563	Cultural Evolution I	(3-0)3
ARME	564	Cultural Evolution II	(3-0)3
ARME	580	Photography	(2-2)3
ARME	590	Summer Practice	NC
ARME	591	Seminar in Archaeometry I	(0-2)NC
ARME	592	Seminar in Archaeometry II	(0-2)NC
ARME	599	Term Project	NC
ARME	600	Ph. D. Thesis	NC
ARME	601	Seminar in Archaeometry III	(0-2)NC
ARME	602	Seminar in Archaeometry IV	(0-2)NC
ARME	603	Summer Field Research	NC
ARME	7XX	Special Topics in Archaeometry	(3-0)3
ARME	8XX	Special Studies	(4-2)NC
ARME	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF COURSES

ARME 500 MS. Thesis NC
Program of research leading to M.S. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their third semester while the research program or write-up of thesis is in progress. (F&S)

ARME 501 General Archaeometry (3-0)3
Brief description of the principles, techniques and limitations of Radiocarbon (C-14), Thermoluminescence (TL), Electron Spin Resonance (ESR), Potassium/Argon, Uranium series, Fission Track, Obsidian Hydration and Varve Chronology. Structure determination and source identification of archaeological materials by lead Isotope, Instrumental Neutron Activation (INAA), Chemical,

Microscopical, Petrographical, Radiographical, and X-ray Fluorescence Analyses. Non destructive testing techniques. Methods of investigating the ancient technology. Methods of prospection. (F)

ARME 502 Analysis of Data in Archaeometry (2-2)3
Summarization of data properties of different theoretical distributions, the concept of hypothesis testing and employment of different methods (regression, correlation, principle component, discriminant function analysis and ANOVA) with special reference to archaeometric data (S).

ARME 511 Basic Science in Archaeometry (2-2)3
Elements. Isotopes. Compounds. Chemical and physical changes. Energy. Matter. Different states of matter. Electronic, optical, magnetic and thermal properties of materials. Electromagnetic radiation and its interaction with matter. Chemical treatments of materials. Cell, genetics and biological systems. (F)

ARME 515 Spectroscopic Analysis in Archaeometry (2-2)3
Identification and structure determination of archaeological materials by using the spectroscopic methods; atomic absorption and emission, x-ray diffraction, neutron activation, optical spectroscopy, electron spin resonance. (R)

ARME 521 History of Technology (3-0)3
A general survey of development of technology from prehistoric time to medieval period. (R)

ARME 531 General Archaeology (3-0)3
General introduction to archaeology. Prehistoric periods. Historic periods. Classical archaeology. Medieval archaeology. (S)

ARME 540 Conservation and Restoration of Archaeological Objects (2-2)3
Decay of archaeological materials in soil and in exposed environment. Principles and some techniques of conservation. Possible interference problems in archaeometry due to conservation. (S)

ARME 541 Archaeological Materials and Their Properties (3-0)3
Basic nature of materials; their properties and behavior. Organic materials, paintings, ink, foods and all other organic compounds and their nature. Structure of metals and alloys. Structural imperfections. Modification of properties through changes in micro structure. Corrosion of metallic materials. Traditional ceramic materials. Raw materials and classification of products. Ceramic forming methods. Glass melting and forming. Glazes and enamels. Nature of polymeric materials. (F)

ARME 543 Methods and Techniques in Arhaeometry (2-2)3
Identification and structure determination of archaeological materials using spectroscopic methods, x-ray diffraction, thin section, SEM-EDX analyses. Techniques of dating and conservation-restoration of materials.

ARME 550 Ancient Mining and Metallurgy (3-0)3
Early mining techniques in Anatolia. Relation between the ores and the mining techniques. Instruments found from the excavations in early mining regions. Types of ore preparation and smelting techniques in ancient times. Methods of alloy preparation. Techniques of the shaping of metallic materials. (R)

ARME 553 Human Population Biology (3-0)3
Discussion of genetical, anatomical and ecological parameters of human population. (R)

ARME 563 Cultural Evolution I (3-0)3
This course aims at introducing the anthropological approach in understanding what happened in history and is happening today. Therefore the concepts of culture, primate and human social organizations, evolution, cultural systems such as language and communication; marriage, family and kinship; production, consumption and exchange; social control; beliefs, myths and cosmology will be studied in terms of cultures in-nature.(F)

ARME 564 Cultural Evolution II (2-2)3
This course teaches techniques of anthropological research and scientific writing. Designing a research project, doing a literature survey, collecting qualitative and quantitative data through participant observation and learning the form and content of scientific writing will be required. Theoretical framework comparative literature, presentation of data as supporting evidence and the analysis make up the content while the title page, table of contents, abstract, introduction, discussion, conclusion, list of references and addenda constitute the form of a scientific manuscript. (S)

ARME 580 Photography (2-2)3
Basic principles of photography to be applied in field studies as well as in laboratory in order to record research work. (F& S)

ARME 590 Summer Practice NC
Summer practice of at least 3 weeks preferable carried out in an excavation site, research laboratories of the museums or conservation centers. Report prepared at the end of summer practice should reflect the practical experience.

ARME 591-592 Seminar in Archaeometry I-II (0-2) NC
The seminar covers general aspects of archaeometry, given by invited speakers and students. Students prepare and present papers of different subjects including the review of recent researches as well as certain problems in related to their theses. (F&S)

ARME 599 Term Project NC
A research project on a topic in archaeometry normally based on laboratory work. The student is required to write a comprehensive report literature as well as findings of his/her research.

ARME 600 Ph.D. Thesis NC

Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their third semester.

ARME 601-602 Seminar in Archaeometry III-IV (0-2)NC
The seminar covers general aspects of archaeometry, given by invited speakers and students. Students prepare and present papers of different subjects including the review of recent researches as well as certain problems in related to their theses.

ARME 603 Summer Field Research NC
Students are required to carry out a research in an excavation site, research laboratories of the departments, museums or conservation centers and report a research paper during the summer of the first year. Research papers will be presented in the beginning of the second year of the program.

ARME 7XX Special Topics in Archaeometry (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge. Typical contents include characterization of ancient ceramics, determination of diet factor elements, archaeological soil analysis, (R)

ARME 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

ARME 9XX Advanced Studies (4-0)NC
Graduate Students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

BIOCHEMISTRY PROGRAM

PROFESSORS

ADALI, Orhan (***Department Chair)***: B.S., M.S., Ph.D., METU.
AKKAYA, Mahinur: B.S., METU; M.S., Ph.D., Ohio State University.
BÖLÜKBAŞI, Ufuk: B.S., M.S., METU; Ph.D. Iowa State University.
BAYINDIRLI, Alev: B.S., M.S., Ph.D., METU.
BOZOĞLU, Faruk: B.S., M.S., METU; Ph.D., North Carolina University.
GÖKÇAY, F.Celal: B.S. İstanbul University; Ph.D. University of Wales, U.C. Cardiff.
GÜRAKAN, Candan: B.S., M.S., Ph.,D., METU.
GÜRAY, N. Tülin: B.S., M.S., Ph.D., METU.
HAMAMCI, Haluk: B.S., M.S., METU; Ph.D., University of California Davis.
KOCABIYIK, Semra: B.S., Ankara University; M.S., Ph.D., METU.
ÖKTEM, Hüseyin Avni: B.S., M.S., METU; Ph.D., Universitatis Dc Attila Jozsef.
ÖZCENGİZ, Gülay: B.S., Hacettepe University; M.S., Ph.D., METU.
SEVERCAN, Feride: B.S., Ankara University; M.S., University of Rochester; Ph.D., Hacettepe University.
YÜCEL, Meral: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

BANERJEE, Sreeparna: BS, Presidency College, Calcutta University; MS, PhD, University of Leeds.
ÇORUH, Nursen: B.S., M.S., METU; Ph.D. University of Missouri.
DOĞRU, Ewa: M.S., Warsaw University, Ph.D., Polish Academy of Science
İÇGEN, Bülent: B.S., M.S., Ph.D., METU.
SON, Çağdaş B.S., M.S., METU; Ph.D. University of Tennessee

ASSISTANT PROFESSORS

SOYER, Yeşim: B.S., M.S., Ankara University, Ph.D., Cornell University
ÖZTOP, Mecit: B.S., M.S., METU, Ph.D., University of California, Davis
SOMEL, Mehmet: B.S., M.S., METU; Ph.D., University of Leipzig

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAMS: The graduate program in Biochemistry is a joint interdisciplinary program of four departments, namely Biology, Chemistry, Food Engineering and Environmental Engineering, offering M.S. and Ph.D. degrees. It is open to students with a variety of backgrounds and career goals. Fundamental subjects such as molecular biochemistry, chemistry, enzyme kinetics, molecular biology, biochemical toxicology, and molecular genetics are supplemented by several applied elective courses such as food processing, biochemical engineering, and enzyme technology.

MAJOR GRADUATE LEVEL RESEARCH ACTIVITIES:

- Purification, biochemical and immunological characterization of microsomal drug metabolizing to enzyme systems (NADPH dependent cytochrome P-450 reductase; cytochrome P-450 isozymes; Flavin monooxygenases, and conjugation enzymes (glutathione-S-transferases; N-acetyl transferases)
- Purification and characterization of lung microsomal cytochrome b5 and NADH cytochrome b5 reductase and their interaction with drug metabolizing enzymes.
- Identification and characterization of stress proteins (heat, cold, metal and salt) in different crop plants; genetic manipulation of crop plants.
- Application of new technologies on destruction of food microorganisms; identification of food microorganisms, hazard analysis.
- Control of malo-lactic fermentation.
- Polymorphism of drug metabolizing enzymes in human (glutathione-S-transferases; N-acetyl transferases, P-450, FMO)
- Structure function studies on flavin containing monooxygenases.
- Cytochrome P-450 dependent drug metabolism in diabetic animals.
- Genotoxicity and DNA interactions of metals, free radicals and newly synthesized anticancer agents.

-Enzyme kinetics; kinetic studies on regulatory enzymes.
-Biochemical characterization of signal transduction pathways in yeast, plants and mammalian cell lines.
-Enzyme technology; large scale production, purification and characterization of industrially important enzymes.
-Protein conformation and stability; protein modification; metal and ligand binding; circular dichroism and fluorescence techniques.
-Biochemical, cytotoxic, and genotoxic effects of medicinal plant extracts on animal tissue cultures.
-Biosensor development using recombination proteins (GSTs)
-Design and synthesis of artificial enzymes and fluorescent chemosensors.
-Molecular marker isolation (such as AFLP) for mapping and genotyping of crop plants
-Analysis of anti-sense reagents.
-Effects of vitamin E on erythrocyte membrane structure and stability.
. -Studying the molecular basis of individual variation in working and reference memory in different rat strains.
. -Studies on the role of some pharmacological agents as a therapeutic tool in memory deficits in young and old animals.
. -Monitoring microbial catabolic enzymes to degrade pollutants.
-Bioremediation of xenobiotics.
. -Food biochemistry, antioxidants, food polymers.
-Human evolution at the transcriptome and genetic levels and cancer, brain aging
-Protein protein interactions, receptor ligand interactions.
-Effect of protein dimerization on function and trafficking..

LABORATORIES AND EQUIPMENT: The facilities of the four related departments are used for teaching and research.

CAREER OPPORTUNITIES: Biochemistry graduates may have career opportunities in industry, pharmaceutical companies, biotechnology firms, and environment and health sectors in addition to research and teaching in universities and research institutions.

GENERAL INFORMATION: A graduate program leading to M.S. and Ph.D. degrees in Biochemistry has recently been initiated as an interdepartmental major, administered jointly by the Departments of Biology, Chemistry, Environmental Engineering and Food Engineering. The aim of the program is to coordinate research activity and to promote interaction between graduate students and staff members engaged in biochemical research. The emphasis of the program is on the molecular aspects of pure and applied systems.

The major program is open to students with a variety of backgrounds and career goals. An undergraduate major in Biology or Chemistry provides for early orientation in the program.
However, highly individualized courses of introduction may be arranged for students with undergraduate majors in other fields of science so that a switch to biochemistry at the graduate level is feasible.

ADMISSION REQUIREMENTS AND PREREQUISITES: In addition to fulfilling the general requirements for admission to graduate status (see relevant sections of this Catalogue) the applicant to the Graduate Program in Biochemistry is required to have had the equivalents of the following undergraduate courses:

BIO 106, 307, 308, 311 and 415
CHEM 101, 102, 107, 208 and 210
MATH 151 and 152
PHYS 111 and 112

Applicants with strong undergraduate records but lacking some of the preparation indicated above may be admitted with the condition that the deficiencies be removed early in their graduate career.

DEGREE REQUIREMENTS: BCH 591 is compulsory course for the M.S. Degree. Doctoral students are also required to take BCH 503. Remaining credit requirements may be met by taking any combination of above courses and related courses in participating departments: BIO 505, 506, 507, 511, 513, 522, 537, 538 and 543; CHEM 518, 520, 528, 537, 542, 550, 589; ENVE 510, 540; FDE 571, 572, 579. Study programs are planned with approval of the thesis research and are subject to the approval of the Program Committee.

GRADUATE CURRICULUM

M.S. in Biochemistry

BCH	500	M.S. Thesis	NC
BCH	591	Seminar in Biochemistry	(0-2)NC

7 elective courses

Total minimum credit: 21
Number of Courses with credit (min) : 7

Ph.D. in Biochemistry

BCH	503	Intermediary Metabolism and its Regulation *	(3-0)3
BCH	600	Ph.D. Thesis	NC
BCH	691	Seminar	(0-2)NC

6 elective courses

Total minimum credit: 21
Number of Courses with credit (min) : 7

* or BIO 503 Intermediary Metabolism and Its Regulation

GRADUATE COURSES

BCH	500	M.S. Thesis	NC
BCH	501	Free Radicals in Biochemical Systems	(3-0)3
BCH	503	Intermediary Metabolism and Its Regulation	(3-0)3
BCH	508	Biochemical Toxicology and Pharmacology	(3-0)3
BCH	509	Enzyme Kinetics	(3-0)3
BCH	511	Experimental Techniques in Biochemistry	(3-0)3
BCH	512	Quantitative Problems in Biochemistry	(3-0)3
BCH	516	Control Mechanisms in Biochemistry	(3-0)3
BCH	543	Experimental Enzymology	(1-4)3
BCH	551	Enzymatic Reaction Mechanisms	(3-0)3
BCH	555	Biochemistry of Hormones	(3-0)3
BCH	591	Seminar in Biochemistry	(0-2)NC
BCH	592	Advanced Chemical Perspectives in Biochemistry	(3-0)3
BCH	600	Ph.D. Thesis	NC
BCH	691	Seminar	(0-2)NC
BCH	7XX	Special Topics in Biochemistry	(3-0)3
BCH	8XX	Special Studies	(4-2)NC
BCH	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF COURSES

BCH 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between the student an a faculty member. Students register to this course in all semesters starting from the appointment of the supervisor. (F &S)*

BCH 501 Free Radicals in Biochemical Systems (3-0)3
Toxic free radicals can be produced by many reactions required for the normal metabolism of the cell. The reactions of these radicals are important because of the role they play in toxicity and various disorders. This course covers free radical reactions in biological systems including food materials and antioxidants as part of defense systems or used as food additives with reference to recent articles in literature. (F)

BCH 503 Intermediary Metabolism and Its Regulation (3-0)3
(See also BIO 503)
Intensive study of the metabolic pathways of carbohydrates, lipids and nitrogenous compounds and their interrelationships, including control mechanisms. The effects of hormonal and

nutritional status on the activity of these major pathways. (S)
Prerequisites: BIO 307 and BIO 308

BCH 508 Biochemical Toxicology and Pharmacology (3-0)3
Molecular events that occur during the toxic action of drugs, pesticides, industrial chemicals, food contaminants and natural carcinogens. Effects of drugs and environmental chemicals on cell heredity, chemical mutagenesis, teratogenesis and carcinogenesis. Recent advances in drug-drug interactions in man are discussed. The course includes lectures and discussions of current research publications. (S)

BCH 509 Enzyme Kinetics (3-0)3
(See also BIO 509)
Steady-state treatment of simple and multi-step enzymatic reactions. Inhibition analysis, activation cooperative interactions. Multi-substrate systems. Environmental effects on enzyme activity. Transient state kinetics. (R)
Prerequisite: (BIO 307and BIO 308) or BIO 353

BCH 511 Experimental Techniques in Biochemistry (3-0)3
(See also BIO 511)
Theory and practice of fundamental biochemical techniques employed in the study of the structure and function of biological macromolecules in purified or subcellular systems. Spectrophotometry, differential centrifugation, gel filtration, ion exchange and affinity chromatography HPLC and polyacrylamide gel electrophoresis and Western-blotting. (F)
Prerequisites: BIO 30, BIO 308 and BIO 311

BCH 512 Quantitative Problems in Biochemistry (3-0)3
(See also BIO 512)
Solution of numerical problems in biochemistry involving acid-base chemistry, blood buffers, chemistry of biological molecules, enzymes, biochemical energetics, spectrophotemetry, isotopes and scintillation counting.

BCH 516 Control Mechanisms in Biochemistry (3-0)3
(See also BIO 516)
Transcriptional, translational and post-translational control of protein level and activity in response to changes in the intracellular and extracellular environment. (A S)
Prerequisites: BIO 306, BIO 307 and BIO 308.

BCH 543 Experimental Enzymology (1-4)3
(See also BIO 543)
A laboratory course concerned with biochemical and molecular aspects of enzyme function. Purification and characterization of the enzymes, optimization of the enzyme assays, simple enzyme kinetics, spectrophotometry, SDS-polyacrylamide gel electrophoresis, Enzyme-linked immunoassays. (R) *Prerequisites: BIO 307, BIO 308 and BIO 311*

BCH 551 Enzymatic Reaction Mechanisms (3-0)3
A detailed study of the chemical basis of the enzyme action. Discussions of the theories of enzyme action. reaction mechanisms of selected groups of enzymatic transformations. The main objective of the course is to open the black box that has represented the enzyme, and then display and study the fascinating organic chemistry at the core of its actions. (F)

BCH 555 Biochemistry of Hormones (3-0)3
General concepts regarding the biochemical nature of hormones and the basis of hormone action. Hormone receptors and transmembrane signaling. Biological effects of hormones in health and illness. Regulation of hormone action. Discussions of current publications on thyroid, pancreatic, adrenocorticosteroid, glycoprotein, adenohypophysial, neurohypophysial and gonadal hormones; catecholamines, prostaglandins and vitamin D. (S)

BCH 591 Seminar in Biochemistry (0-2)NC
Presentation of topics of general interest, research activities and recent development in biochemistry and related fields by graduate students, staff members and invited speakers. (F & S)

BCH 592 Advanced Chemical Perspectives in Biochemistry (3-0)3
(See also CHEM 592)
Review of selected Biochemistry topics at an advance level with a chemical perspective. Physical interactions that determine the properties of proteins, conformational properties of polypeptide chains, proteins in solution and in membranes. An advanced treatise on the photosynthesis and electron transport chain. (F&S)

BCH 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between the student and a faculty member. Students register to this course in all semesters

starting from the appointment of the supervisor. (F & S)

BCH 691 Seminar (0-2)NC
Enables the student to perform a detailed study on his/her thesis subject. Guidance in research and regular progress reports will be submitted so that specific problems of student's research can be discussed. (F & S)

BCH 7XX Special Topics in Biochemistry (3-0)3
Courses not listed in the catalogue. Contents vary from year to year according to recent developments in biochemical sciences and interest of instructor in charge. Typical contents include biological oxidations, muscle biochemistry, radiobiochemistry, industrial biochemistry, computational biochemistry, etc. (F & S)

BCH 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor. (F & S)

BCH 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her advisor. (F & S)

F: Fall, S: Spring A: Alternative year,
R: Upon request, WE; Wide elective.

BIOMEDICAL ENGINEERING PROGRAM

PROFESSORS

AKKAYA, Mahinur: B.S., METU; M.S., The Ohio State University; Ph.D., The Ohio State University.
AŞIK, Zülfü: B.S., METU; M.S., METU; Ph.D., Texas Tech University.
ÇALIK, Pınar: B.S., Ankara University; M.S., Ankara University; Ph.D., Ankara University.
EYÜBOĞLU, B. Murat: B.S., METU; M.S., METU; Ph.D., University of Sheffield.
GENÇER, Nevzat: B.S., Bosphorus University; M.S., METU; Ph.D., METU.
HALICI, Uğur: B.S., METU; M.S., METU; Ph.D., METU.
HASIRCI, Nesrin: B.S., METU; M.S., METU; Ph.D., METU.
HASIRCI, Vasıf ***(Department Chair)***: B.S., METU; M.S., METU; Ph.D., Reading University.
İZGÜ, Fatih: B.S., Ankara University; M.S., Ankara University; Ph.D., Ankara University.
KOCABIYIK, Semra B.S., Ankara University; M.S., METU; Ph.D., METU.
LEBLEBİCİOĞLU, M. Kemal: B.S., METU; M.S., METU; Ph.D., METU.
ÖZTÜRK, Abdullah: B.S., İstanbul Technical University, M.S. University of Missouri-Rolla, Ph.D., University of Missouri-Rolla.
SEVERCAN, Feride: B.S., Anakara University; M.S., University of Rochester, Ph.D., Hacettepe University.
TARMAN, Hakan I.: B.S., M.S., Boğaziçi University; Ph.D., Brown University.
WEBER, Gerhard Wilhelm (Associate : B.S., RWTH Aachen; M.S., RWTH Aachen; Ph.D., RWTH Aachen.

ASSOCIATE PROFESSORS

BANERJEE, Sreeparna: B.S., Calcutta University; M.S., Ph.D., University of Leeds
DOĞRU, Ewa: B.S., Warsaw University; M.S., Warsaw University; Ph.D., Polish Academy of Science, Nencki Institute of Experimental Biology.
DURUCAN, Caner: B.S., METU; M.S. The Pennsylvania State University; Ph.D., The Pennsylvania State University.
ERSON BENSAN, Ayşe Elif: B.S., METU; M.S., University of Michigan; Ph.D., University of Michigan.
EVİS, Zafer: B.S., METU; M.S., Rensselaer Polytechnic Institute; Ph.D., Rensselaer Polytechnic Institute.
GÜRSEL, Mayda: B.S., METU; M.S., METU; Ph.D., University of London.
GÜRSES, Senih: M.D., Medical School, Hacettepe University; M.S., Boğaziçi University; Ph.D., METU
KESKİN, Dilek B.S., METU; M.S., METU; Ph.D., METU.
KÜLAH, Haluk: B.S., METU; M.S., METU; Ph.D., University of Michigan, Ann Arbor.
PURUTÇUOĞLU GAZİ, Vilda: B.S., METU; M.S. METU; Ph.D. Lancaster University.
SERİNAĞAOĞLU DOĞRUSÖZ, Yeşim: M.S., METU; Ph.D., Northeastern University.
ULUSOY, İlkay ***(Associate Director of the Graduate School of Applied Mathematics)***: B.S., METU; M.S., The Ohio State University; Ph.D., METU.
TEZCANER, Ayşen: B.S., METU; M.S., METU; Ph.D., METU.
YANIK, Tülin: B.S., Ege University; M.S., Ege University, The George Washington University; Ph.D., George Washington University.

ASSISTANT PROFESSORS

GÖKÇAY, Didem: B.S., METU; M.S., METU; Ph.D., University of Florida
ÖZÇUBUKÇU, Salih: B.S., METU; M.S., METU; Ph.D., RWTH Aachen University
TÖNÜK, Ergin: B.S., METU; M.S., METU; Ph.D., METU

GENERAL INFORMATION: Biomedical Engineering is an interdisciplinary program leading to M.S. and Ph.D. degrees. The main purpose of this program is to give graduate level education and challenging research in this exciting field.

Biomedical Engineering integrates biological, chemical, physical, mathematical, computational sciences with engineering principles and techniques to apply to the problems in the medical field. The main purpose of the field is to improve patient health care and the quality of life. Therefore, it advances fundamental

concepts and creates knowledge from the molecular to the organ systems levels. Biomedical Engineering is a highly expanding field since the health sector is improving, and therefore, the need for trained personnel is increasing very rapidly. The program at METU has been developed to meet this growing need in Turkey. The program, with its four tracks, Bioelectrical Engineering, Biomaterials, Biomechanics and Biomolecular Engineering is unique in the country.

The broad research span consists of medical imaging, image processing, physiological signal processing, synthesis and design of prostheses, medical devices, material-cell interactions, nanobiomaterials, responsive and intelligent systems, tissue engineering, mechanical analysis of locomotion and movement, cell and tissue mechanics, mechanical characterization and identification of biological materials, biomechanical modeling and simulation, biostatics and biodynamics of solids and fluids, biomolecular systems, genome assembly, protein structure and alignment, design of novel therapeutics or diagnostic biomolecules, construction of artificial gene circuits, engineering metabolic pathways, protein structure-function analyses; prediction of gene expression, mathematical modeling and computer simulations for systematic examination of biological data, biological molecules and their interactions.

Biomedical Engineering program is open to students with an undergraduate degree from the departments of science, engineering and medicine. Graduates might be required by the Admission Committee to take preparatory courses for a period of up to 2 semesters depending on the individual's background.

ADMISSION REQUIREMENTS AND PREREQUISITES: In addition to fulfilling the general requirements for admission to graduate status, the students applying to the Graduate Program of Biomedical Engineering, are expected to have the background at the level of the following undergraduate courses:

Biological Sciences: Equivalent of BIO 101 and BIO 102 or GENE 103 and GENE 104 or BIO255 courses
Computer Programming: Equivalent of CENG 230 or CENG 220 or CENG 200 courses
Freshman Chemistry: Equivalent of CHEM 101 and CHEM 102 or CHEM 105 and CHEM 106 or CHEM 107 courses
Freshman Mathematics: Equivalent of MATH 151 or MATH 119 and MATH 152 or MATH120 courses
Freshman Physics: Equivalent of PHYS 111and PHYS 112 or PHYS 105 and PHYS 106 courses

Applicants who satisfy the admission requirements for the courses listed above except one course may follow a deficiency program provided that credit limits and prerequisite requirements are satisfied. Applicants who do not need to follow a deficiency program for the track chosen and satisfy the admission requirements for the courses listed above except any one of the Biological Sciences, Computer Programming or Chemistry courses may take this course in the first semester.

M.S. IN BIOMEDICAL ENGINEERING

Applicants who have completed the deficiency program for the specific track will have to take a minimum of 7 courses with a total credit of minimum 21. The students from all tracks have to take BME 501 Introduction to Biomedical Engineering and BME 502 Human Physiology and one of the following courses EE 501 Linear system theory or ES 501 Analytical methods in Engineering or IAM 561 Introduction To Scientific Computing I or IAM 562 Introduction To Scientific Computing II or IAM 563 Methods of Applied Mathematics or METE 503 Mathematical Methods in Materials Research I.

The electives courses are grouped below and the students have to select the rest of the courses from the lists according to their individual tracks.

Ph.D. IN BIOMEDICAL ENGINEERING

Course requirements involve 3 compulsory (core) courses and 4 electives. Degree program courses must be distributed as ;

minimum of two courses from life sciences,
minimum of two courses from engineering,
minimum of two courses from mathematics and other sciences.

Ph.D. Program in Bioelectrical Engineering Track:

Ph.D. Program for B.S. degree holders: Those who have been accepted to the program with a bachelor's degree are expected to complete the *deficiency* and *core* program requirements for the BME M.S. program. Beyond this, in addition to the two restricted elective courses of the track, at least 27 credits (or 9 graduate level elective courses) course requirements for the Ph.D must be fulfilled by any technical elective courses from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

Ph.D. Program for M.S. and M.D. degree holders*:*
1. Ph.D. Program after completing M.S. in Bioelectrical Engineering track : Graduate students who have an M.S. degree in Bioelectrical Engineering track of the BME program must take a minimum of 8 (24 credits) courses from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

2. Ph.D. Program after completing M.S. in other tracks of BME: Graduate students who have an M.S. degree in Biomedical Engineering (other than bioelectrical track) must first satisfy the deficiency program requirements of the track, then take a minimum of 8 (24 credits) courses from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine, including the restricted elective courses of the track.

3. Ph.D. Program after completing M.S. in Science or Engineering (other than BME) or M.D. degree: Graduate students accepted to the program who have an M.S. degree in Science or Engineering Programs, other than the Biomedical Engineering Graduate or an M.D. Program, are expected to complete the *deficiency* and *core* program requirements for the BME M.S. program. In addition to the two restricted elective courses, at least 3 (9 credits) courses must be taken from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

Ph.D. Program Biomaterials Track:

Ph.D. Program for B.S. degree holders: Those who have been accepted with a bachelor's degree are expected to complete the *deficiency* and *core* program requirements for the Biomaterials Track of BME M.S. program. Beyond this, in addition to the one *restricted* elective course (Group 1), at least 30 credits (or 10 graduate level elective courses) course requirements for the Ph.D must be fulfilled as such:

4 courses from Group 2 of Restricted Technical Elective list of Biomaterials Track
4 courses from Group 3 of Restricted Technical Elective list of Biomaterials Track
2 Technical Electives: Two Technical Elective courses from Faculty of Science, Faculty of Engineering and/or Faculty of Medicine.

Ph.D. Program for M.S. and M.D. degree holders:
1. Ph.D. Program after completing M.S. in Biomaterials track : Graduate students who have an M.S. degree in Biomaterials track of the BME program must take a minimum of 8 (24 credits) graduate level courses. 6 courses (18 credits) must be selected from the Restricted Technical Elective list of the Biomaterials Track and two Technical Elective courses from Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

2. Ph.D. Program after completing M.S. in other tracks of BME : Graduate students who have an M.S. degree in Biomedical Engineering (other than biomaterials track) must first satisfy the deficiency program requirements of the track, then take a minimum of 8 (24 credits) graduate level courses including the restricted elective courses of the track. Six courses (18 credits) must be selected from the restricted technical elective list of the Biomaterials Track and one Technical Elective course from Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

3. Ph.D. Program after completing M.S. in Science or Engineering (other than BME) or M.D. degree: Graduate students accepted to the program who have an M.S. degree in Science or Engineering Programs, other than the Biomedical Engineering Graduate Program, are expected to satisfy the deficiency and core program requirements for the Biomedical Engineering M.S. Program. In addition, the student should take the course in Group 1, and two each from Groups 2 and 3 Restricted Elective Course lists.

Ph.D. Program in Biomechanics Track:

Ph.D. Program for B.S. degree holders: Those who have been accepted to the program with a bachelor's degree are expected to complete the deficiency and core program requirements for the Biomedical Engineering M.S. program Beyond this, in addition to the three restricted elective courses of the track, at least 24 credits (or 8 graduate level elective courses) course requirements for the Ph.D must be fulfilled by any technical elective courses from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

Ph.D. Program for M.S. and M.D. degree holders:

1. Ph.D. Program after completing M.S. in Biomechanics track : Graduate students who have an M.S. degree in Biomechanics track of the BME program must take a minimum of 8 (24 credits) courses from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

2. Ph.D. Program after completing M.S. in other tracks of BME: Graduate students who have an MSc degree in Biomedical Engineering (other than biomechanics track) must first satisfy the deficiency program requirements of the track, then take a minimum of 8 (24 credits) courses from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine, including the restricted elective courses of the track.

3. Ph.D. Program after completing M.S. in Science or Engineering (other than BME) or M.D. degree: Graduate students accepted to the program who have an M.S. degree in Science or Engineering Programs, other than the Biomedical Engineering Graduate or an M.D. Program, are expected to complete the deficiency and core program requirements for the Biomedical Engineering M.S. program. In addition to the three restricted elective courses, at least 2 (6 credits) courses must be taken from the Faculty of Science and Faculty of Engineering and/or Faculty of Medicine.

Ph.D. Program in Biomolecular Engineering Track:

Ph.D. Program for B.S. degree holders: Students holding only bachelor's degree if planning directly to proceed to the doctoral degree, are expected to complete the deficiency and core program requirements for the Biomedical Engineering MS program. Beyond this, in addition to the two restricted elective courses of the track, at least 27 credits (or 9 graduate level elective courses) course requirements for the Ph.D must be fulfilled by any technical elective courses from the elective list or from elective courses (5XX or 7XX) offered by the Faculty of Science and Faculty of Engineering or Faculty of Medicine.

Ph.D. Program for M.S. and M.D. degree holders:

1. Ph.D. Program after completing M.S. in Biomolecular Engineering track: Graduate students who have an MS degree in Biomolecular Engineering track of BME program must take a minimum of 8 (24 credits) graduate level courses. The courses can be selected from the elective list or from elective courses (5XX or 7XX) offered by the Faculty of Science and Faculty of Engineering or Faculty of Medicine.

2. Ph.D. Program after completing M.S. in other tracks of BME : Graduate students who have an MS degree in Biomedical Engineering (other than biomolecular engineering track) must first satisfy the deficiency program requirements of the track choosen , then take a minimum of 8 (24 credits) graduate level courses including the restricted elective courses of the track. The remaining courses can be selected from the elective list or from elective courses (5XX or 7XX) offered by the Faculty of Science and Faculty of Engineering or Faculty of Medicine .

3. Ph.D. Program after completing M.S. in Science or Engineering (other than BME) or M.D. degree: Graduate students accepted to the program who have an M.S. degree in Science or Engineering Programs, other than the Biomedical Engineering Graduate Program or an M.D. Program, are expected to complete the deficiency and core program requirements for the Biomedical Engineering M.S. program. Beyond this, in addition to the two restricted elective courses, at least 9 credits (or 3 graduate level elective courses) course requirements for the Ph.D must be satisfied. The courses can be selected from the elective list or from elective courses (5XX or 7XX) offered by the Faculty of Science, Faculty of Engineering or Faculty of Medicine.

GRADUATE CURRICULUM

M.S. in Biomedical Engineering

BME	500	M.S. Thesis	NC
BME	501	Introduction to Biomedical Engineering	(3-0)3
BME	502	Human Physiology	(3-2)4
BME	590	Seminar	NC
ES	501	Analytical Methods In Engineering I	(3-0)3

1 course from Group 1 [2]
1 course from Group 2 [2]
2 approved elective courses [3]

Total minimum credit: 22
Number of Courses with credit (min): 7

Ph.D. in Biomedical Engineering
If admitted by M.S. degree

BME	501	Introduction to Biomedical Engineering[4]	(3-0)3
BME	502	Human Physiology[4]	(3-2)4
BME	600	Ph.D. Thesis	NC
BME	690	Seminar	NC
EE	501	Linear Systems Theory I [1]	(3-0)3

4 approved elective courses [3]

Total minimum credit : 22
Number of Courses with credit (min) : 7

If admitted by B.S. degree:

BME	501	Introduction to Biomedical Engineering	(3-0)3
BME	502	Human Physiology	(3-2)4
BME	600	Ph.D. Thesis	NC
BME	690	Seminar	NC
EE	501	Linear Systems Theory I[1]	(3-0)3

1 course from Group 1 [2]
1 course from Group 2 [2]
1 course from Group 3[2]
8 approved elective courses [3]

Total minimum credit: 43
Number of Courses with credit (min): 14

[1] EE 501 or equivalent: ES 501, IAM 561, IAM 562, IAM 563, METE 503.
[2] For each track, 1 course from group 1 and 1 course from group 2, 1 course from group 3 will be selected. See below for list of courses.
[3] Remaining credit requirements (2 courses) may be fulfilled with graduate level courses offered by the Faculty of Science, Faculty of Engineering and/or Faculty of Medicine.
[4] If not taken during M.S. program.

GRADUATE COURSES

BME	500	M.S. Thesis	NC
BME	501	Introduction to Biomedical Engineering	(3-0)3
BME	502	Human Physiology	(3-2)4
BME	590	Seminar in BME	(0-2)NC
BME	600	Ph.D. Thesis	NC
BME	690	Seminar in BME	(0-2)NC
BME	7XX	Special Topics in Biomedical Engineering	(3-0)3
BME	8XX	Special Studies	(4-2)NC
BME	9XX	Advanced Studies	(4-0)NC

ELECTIVE COURSES

Bioelectrical Engineering Track:

Group 1: At least one course must be selected from:

EE	503	Signal Analysis and Processing
EE	515	Bioelectricity and Biomagnetism
EE	518	Physiological Control Systems
EE	519	Advanced Medical Imaging
EE	610	Integrated Sensors and Sensor Systems
EE	634	Digital Image Processing

Group 2: At least one course must be selected from:

BIO	409	Introduction to Neurophysiology
BIO	430	Sensory Physiology
BIO	473	Molecular Biology of the Cell
BIO	479	Cell Cycle And Its Regulation
BIO	507	Neurobiology
BIO	510	Structure And Function of Biological Membranes
BIO	544	Control Mechanisms in Molecular Biology
BIO	586	Human Genetics

Biomaterials Track:

Group 1: At least one course must be selected from:

BIO	514	Biomaterials
CHEM	568	Biomedical Materials

Group 2: At least one course must be selected from:

BIO	401	Molecular Cell Biology
BIO	407	Immunology
BIO	409	Introduction to Neorobiology
BIO	423	Recombinant DNA Techniques
BIO	554	Macromolecules in Biotechnology and Biomedicine
BIO	580	Controlled Release Systems and Drug Targeting
BIO	584	Advances in Biomaterials
BIO	510	Structure and Function of Biological Membranes
BIO	586	Human Genetics

Group 3: At least one course must be selected from:

CENG	569	Pattern Recognition
EE	415	Introduction to Medical Imaging
EE	583	Pattern Recognition
ES	444	Fundamentals of Tissue Engineering
ES	494	Introduction to Bioengineering
ES	503	Finite Element Method
ES	514	Mechanical Behaviour of Deformable Bodies
ES	541	Introduction to Biomechanics
METE	425	Colloidal Behaviour of Ceramics
METE	434	Principles of Ceramic Processing
METE	451	Ceramic Materials
CHEM	432	Solid State Chemistry and Inorganic Materials
CHEM	446	Statistical Thermodynamics
CHEM	447	Surface Chemistry
CHEM	509	Statistical Thermodynamics
CHEM	537	Organic Chemistry of Macromolecules
CHEM	539	Mechanical and Viscoelastic Properties of Polymers
CHEM	541	Advanced Topics in Polymer Chemistry
CHEM	545	Polymer Science and Technology
CHEM	548	Physical Chemistry of Interphases
CHEM	549	Total Synthesis of Natural Compounds
CHEM	564	Structure and Morphology of Macromolecules
GENE	405	Animal Cell Culture Techniques
GENE	473	Molecular Biology of the Cell
METE	456	Surface Processing of Materials
METE	460	Engineering with Polymers
METE	470	Composite Materials
METE	477	Testing and Evaluation of Engineering Materials
METE	501	Thermodynamics of Materials
METE	506	Kinetics of Processes in Materials
METE	508	Advanced Optical Techniques
METE	544	Properties of Glass
PST	501	Polymer Science
PST	504	Advance Structure and Property Relationships in Polymers
PST	508	Science and Characterization of Macromolecules

Biomechanics Track:

Group 1: At least one course must be selected from:

ES	541	Introduction to Biomechanics
ES	542	Advanced Biomechanics

Group 2: At least one course must be selected from:

CHEM	539	Mechanical and Viscoelastic Properties of Polymers
EE	503	Signal Analysis and Processing
EE	518	Physiological Control System Analysis
EE	551	Multivariable Control Systems I
EE	554	Optimal Control Theory
EE	558	System Identification and Adaptive Control
EE	587	Introduction to Robotics
EE	588	Robot Hand Dynamics of Manipulation
EE	655	Chaotic Dynamics
ES	444	Fundamentals of Tissue Engineering
ES	505	Variational Methods in Engineering
ES	511	Basic Principles of Mechanics
ES	516	Spectral Methods
ES	521	Theory of Elasticity
ES	525	Theory of Continuous Media I
ES	527	Fracture Mechanics
ES	531	Mechanics of Composite Materials
ES	536	Energy Methods
ES	554	Nonlinear Dynamics
ES	571	Basic Principles of Fluid Mechanics
ES	572	Advanced Fluid Mechanics
ME	502	Advanced Dynamics
ME	506	Dynamics of Nonlinear Systems
ME	507	Applied Optimal Control
ME	511	Modern Control
ME	520	Analysis and Measurement Techniques for Random Vibrations and Noise
ME	522	Principles of Robotics
ME	543	Theory of Elasticity
ME	547	Introduction to Continuum Mechanics
ME	549	Experimental Stress Analysis I
ME	583	Engineering Fracture Mechanics

Group 3: At least one course must be selected from:

BIO	409	Introduction to Neurobiology
BIO	430	Sensory Physiology
BIO	507	Neurobiology
BIO	514	Biomaterials
BIO	584	Advances in Biomaterials
CHEM	568	Biomedical materials
GENE	405	Animal Cell Culture Techniques
GENE	473	Molecular Biology of the Cell
PES	533	Physiology of Exercise
PES	550	Motor Control

Biomolecular Engineering Track:

Group 1: At least one course must be selected from:

BIO	537	Genetic Engineering (or Bio 423 Recombinant DNA Techniques)

Group 2: At least one course must be selected from:

CENG	465	Introduction to Bioinformatics,
CENG	734	Advanced Topics in Bioinformatics
CHE	513	Biochemical Reaction Engineering,
CHE	517	Metabolic Engineering,
EE	415	Introduction to Medical Imaging
EE	416	Fundamentals of Biomedical Engineering
EE	503	Signal Analysis and Processing
EE	515	Bioelectricity and Biomagnetism
EE	518	Physiological Control Systems
EE	519	Medical Imaging,
EE	583	Pattern Recognition (or CENG 564)

Additional Elective Courses

BIO	586	Human Genetics,
BIO	544	Control Mechanisms in Molecular Biology
CHEM	551	Enzymatic Reaction Mechanisms
BIO	562	Spectroscopy of Biological Molecules and Membranes
CHE	513	Biochemical Reaction Engineering,
CHE	517	Metabolic Engineering,
EE	503	Signal Analysis and Processing,
EE	515	Bioelectricity and Biomagnetism,
EE	518	Physiological Control Systems,
EE	519	Medical Imaging,
EE	583	Pattern Recognition (or CENG564)
IS	574	Medical Imaging Technology,
CENG	734	Adv. Topics in Bioinformatics,

DESCRIPTION OF COURSES

BME 500 M.S. Thesis NC
A program of research leading to the M.S. degree is decided between the student and a faculty member. Students register to this course at all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

BME 501 Introduction to Biomedical Engineering (3-0)3
This course gives information about the four existing tracks of the BME program. Students learn about the topics and types of research activities in the bioelectrical, biomaterials, biomechanics, and biomolecular areas.

BME 502 Human Physiology (3-0)3
The course presents a general survey of operation of all physiological systems, their interactions and cooperation to maintain homeostasis, and increase individual and species capacity for adaptation to different and variable life conditions.

BME 590 Seminar in BME (0-2)NC
This course consists of meetings among the department staff, invited speakers and graduate students to discuss the recent developments in Biomedical Engineering. Each student is requested to present a seminar covering the research results, preferably before the final stage of writing his/her thesis.

BME 600 Ph.D. Thesis NC
A program of research leading to the Ph.D. degree is decided between student and a faculty member. Students register to this course at all semesters starting from the beginning of their second semester while their research is in progress.

BME 690 Seminar in BME (0-2)NC
This seminar consists of meetings among the department staff, invited speakers and graduate students to discuss the recent developments in Biomedical Engineering. Each student is requested to present a seminar covering the research results, preferably before the final stage of writing his/her thesis.

BME 7XX Special Topics in Biomedical Engineering (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge.

BME 8XX Special Studies(4-2)NC The M.S. student studies a specific topic under the guidance of a faculty member, normally his/her adviser.

BME 9XX Advanced Studies (4-0)NC
A group of graduate students choose and study an advanced topic under the guidance of a faculty member, normally the adviser of the students.

BIOTECHNOLOGY PROGRAM

PROFESSORS

ADALI, Orhan: B.S., M.S., Ph.D., METU.
AKKAYA, Mahinur: B.S., METU; M.S., Ph.D., Ohio State University.
BAYINDIRLI, Alev: B.S., M.S. Ph.D., METU.
BAYRAMLI, Erdal: B.S., M.S., METU; Ph.D., Mcgill University.
BOZOĞLU, Faruk: B.S., M.S., METU; Ph.D., NCSU Raleigh, N.C.
BÖLÜKBAŞI, Ufuk: B.S., M.S., METU; Ph.D., Iowa State University.
ÇALIK, Pınar; B.S., M.S., METU; Ph.D., Ankara University
DEMİRER, Göksel Niyazi : B.S., M.S., METU; Ph.D., Vanderbilt University
DİLEK, Filiz Bengü ***(Department Chair)***: B.S., M.S. Ph.D., METU.
EROĞLU, İnci: B.S., M.S., Ph.D., METU.
GÖKÇAY, F. Celal: B.S., İstanbul University; Ph.D., University of Wales, U.C. Cardiff.
GÜNDÜZ, Ufuk: B.S., M.S., Iowa State University; Ph.D., METU.
GÜRAKAN, G. Candan: B.S., M.S., Ph.D., METU.
GÜRAY, Tülin: B.S., M.S., Ph.D., METU.
HAMAMCI, Haluk: B.S., M.S., METU; Ph.D., University of California Davis.
HASIRCI, Nesrin: B.S., M.S., Ph.D., METU.
HASIRCI, Vasıf: B.S., M.S., METU; Ph.D., University of Reading.
İZGÜ, Fatih: B.S., M.S., Ph.D., Ankara University.
KAYA, Zeki: B.S., İstanbul University; M.S., Ph.D., Oregon State University.
KOCABIYIK, Semra: B.S., Ankara University; M.S., Ph.D., METU.
ÖKTEM, Hüseyin Avni: B.S., M.S., METU; Ph.D., Universitatis De Attila Jozsef.
ÖZCENGİZ, Gülay: B.S., Hacettepe University; M.S., Ph.D., METU.
SANİN, F. Dilek : B.S., M.S., METU; Ph.D., Duke University
SEVERCAN, Feride: B.S., Ankara University; M.S., University of Rochester; Ph.D., Hacettepe University.
TANYELİ, Cihangir; B.S., M.S., Ph.D., METU
TOGAN, İnci: B.S., METU; M.S.,Johns Hopkins University; Ph.D., METU.
TOPPARE, Levent Kamil: B.S., M.S. Ph.D., METU.
YETİŞ, Ülkü: B.S., METU; M.S., University of Pittsburgh; Ph.D., METU.
YÜCEL, Meral: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

BANARJEE, Sreeparna: B.S., Calcutta University; M.S., Ph.D., University of Leeds.
CAN, Tolga : B.S. METU; M.S.,PhD., University of California.
ÇEKMECELİOĞLU, Deniz: B.S., M.S., University of Gaziantep; Ph.D., Pennsylvania State University.
ÇORUH, Nursen; B.S., M.S., METU; Ph.D., Universty of Missouri-St. Louis.
ERSON BENSAN, Ayşe Elif: B.S. METU; M.S.,PhD., University of Michigan.
GÖZEN, Ayşegül: B.S., METU; Ph.D., Michigan State University.
GÜRSEL, Mayda: B.S., M.S., METU; Ph.D., University of London.
İÇGEN, Bülent: M.S., Ph.D., METU.
KESKİN, Dilek: B.S., M.S. Ph.D., METU.
ÖNDE, Sertaç: B.S., M.S., METU; Ph.D., University of Leeds.
ÖZEN, Can : B.S. METU; Ph.D.,The University of Tennessee. *(Vice-Chair)*
SON, Çağdaş Devrim: B.S., M.S., METU; Ph.D., University of Tennessee, Knoxville.
TEZCANER, Ayşen : B.S., M.S. Ph.D., METU.
YANIK, Tülin:B.S., M.S., Ege University; M.Phil., Ph.D., George Washington University.

ASSISTANT PROFESSORS

EREL, İrem: B.S., M.S., Istanbul Technical University; Ph.D., Stevens Institute of Technology.
ERGÜDER, Tuba Hande: B.S., M.S., Ph.D., METU.
ÖZÇUBUKÇU, Salih: B.S., M.S., METU; Ph.D., RWTH Aachen University.
ÖZTOP, Halil Mecit: B.S., M.S., METU; Ph.D., University of California Davis.

KOKU, Harun: B.S., M.S., METU; Ph.D., University of Delaware.
SOMEL, Mehmet: B.S., M.S., METU; Ph.D., University of Leipzig.
SOYER, Yeşim: B.S., M.S., Ankara University; Ph.D., Cornell University.

INSTRUCTOR

MURDOCH, Robert Waller: B.S., University of Texas at Austin; Ph.D., Cornell University.

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: Biotechnology Graduate Program has started in 1990 with the initiative of the faculty members of the Food Engineering Department, as an interdisciplinary program with the cooperation of the following departments which are Food Engineering Department, Chemical Engineering Department, Environmental Engineering Department, Biology Department, Chemistry Department; at the Middle East Technical University. The Graduate program awards M.S. and Ph.D. degrees upon the completion of the requirements. Currently, there is no undergraduate program in Biotechnology Department. The mission of the Biotechnology Program at the Middle East Technical University is to provide its students with an education that establishes a strong foundation and appreciation for understanding developments in the rapidly advancing field of biotechnology, to develop the technical and critical thinking skills necessary for success in the field, to foster ethical behavior, and to promote outreach. The purpose of the Biotechnology Graduate Program is to train students for advanced degrees in biotechnology to do research, teaching and industrial applications.

CONTRIBUTING DEPARTMENTS: Biology, Chemistry, Environmental Engineering, Food Engineering, and Chemical Engineering.

RESEARCH FACILITIES: The following laboratories and research facilities are available for faculty and the students. The research laboratories are located in the supporting department's buildings.

- Microbiology Laboratory(B, ENVE)
- Molecular Genetics Laboratory(B)
- Plant Biotechnology Laboratory(B)
- Pharmaceutical Biotechnology Laboratory(B)
- Biotechnology Research Unit(B)
- Biotechnology Laboratory (CHE)
- Food Chemistry and Biochemistry Laboratory(FDE)
- Enzyme Laboratory(FDE)
- Genetic Engineering Laboratory(FDE)

GRADUATE CURRICULUM

The department is supported by the course programs of the five contributing departments' course offerings as well as BTEC code courses. Seminar in Biotechnology for M.Sc. Students I

M.S. in Biotechnology

BTEC	500	Master Thesis	NC
BTEC	503	Fundamentals of Biotechnology	(3-0)3
BTEC	590	Seminar in Biotechnology for M.Sc. Students I	(0-2) NC
BTEC	591	Seminar in Biotechnology for M.Sc. Students II	(0-2) NC

6 elective courses*
Total minimum credits: 21
Number of courses with credit (min): 7

Ph.D. in Biotechnology

If admitted by M.S. degree:

BTEC	600	Ph.D. Thesis	NC
BTEC	690	Seminar in Biotechnology for Ph.D. Students I	(0-2) NC
BTEC	691	Seminar in Biotechnology for Ph.D. Students II	(0-2) NC

7 elective courses*
Total minimum credits: 21
Number of courses with credit (min): 7

*****BTEC 503 (If not taken before)

If admitted by B.S. degree:

BTEC	503	Fundamentals of Biotechnology	(3-0)3
BTEC	590	Seminar in Biotechnology for M.Sc. Students	(0-2) NC
BTEC	591	Seminar in Biotechnology for M.Sc. Students II	(0-2) NC
BTEC	600	Ph.D.Thesis	NC
BTEC	690	Seminar in Biotechnology for Ph.D. Students I	(0-2) NC
BTEC	691	Seminar in Biotechnology for Ph.D. Students II	(0-2) NC

13 elective courses*
Total minimum credits: 42
Number of courses with credit (min): 14

*BIO 415-Physical Chemistry for Biological Sciences (Non-engineers must take this course if not taken before)
BIO 420-Biochemistry (Non-biologists must take this course if not taken before)
CHE 428-Introduction to Process Principles (Non-engineers must take this course if not taken before)

*****No more than 3 electives could be taken from the same discipline other than Biotechnology Program

GRADUATE COURSES

BTEC	500	Master Thesis	NC
BTEC	503	Fundamentals of Biotechnology	(3-0)3
BTEC	510	Fungal Biotechnology	(3-0)3
BTEC	590	Seminar in Biotechnology for M.Sc. Students I	(0-2) NC
BTEC	591	Seminar in Biotechnology for M.Sc. Students II	(0-2) NC
BTEC	600	Ph.D. Thesis	NC
BTEC	690	Seminar in Biotechnology for Ph.D. Students I	(0-2) NC
BTEC	691	Seminar in Biotechnology for Ph.D. Students II	(0-2) NC
BTEC	7XX	Special Topics in Biotechnology	(3-0)3
BTEC	8XX	Special Studies	(4-2) NC
BTEC	9XX	Special Studies	(4-0) NC

DESCRIPTION OF COURSES

BTEC 500 Master Thesis NC
Research program leading to M.S. degree. The student should have two advisors of two different contributing departments and should register this course every semester starting by their second semester.

BTEC 503 Fundamentals of Biotechnology (3-0)3
The principles in modern biotechnology; rDNA techniques, tissue culture, bioreactor design and applications are covered in the introductory level.

BTEC 510 Fungal Biotechnology (3-0)3
The use of filamentous fungi and yeast in biotechnological processes for the production of biomass, primary and secondary metabolites and enzymes. Fungal biology, physiology and genetics in relation to industrial processes. The kinetics of fungal growth.

BTEC 590 Seminar in Biotechnology for M.Sc. Students I (0-2) NC
Presentations of topics of general program interest, current research activities and recent developments in the related fields by graduate students, staff members, and invited speakers. M. Sc students must register for this course at 3 semesters during their M. Sc and Ph.D. on B.S. students must register for this course at least once during their Ph.D. on B.S. study.

BTEC 591 Seminar in Biotechnology for M.Sc. Students II (0-2) NC

Presentations of topics of general program interest, current research activities and recent developments in the related fields by graduate students, staff members, and invited speakers. M.Sc. students and Ph.D. on B.S. students must register for this course at least once during their M.Sc. study and Ph.D. on B.S. study. Students prepare a seminar directly related to their ongoing thesis research as a part of the Biotechnology Graduate Program.

BTEC 600 Ph.D. Thesis NC

Research work towards the basics of one of the disciplines making up biotechnology. The student should choose two advisors, of two contributing departments and enroll the course for all semesters starting with his/her third semester.

BTEC 690 Seminar in Biotechnology for Ph.D. Students I (0-2) NC

Presentations of topics of general program interest, current research activities and recent developments in the related fields by graduate students, staff

members, and invited speakers. Ph.D. students must register for this course at 4 semesters during their Ph.D. and Ph.D. on B.S. students must register for this course at 3 semesters during their Ph.D. on B.S. study.

BTEC 691 Seminar in Biotechnology for Ph.D. Students II (0-2) NC

Presentations of topics of general Program interest, current research activities and recent developments in the related fields by graduate students, staff members and invited speakers. Ph.D. and Ph. D. on B.S. students must register for this course at least once during their Ph.D. and Ph. D. on B.S. study. Ph.D. and Ph. D. on B.S. students prepare a seminar directly related to their ongoing thesis research as part of the Biotechnology Graduate Program.

BTEC 7XX Special Topics in Biotechnology (3-0)3

Principles of eukaryotic cell cultivation with special emphasis on mammalian cells. Anchorage dependent and independent cells. The use of cell culture towards the production of vaccines and metabolites.

BTEC 8XX Special Studies (4-2)NC

M.S. students choose and study a topic under the guidance of a faculty member normally his/her advisor.

BTEC 9XX Advanced Studies (4-0)NC

Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member normally.

CEMENT ENGINEERING PROGRAM

PROFESSORS

ÇİLİNGİR, Fatma Canan: B.S., M.S., METU; M.S., Loughbrough University. Tech.; Ph.D., Ege University.
GÖNCÜOĞLU, Cemal: B.S., M.S., Istanbul University; Ph.D., Bonn University.
HOŞTEN, Çetin: B.S., M.S.,METU; Ph.D., U.C. Berkeley.
KARPUZ, Celal: B.S., M.S., Ph.D., METU.
LEBLEBİCİOĞLU, Kemal: B.S., M.S., Ph.D., METU.
ÖZGEN, Canan ***(Director of the Graduate School of Natural and Applied Sciences):*** B.S., M.S., Ph.D., METU.
ÖZGÜVEN, Nevzat ***(Vice President)***: B.S., M.S., METU; Ph.D., University of Manchester.
ÖZTÜRK, Abdullah: B.S., Istanbul Technical University; M.S., Ph.D., University of Missouri-Rolla.
PLATİN, Bülent Emre: M.S.,The Technical University of Istanbul,
M.S., Ph.D., Massachusetts Institute of Technology.
TOKYAY, Mustafa: B.S., M.S., Ph.D., METU.
TÜRKMENOĞLU (GÜNAL), Asuman: B.S., M.S., METU, Ph.D., University of Cincinnati.
YAMAN, İsmail Özgür: B.S., M.S., METU; Ph.D., Wayne State University.

ASSOCIATE PROFESSORS

BİLGİN, Hasan Aydın: B.S., M.S., Ph.D., METU
ERDOĞAN, Sinan Turhan ***(Department Chair)***: B.S., METU; M.S., Ph.D., University of Texas.
RAFATOV, İsmail: Ph.D., Kırgız-Rusya-Slavik University.
TUNCAY, Çağlar: B.S., M.S., Ph.D., METU

ASSISTANT PROFESSOR

KÖKSAL, Fatma Toksoy: B.S., M.S., Ph.D., METU.

INSTRUCTOR

ÖZTİN, Cevdet: B.S., M.S., Ph.D., METU

GENERAL INFORMATION: Cement Engineering is an interdisciplinary graduate program aiming to provide the engineers with the necessary knowledge and technical background desired by the cement industry. The program has been proposed and backed by the Turkish Cement Manufacturers' Association (TÇMB) representing the Turkish cement industry. The industry, being one the largest of its kind in the World based on the capacity and annual production of its 39 factories and 18 grinding plants, usually ranks within the top three in Europe and top eight in the World. It employs around 8400 people including about 1500 engineers and technical personnel and also provides jobs to some 4600 people belonging to various contractors in the factories.

Currently most of the engineers employed in the cement industry have either chemical or mechanical engineering degrees. On the other hand, the manufacturing of cement involves various stages such as the evaluation and mining of the raw materials - mainly limestone and clay - and later, crushing, grinding, proportioning and calcining them. In modern cement plants all the operations are carried with electromechanical and electronic remote control systems. Continuous quality control is maintained over the production and the environmental regulations are strictly followed. Thus, manufacturing of cement is an interdisciplinary activity related not only to chemical and mechanical engineering but also to mining, geological, electrical, industrial, environmental, and civil engineering fields.

Being aware of the interdisciplinary nature of cement manufacturing, a "cement engineer" has been defined as "An engineer who possesses the minimum technical and administrative knowledge related to all of the stages of cement manufacturing, from mining the raw materials to the utilization of cement". The graduate program on cement engineering is designed to raise such engineers and to fulfill the needs of the cement industry. Therefore, the aim of the Middle East Technical University Cement Engineering Graduate Program is to prepare skilled students to pursue successful professional careers in the cement industry. However, it is anticipated that the graduates of this program will not only be preferred by the cement industry but with their

background, they will also have better job opportunities in similar industries such as concrete, lime, gypsum, ceramics, brick and tile industries.

OBJECTIVES OF THE PROGRAM: M.S. Program in Cement Engineering aims to equip the students with a knowledge and understanding of the theoretical and practical aspects related to various stages of cement manufacturing and utilizing cement, both at technical and at administrative levels. In particular, the program aims to provide the students with:

- An understanding of the characteristics of cement raw materials in relation to cement production and quality, methods of extracting, crushing and grinding the raw materials like clay and limestone,
- Basic knowledge on chemistry and manufacturing of cement; constitution of cement components and their phase relations, calcination reactions in rotary kiln, energy and material balance, hydration reactions and products,
- Basic knowledge on types, standards and quality control of cement and cement –based materials (mostly concrete) and their utilization,
- Basic knowledge on power distribution network and process automation in cement plants, computer aided process and quality control systems, plant air and water networks, mechanical aspects for mills and kilns
- Basic knowledge on sustainable developments in cement industry and general management systems for cement plant operation.
- An ability to work in various parts of a cement plant at technical or at administrative levels to perform the required tasks efficiently with considerations of energy-saving and environmental issues,
- An ability to develop a vision for the future developments in the plant, to detect the technical and administrative shortcomings and propose solutions for them.

ADMISSION REQUIREMENTS: Admission priority is based on the assessment of the applicant's capacity to pursue the program. Consideration is given to applicant's undergraduate record (CGPA), Academic Graduate Selection Examination (ALES) or Graduate Record Examinations (GRE) score, letters of references, and English Proficiency.

GRADUATE CURRICULUM

M.S. in Cement Engineering (Thesis)

CEME	500	M.S. Thesis	NC
CEME	501	Cement Raw Materials and Preparation	(3-0)3
CEME	502	Cement Plant Systems	(3-0)3
CEME	590	Seminar	NC
CHE	558	Chemistry and Manufacturing of Cement	(3-0)3
CE	545	Cement and Concrete Quality	(3-0)3

3 electives *
Total credit (min): 21
Number of courses with credit (min): 7

M.S. in Cement Engineering (Without Thesis)

CEME	501	Cement Raw Materials and Preparation	(3-0)3
CEME	502	Cement Plant Systems	(3-0)3
CEME	590	Seminar	NC
CEME	599	Term Project	NC
CHE	558	Chemistry and Manufacturing of Cement	(3-0)3
CE	545	Cement and Concrete Quality	(3-0)3

6 electives *
Total credit (min): 30
Number of courses with credit (min): 10

* No more than two electives could be taken from the same discipline.

GRADUATE COURSES

CE	545	Cement and Concrete QualitY	(3-0)3
CHE	558	Chemistry and Manufacturing of Cement	(3-0)3
CEME	500	M.S. Thesis	NC
CEME	501	Cement Raw Materials and Preparation	(3-0)3
CEME	502	Cement Plant Systems	(3-0)3
CEME	590	Seminar	NC
CEME	599	Term Project	NC
CEME	7XX	Special Topics	(3-0)3
CEME	8XX	Special Studies	(4-2) NC

DESCRIPTION OF COURSES

CEME 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between the student and two faculty members from different disciplines. Students register to this course in all semesters starting, the latest, from the beginning of their third semester till the research program or write-up of thesis ends.

CEME 501 Cement Raw Materials and Preparation (3-0)3
Elements of the mineralogy and geology of cement raw materials, assessment of the raw-material mineral deposits. Quarrying methods, operations and equipment. Raw mix preparation operations: size reduction and air separator systems in cement plants, concepts of particle size distribution and fineness, blending.

CEME 502 Cement Plant Systems (3-0)3
Main principles for power distribution network and process automation of the cement plants. Computer aided process and quality control systems, engineering principles for plant air and water network, the mechanical aspects for kilns, mills and other main equipments, wearing phenomena in cement manufacturing process, sustainable developments in cement industry and general management systems for cement plant operation.

CEME 590 Seminar NC
Presentation of topics of general interest, research activities and recent developments related to cement engineering by graduate students, staff members and invited speakers.

CEME 599 Term Project NC
A research project on a topic in cement engineering. The student is expected to write a comprehensive report covering the latest literature on the subject as well as findings of his/her research work.

CEME 7XX Special Topics (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and.advisor.

CEME 8XX Special Studies (4-2)NC
M.S. student chooses and studies a topic under the guidance of a faculty member, normally his/her advisor.

EARTHQUAKE STUDIES PROGRAM

PROFESSORS

AKKAYA, Ayşen Dener: B.S., M.S., Ph.D., METU
AKYÜZ, Uğurhan ***(Associate Dean of the Faculty of Engineering):*** B.S., M.S., Ph.D., METU.
BAKIR, Sadık: B.S., M.S., METU; Ph.D., Iowa State University
ÇETİN, Önder: B.S., METU; M.S., Ph.D., University of California Berkeley.
DİCLELİ, Murat: B.S., M.S., METU; Ph.D., University of Ottawa.
DÜZGÜN, Şebnem: B.S., M.S., Ph.D., METU.
ERSOY, Melih (***Department Chair***): B.Sc., METU; M.C.P., Columbia University; Ph.D., METU
GÜLEÇ, Nilgün: B.S., M.S., METU; Ph.D. University of Cambridge.
KARANCI, Nuray: B.S. METU; M.S. Liverpool University; Ph.D. Hull University.
KARSLIOĞLU, M. Onur: B.S., KTÜ; M.S., University of Bonn; Ph.D., Technical University of Munich.
KOÇYİĞİT, Ali: B.S., M.S., Ankara University; Ph.D. Ankara University.
ÖZCEBE, Güney: B.S., M.S., METU; Ph.D., University of Toronto.
ÖZKAN, M. Yener: B.S., University of Istanbul; M.S. Utah State University; Ph.D. METU.
ROJAY, Fuat Bora: B.S., M.S., Ph.D., METU.
SUCUOĞLU, Haluk: B.S., M.S., Ph.D., METU.
TOPRAK, Vedat: B.S., M.S., Ph.D., METU.
UTKU, Mehmet: B.S., M.S., METU; Ph.D. University of Texas at Austin.
YAKUT, Ahmet: B.S., M.S., METU; Ph.D., The University of Texas at Austin.
YÜCEMEN, M. Semih: B.S., METU; M.S., Georgia Institute of Technology;
Ph.D., University of Illinois, Urbana – Champaign.

ASSOCIATE PROFESSORS

AKKAR, Sinan: B.S., M.S., Ph.D., METU.
ARICI, Yalın: B.S., METU; M.S., Ph.D., University of California.
CANER, Alp: B.S., METU; M.S. North Carolina State University; Ph.D. North Carolina State University
GÜNDOĞAN, Askan Ayşegül: B.S.,METU; M.S. METU; Ph.D. Carnegie Mellon University
KALAYCIOĞLU, Sibel: B.A.,METU; Ph.D., University of Kent.
TÜRER, Ahmet: B.S. ,METU; M.S. University of Cincinnati; Ph.D. University of Cincinnati

ASSISTANT PROFESSORS

BALABAN, Meltem Şenol: .S. METU; M.S. METU; Ph.D. METU; Ph.D., University of Tokyo.
BURAK, Burcu: B.S. METU; M.S. University of Michigan; Ph.D. University of Michigan
ERKAN, Başbuğ Burçak: B.S. METU; M.S. University of Warwick; Ph.D. London School of Economics
ÖZACAR, Arda: B.S. METU; M.S. METU; Ph.D. University of Arizona
YILMAZ, Tolga: B.S. METU; M.S. METU; Ph.D. METU.

AIMS AND OBJECTIVES: The Earthquake Studies Program aims to foster interdisciplinary teaching and research related to natural disasters affecting Turkey and particularly in the area of earthquakes. Turkey lies in one of the most active earthquake zones of the world. Furthermore, due to the negative effects of low-quality building in urban areas Turkey is one of the countries having the highest risk with respect to earthquakes and disasters. In earthquakes affecting urban areas within the last ten years, more than 20,000 persons have died and property losses have exceeded 20 billion US dollars. These losses are an obstacle to Turkey's economical development. The reduction of high seismic risk in earthquake-prone cities to acceptable levels is possible with the implementation of unified projects involving all disaster-related disciplines.

For the mitigation of earthquake losses, it is necessary to ensure that the disciplines of earth sciences (geology, seismology), earthquake engineering, risk-based urban planning and communal psychology/sociology be made to work together. In both developed and developing countries of the world, there are no cities that face as high an earthquake risk as that of Turkey. The reason for the high risk lies not

only in the great danger due to earthquakes but also in the fact that the building stock is of poor quality. This is why Turkey provides the most effective application area for multidisciplinary studies related to earthquakes. The main aims of the Earthquake Studies Program have been determined as follows:

- To institute an academic program in the areas of Earthquake Engineering, Active Tectonics and Disaster Management leading initially to the Master's degree (M.S.) and further ahead to the Doctoral degree (Ph.D.).
- To coordinate integrated interdisciplinary research within the framework of graduate theses and thus enable the transfer of knowledge and data to the public and private sectors.
- To offer educational services and conduct extension courses.

Earthquake Studies Program is an interdisciplinary program leading to an M.S. degree in the following three fields of study:

- Earthquake Engineering
- Active Tectonics
- Disaster Management

The information and curriculum for each subprogram are as follows:

I. EARTHQUAKE ENGINEERING

The efficient and permanent way of reducing earthquake risk in our country to acceptable levels is providing advanced training and education for practicing engineers and researchers. There is an increased demand towards well trained earthquake engineering experts in the world. There are also valid reasons for the need of well trained individuals in Turkey. Besides fulfilling Turkey’s own needs, Turkish engineers who are involved in important international projects need to be aware of the current knowledge in earthquake engineering, in order to maintain their involvement. The primary objective is to have the graduate students who will be studying earthquake engineering gain the overall conceptual knowledge first, and then focus on a special topic.

II. ACTIVE TECTONICS

The graduate program in Active Tectonics is designed to familiarize students with earthquake geology, earthquake hazard and its assessment. Active Tectonics program provides a link between seismology and active tectonics for a comprehensive integration and understanding of earthquakes, and providing a full background to students who feel themselves as an expert in the solution of earthquake and earthquake-induced problems.

III. DISASTER MANAGEMENT

Disasters in contemporary society, whether of natural or technological origin are complex phenomena that demand comprehensive and multi-disciplinary assessments and action. This is distinctly different from conventional and simpler forms of hazards and accidents. Earthquakes too are considered today not simply as a technical issue of structural robustness, but to define an interrelated area of study and that involves and requires contributions from a wide spectrum of expertise. Understanding of natural and social systems and processes, as well as their interactions is an essential step in the study of disasters. Further to this however, is the need to develop a capacity to manage such systems be it in the context of emergency / crisis environments, or alternatively in the management of risks prior to disasters. The technical know-how related to both aspects of disaster management are based on theory or conveyed by means of case studies, widely spread in many fields of study and practice. Earth sciences and natural sciences, as well as anthropological and historical studies, economics, sociology, psychology, have direct contributions to make in the understanding of such systems. On the other hand, politics, social and physical planning, engineering, systems management, law, medicine, security sciences, and others contribute to the prescriptive capacity in building up the practice and implementation of preventive decisions. The priority of the disaster management program is explicitly on the latter aspects of disasters.

GRADUATE CURRICULUM

M.S. in Earthquake Engineering Track

EQS	500	M.S. Thesis	NC
EQS	501	Earthquake Disaster Policies	(3-0)3
EQS	503	Seismology	(3-0)3
EQS	590	Seminar in EQS	(0-2) NC
CE	529	Structural Dynamics	(3-0)3
CE	568	Soil Dynamics	(3-0)3

4 elective courses
Total minimum credit: 24
Number of courses with credit (min): 8

M.S. in Disaster Management Track

EQS	500	M.S. Thesis	NC
EQS	501	Earthquake Disaster Policies	(3-0)3
EQS	503	Seismology	(3-0)3
or			
EQS	505	Fundamentals of Earthquake Studies	(3-0)3
EQS	590	Seminar in EQS	(0-2) NC
CP	562	Urban Risks and Planning	(3-0)3
PSY	567	Psychological and Social Aspects of Disasters	(3-0)3

4 elective courses
Total minimum credit: 25
Number of Courses with credit (min): 8

M.S. in Active Tectonics Track

EQS	500	M.S. Thesis	NC
EQS	501	Earthquake Disaster Policies	(3-0)3
EQS	503	Seismology	(3-0)3
EQS	590	Seminar in EQS	(0-2) NC
GEOE	621	Neotectonics	(3-0)3
GEOE	713	GPS in Active Tectonics	(3-0)3
GEOE	717	Topics in Active Tectonics	(3-0)3

3 elective courses
Total minimum credit: 24
Number of courses with credit (min): 8

GRADUATE COURSES

EQS	500	M.S. Thesis	NC
EQS	501	Earthquake Disaster Policies	(3-0)3
EQS	503	Seismology	(3-0)3
EQS	505	Fundamentals of Earthquake	(3-0)3
EQS	507	Ionospheric Effects as the Precursors of the Earthquake Studies	(3-0)3
EQS	590	Seminar in Earthquake Studies	(0-2) NC
EQS	7XX	Special Topics in Earthquake Studies	(3-0)3
EQS	8XX	Special Studies	(4-2) NC

ELECTIVE COURSES

Earthquake Engineering Track:

Earthquake Studies Program Courses

EQS 507 Ionospheric Effects as the Precursors of the Earthquake

Department of Civil Engineering Courses

CE 526 Finite Element Method
CE 527 Theory of Elasticity
CE 528 Structural Stability
CE 581 Behavior of Reinforced Concrete Members and Structures
CE 586 Earthquake Engineering
CE 588 Bridge Design
CE 589 Structural Reliability
CE 707 Space Technology in Geodesy and Geodynamics
CE 708 Geodetic Monitoring of Geodynamical Phenomenon
CE 5602 Numerical Modeling in Geomechanics
CE 735 Engineering Decision and Risk Analysis
CE 5603 Seismic Hazard Assessment
CE 742 Structural Health Monitoring
CE 743 Condition and Vulnerability Assessment of Buildings
CE 786 Performance Based Seismic Design Seismic
CE 793 Base Isolation

Department of Engineering Sciences Courses

ES 501Analytical Methods in Engineering I
ES 502 Analytical Methods in Engineering II
ES 504 Numerical Solution of Partial Differential Equations
ES 505 Variational Methods in Engineering
ES 507 Boundary Element Method
ES 528 Wave Propagation in Solids
ES 536 Energy Methods

ES 538 Soil-Structure Interaction Analysis
ES 552 Stochastic Methods in Engineering Mechanics

Department of Mathematics Courses
MATH 581 Numerical Analysis I
MATH 582 Numerical Analysis II

Department of Geological Engineering Courses
GEOE 501 Global Tectonics
GEOE 527 Elements of Seismology
GEOE 607 Advanced Seismology and Seismic Instrumentation
GEOE 621 Neotectonics
GEOE 717 Topics in Active Tectonics

Geodetic and Geographic Information Technologies Program
GGIT 532 GIS and RS in Disaster Management

Active Tectonics Track:

Earthquake Studies Program Courses
EQS 507 Ionospheric Effects as the Precursors of the Earthquake

Courses from the Department of Geological Engineering
GEOE 506 Advanced Photogeology
GEOE 528 Remote Sensing (Satellite)
GEOE 557 Geographic Information Systems in Earth Sciences

Courses from the Department of Electrical and Electronic Engineering
EE 430 Digital Signal Processing

Courses from the Department of Civil Engineering
CE 561 Environmental Geotechnics
CE 735 Engineering Decision and Risk Analysis
CE 5603 Seismic Hazard Assessment

Courses from the Department of City and Regional Planning
CP 517 Issues in Urban Archaeology
CP 541 The Urban Design and Planning Process

Courses from the Geodetic and Geographic Information Technologies Program
GGIT 532 GIS and RS in Disaster Management

Disaster Management Track:

Earthquake Studies Program Courses
EQS 507 Ionospheric Effects as the Precursors of the Earthquake

Department of City and Regional Planning Course
CP 707 Urban Risk Mitigation Research Project

Department of Civil Engineering Courses
CE 490 Introduction to Earthquake Resistant Design
CE 735 Engineering Decision and Risk Analysis

Department of Geological Engineering Courses
GEOE 557 Geographic Information Systems in Earth Sciences

Geodetic and Geographic Information Technologies Program
GGIT 532 GIS and RS in Disaster Management

Department of Architecture Courses
REST 555 Diagnosis and Treatment of Structural Faults and Material Decay
BS 535 Earthquake Resistant Building Design in Architecture
BS 587 Fire Control in Architecture

Department of Philosophy Courses
PHIL 571-572 Eco-Philosophy: Philosophy of Environment I-II
PHIL 588 Environmental Ethics
PHIL 585 Ethics and Decision Making

Department of Economics Courses
ECON 650 Economics of Uncertainty and Information

DESCRIPTION OF COURSES

EQS 500 M.S. Thesis NC
A program of research leading to the M.S. degree is decided between the student and a faculty member. Students register to this course at all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

EQS 501 Earthquake Disaster Policies (3-0)3
Natural and technological hazards and their impacts as subjects of policy; forms and levels of disaster policies; pre-disaster and post-disaster policy orientations; conflicts in natural and social systems and processes; central and local administrations and disasters; operational tools of policy, emergency management; risk avoidance, minimization and sharing; administrative and legal structures in disaster management; hazard and risk assessment mitigation planning and its tools; safety standards in land use; policies to upgrade safety in existing urban areas; appropriate structuring of risk sharing mechanisms and insurance; training, professional and public education.

EQS 503 Seismology (2-2)3
Principles of elastic wave propagation and their application to exploration seismology, the determination of earth structure, and the understanding of earthquake physics. Topics include: necessary mathematical tools (vectors and tensor analysis), fundamentals of elastic wave (stress, strain, elasticity, the equation of motion, wave equations), and advanced theories of seismic wave propagation within the earth (ray theory, body waves, surface waves and normal modes), basics of seismometry, seismic structure of the earth (radial and lateral heterogeneities), and physics of earthquakes (double couple, moment tensor, kinematics and dynamics). Strong ground motion parameters, response and design spectrum concepts, ground motion prediction equations.

EQS 505 Fundamentals of Earthquake Studies (3-0) 3
Introduction to multidisciplinary facets of disasters in general; human and environmental safety requirements. Overview of geological and geophysical aspects of earthquakes, identification and classification of resulting hazards and damages. Analysis of sources of mistakes and faults causing structural and infrastructural hazard; basic survey of hazard and damage reduction; disaster and risk management. Basic rescue, first aid and rehabilitation operations. Multidisciplinary aspects of earthquake hazard mitigation; organizational and administrative activity flows. Benefits of implementing interactive and parallel tasks among public agencies; roles of non-governmental or governmental academic, technical and other institutions in disaster management. Introduction to and emphasis on public educational programs for disaster preparedness.

EQS 507 Ionospheric Effects as the Precursor of the Earthquakes (3-0)3
Demonstration of electromagnetic (EM) observations in different frequency ranges that may be employed as precursor.
to earthquakes. The processes that create the EM signatures. The knowledge of the physics of the Near Earth Space (NES) in order to understand the processes to make the nowcast, forecast and prediction of the natural phenomena such as earthquakes, natural hazards, space weather.

EQS 590 Seminar in Earthquake Studies (0-2) NC
This seminar consists of meetings among the department staff, invited speakers and graduate students to discuss the recent developments in Earthquake Studies. Each student is requested to present a seminar covering the research results, preferably before the final stage of writing his/her thesis.

EQS 7XX Special Topics in Earthquake Studies (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge

EQS 8XX Special Studies (4-2) NC
The M.S. student studies a specific topic under the guidance of a faculty member, normally his/her advisor.

EARTH SYSTEM SCIENCE PROGRAM

PROFESSORS

AKINOĞLU, Bülent, Gültekin: B.S., M.S., Ph.D., METU.
AKKAYA (DENER), Ayşen: B.S., M.S., Ph.D., METU.
AKYÜREK, Zuhal: B.S., M.S., Ph.D., METU.
ALPAS, Hami: B.S., M.S., M.B.A., Ph.D., METU.
BAYKAL, Altan: B.S., M.S., Ph.D., METU.
BEKLİOĞLU, Meryem: B.S., M.S., METU; Ph.D., Liverpool University.
ÇAMUR, Zeki: B.S., KTU; M.S., Ph.D., Cincinnati University.
DEMİRER, Niyazi Göksel: B.S., M.S., METU; Ph.D., Vanderbilt University.
DİLEK, Filiz B.: B.S., M.S., Ph.D., METU.
DOĞAN, Musa: B.S., Ankara University; Ph.D., Edinburgh University.
GÖKÇAY, Celal Ferdi: B.S., M.S., METU; Ph.D., University of Wales.
KARSLIOĞLU, Mahmut Onur: B.S., KTU; M.S., Bonn University; Ph.D., Munich University.
KAYA, Zeki: B.S., İstanbul University; M.S., Ph.D., Oregon S. University.
SANİN, Faika Dilek: B.S., M.S., METU; Ph.D., Duke University.
SARI, Ramazan: B.S., Hacettepe Unicersity; M.S.,Texas Tech University; Ph.D., Texas Tech University.
SOYTAŞ, Uğur: B.S., METU; M.S.,Texas Tech University; Ph.D., Texas Tech University.
TUNCEL, Semra: B.S., M.S., METU; Ph.D., Maryland University.
TURAN, Raşit: B.S., M.S., METU; Ph.D., University of Oslo.
ÜNLÜ, Kahraman*:* M.S., Ankara Univ.; M.S., Iowa State University; Ph.D., University of California Davis.
YALÇINER, Ahmet Cevdet: B.S., M.S., Ph.D., METU.
YETİŞ, Ülkü: B.S., M.S., METU; Ph.D., Pittsburgh University.
YILMAZ, Ayşen ***(Department Chair)***: B.S., Hacettepe University; M.S., Ph.D., METU.
YILMAZ, Özlem Özdemir: B.S., METU; M.S., Ph.D., Texas Tech University.

ASSOCIATE PROFESSORS

ALP, Emre: B.S., M.S., METU; M.S., Ph. D., Marquette University.
BALABAN, Osman: B.C.P., METU; M.S.C. UPL., METU; Ph.D., METU.
BİLGİN, Cemal Can: B.S., M.S., Ph.D., METU.
ERCAN, Hakan: B.S., METU; M.S., METU; Ph.D., Iowa University.
GEDİKLİ, Bahar: B.S., M.S., Ph.D., METU.
GÜNEŞ, Şule: B.S., M.S., Ph.D., Ankara University.
GÖZEN, Ayşe Gül: B.S., METU; Ph.D., Michigan State University.
İÇGEN, Bülent: B.S., M.S., Ph.D., METU.
İMAMOĞLU, İpek: B.S., METU; M.S., University of Newcastle Upon Tyne; Ph.D., University of Wisconsin-Milwaukee.
KANOĞLU, Utku: B.S., M.S., ITU; M.B.A., İstanbul University; Ph.D., University of Southern California.
KENTEL, Elçin: B.S., METU; M.S., Ph.D Georgia Institute of Technology Atlanta.
RITTERSBERGER-TILIÇ, Helga: Vordiplom, Diplom, University of Bonn.; Ph.D., University of Essen.
SOYTAŞ, Uğur: B.S., METU; M.S.,Texas Tech University; Ph.D., Texas Tech University.
SUTCLIFFE (BABALIK), Ela: B.C.P., METU; M.S.C. UPL., METU; Ph. D., University College London.
TARMAN, Hakan Işık: B.S., M.S., Boğaziçi University; Ph.D., Brown University.
VOYVODA, Ebru : B.S., M.S., Ph.D., Bilkent University.
YILMAZ, İsmail Ömer: B.S., METU; M.S., METU; Ph.D., METU.
YÜCEL, İsmail: B.S., ITU; M.S., Arizona University; Ph.D., Arizona University.

ASSISTANT PROFESSORS

KAYMAK, Barış: B.S., METU; Ph.D. Drexel University.
YILMAZ, Koray Kamil: B.S., M.S., METU; Ph.D., Arizona University.

GENERAL INFORMATION: Earth System Science Graduate and Doctorate Programs address the growing national, regional and global demand for trained professionals in Earth System Science and

applications. The degree emphasizes a research-oriented, global systems approach to study the atmosphere, hydrosphere, and lithosphere, including their interrelationships and interactions with the biosphere. Emphasis is on the observation and quantitative analysis of Earth systems which human inflicted problems. Students completing the program will be qualified to pursue careers that require knowledge of the basics of Earth system science and the requisite tools.

The need for the programs exists because human after the industrial revolution modified the global environment faster than they understood the consequences of their changes. The major theme of the program is therefore sustainability, defined as meeting human needs and values while preserving and improving the planets life-support systems.

Graduates of Faculties of Engineering, Social Sciences and Science, those working on this subject in Ministries of Energy and Natural Resources, Environment & Urbanization, Forestry and Water, General Directorate of Meteorology and Policy Making Institutions can apply for graduate study in ESS Program.

Graduates of this program will have a strong background in the theory and application of Earth System Sciences. In this respect, to develop sustainable use of natural resources, technologies, and implement policies becomes crucial, both in a national and global scale. They will be well prepared for either graduate studies or jobs in the areas environmental change (e.g. climate change) and protection, natural resource management and policy.

ADMISSION REQUIREMENTS AND PREREQUISITES: Earth System Science graduate and doctorate programs welcome graduates, i.e. B.Sc. or M. Sc. holders from the departments of Faculty of Art and Sciences, Faculty of Engineering, Faculty of Architecture, Faculty of Economic and Administrative Sciences, and Graduate Schools (GSANS, MASC, IS, IAM). All applicants concerning admission to this program should be made through the Graduate School of Natural and Applied Sciences of the Middle East Technical University. Students who wish to enroll for graduate program in the ESS must be qualified for graduate standing in METU. Proficiency in English at the minimum level of a TOEFL score of 79 or a score in EPE of 65 is required. Applicants are evaluated and accepted to the program based on their CGPA and Graduate Admission Examination (ALES). Since the ESS Graduate Program is highly interdisciplinary, requirements for admission can be flexible and each application can be judged on its own merits and the applicant's background.

TRACKS: Earth System Sciences (ESS) will provide an integrated approach to analyze earth system science. Courses offered in the Program examine interactions among components of the Earth Systems under three tracks.

I.	Earth System Science	M.S. and Ph.D.
II.	Earth System Modeling	M.S. and Ph.D.
III.	Energy, Environmental Economics and Policy	M.S., Ph.D. and M.S. without thesis

GRADUATE CURRICULUM

M.S. with thesis in Earth System Science

ESS	500	M.S. Thesis	NC
ESS	501	The Earth System	(3-0)3
ESS	502	Earth System Science: Economics and Policy	(3-0)3
ESS	590	Seminar	NC

2 restricted elective courses from Group 1
3 elective courses

Total minimum credit: 21
Number of Courses with credit (min): 7

M.S. without thesis in Earth System Science

ESS	501	The Earth System	(3-0)3
ESS	502	Earth System Science: Economics and Policy	(3-0)3
ESS	590	Seminar	NC
ESS	599	Term Project	NC

2 restricted elective courses from Group 1
2 restricted elective courses from Group 2
4 elective courses

Total minimum credit: 30
Number of Courses with credit (min): 10

Ph.D. in Earth System Science

If admitted by M.S. degree in ESS

ESS	600	Ph.D. Thesis	NC
ESS	690	Seminar	NC

2 restricted elective courses from Group 2
5 elective courses

Total minimum credit: 21
Number of Courses with credit (min): 7

Number of Courses with credit (min): 7
* In deficiency program, students must take ESS 501 and ESS 502

Ph.D. in Earth System Science

If admitted by B.Sc.

ESS	501	The Earth System	(3-0)3
ESS	502	Earth System Science: Economics and Policy	(3-0)3
ESS	590	Seminar	NC
ESS	600	Ph.D. Thesis	NC
ESS	690	Seminar	NC

2 restricted elective courses from Group 1
2 restricted elective courses from Group 2
8 elective courses
Total minimum credit: 42
Number of Courses with credit (min): 14

Ph.D. in Earth System Science *

If admitted by M.S. degree from other programs

ESS	600	Ph.D. Thesis	NC
ESS	690	Seminar	NC

2 restricted elective courses from Group 1
2 restricted elective courses from Group 2
3 elective courses
Total minimum credit: 21

GRADUATE COURSES

ESS	500	M.S. Thesis	NC
ESS	501	The Earth System	(3-0)3
ESS	502	Earth System Science: Economics and Policy	(3-0)3
ESS	503	Sustainable Development	(3-0)3
ESS	504	Environment, Society and Technology	(3-0)3
ESS	505	Global Biogeochemistry	(3-0)3
ESS	506	Nature and Human Use	(3-0)3
ESS	507	Climate Change and Modelling	(3-0)3
ESS	508	Environmental Economics	(3-0)3
ESS	509	Energy Policy and Finance	(3-0)3
ESS	590	Seminar I in ESS	(0-2)NC
ESS	599	Term Project	(0-4)NC
ESS	600	Ph.D. Thesis	NC
ESS	690	Seminar II in ESS	(0-2)NC
ESS	7XX	Special Topics in Earth System Science	(3-0)3
ESS	8XX	Special Studies	(4-2)NC
ESS	9XX	Advanced Studies	(4-2)NC

RESTRICTED ELECTIVE COURSES

Group 1: Two courses must be selected from:

PHIL	571	Eco-philosophy: Philosophy of Environment I
IR	570	Global Environmental Issues
ESS	507	Climate Change and Modelling
ESS	508	Environmental Economics
ESS	509	Energy Policy and Finance

Group 2: Two courses must be selected from:

ESS	503	Sustainable Development
ESS	504	Environment, Society and Technology
ESS	505	Global Biogeochemistry
ESS	506	Nature and Human Use

ELECTIVE COURSES*

***** Maximum 2 (two) elective courses from other departments/programs can be elected by the approval of the student's advisor and ESS Administrative Board which are not listed in the tracks below.

Track 1: Earth System Science

AEE	551 Introduction to Space Sciences
BIOL	566 Freshwater Ecology
BIOL	571 Advanced Ecology
BIOL	574 Major Concepts in Ecology
BIOL	587 Plant Biodiversity and Conservation
BIOL	588 Biodiversity and Habitat Conservation
BIOL	744 Paleoecology
CE	530 Modeling in Statistical Hydrology
CE	531 Advanced Hydrology I
CE	599 Groundwater Hydraulics
CE	5701 Hydroclimatology
CE	741 Seismic Hazard Assesments
CHEM	589 Atmospheric Chemistry
ENVE	513 Topics in Atmospheric Chemistry
ENVE	538 Advanced Environmental Chemistry
GEOE	506 Advanced Photogeology
GEOE	515 Advanced Geochemistry
GEOE	545 Applied Sedimentology
GEOE	550 Applied Geophysics
GEOE	568 Paleoclimatology
MASC	512 Chemical Oceanography
MASC	530 Int. To Physical Oceanography
MASC	571 Marine Ecology
MASC	583 Marine Geology
PHYS	573 Physics of Solar Energy

Track 2: Earth System Modeling

AEE	541 Advanced Computational Fluid Dynamics
CE	515 Adjustment of Observations
CE	530 Modelling in Hydrology
CE	531 Advanced Hydrology I
CE	599 Ground Water Hydaulics
CE	728 Geotechnical Earthquake Eng.
CE	761 Marine Hazards and Tsunami
CHE	551 Applied Data Analysis Techniques
ES	508 Statistical Methods for Eng.
ES	516 Spectral Methods
ES	554 Nonlinear Dynamics
ES	571 Basic Principles of Fluid Mechanics
ES	572 Advanced Fluid Mechanics
ES	702 Geophysical Fluid Dynamics
ENVE	502 Modeling Soil and Ground Water Pollution
GEOE	517 Advanced Geostatistics
GEOE	544 Stability of Soil Slopes in Eng. Practice
GEOE	555 Principles and Appl. of Imaging Radar Systems
GEOE	559 GIS Models in Natural Hazard Assessment
GEOE	567 Groundwater Contamination
GEOE	614 Groundwater systems Plan and Management
GEOE	616 Geochemistry of Natural Waters
GGIT	538 Spatial Data Analysis
GGIT	560 Principles of Remote Sensing
GGIT	562 Integration of Remote Sensing and GIS

Track 3: Energy, Environmental Economics and Policy

BA	6505 Applied Regression Analysis
BA	6507 Applied Time Series and Panel Data analysis
BIOL	707 Societal Dependence on Natural Ecosystems
CP	550 Solar Energy and Urban Planning
ENVE	707 Energy and the Environment
ECON	608 Computable General Equilibrium Models
GEOE	530 Economics of Energy Resources
GGIT	535 Information Systems for Natural Resource Management
IR	580 Governance in Trans-boundary Water Systems
IR	669 Law of the Marine Environment Systems
PETE	519 World Energy Sources
PHYS	573 Physics of Solar Energy

DESCRIPTION OF COURSES

ESS 500 M.S. Thesis **NC** A program of research leading to the M.S. degree is decided between the student and a faculty member.

Students register to this course at all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

ESS 501 The Earth System (3-0)3
Near Earth Space (NES): Electromagnetic and charge output of the Sun; radiation, plasma, neutral atmosphere and magnetic environment; the atmosphere, atmospheric dynamics and circulation patterns, atmospheric chemistry. Geosphere: Principals of geological processes, The Earth's materials, deposition in the deep oceans, lakes and rivers, geologic time scales. Hydrosphere: Fresh water over and in soil, ocean water and hydrological cycle, ocean systems, the ocean's role in the global geochemical and biogeochemical cycling and physical/climate systems, freshwater and marine ecosystems. Biosphere: Evolution of biological diversity, terrestrial and aquatic and marine ecosystems, GAIA, Geographic ecology, global ecology, biological feedback mechanisms at global scale. Climate Change-introduction: Introduction to climate variability and climate change. Future prospects for the Earth system.

ESS 502 Earth System Science: Economics and Policy (3-0)3
Institutional framework and issues of climate change; international context and treaties; economic concepts relevant to climate and environmental change; policy issues and options for mitigating the impact of climate change; methods of policy analysis and evolution including modeling fundamentals; model types and modeling issues.

ESS 503 Sustainable Development (3-0)3
To review core concepts and history of sustainable development; to introduce students to innovative frameworks to sustainable development, including institutional analysis, common-pool resource management, and the often overlooked cultural, and psychological underpinnings of environmental decision–making; to examine policy responses to environmental problems caused by economic development; to analyze social case studies and examples through the frameworks presented; to provide a forum for graduate students to present their own research interests and examples regarding sustainable development.

ESS 504 Environment, Society and Technology (3-0)3
The identification, investigation and evaluation of how environment, energy and technology are inter-related and how these interactions influence societal policy formulation, implementation and evaluation at the local, regional, national, international in the context of industrial and organizational levels.

ESS 505 Global Biogeochemistry (3-0)3
The origin and history of life on Earth, life and evolution, production and fate of organic material, major biogeochemical cycles (C, N, P, O, and S) and their interactions with physical, chemical and biological components of terrestrial and aquatic systems, links between local and global cycles, biogeochemical transformations and microbial loops, aerobic and anaerobic processes, climatic forcing of biogeochemical processes, anthropogenic environmental change mediated through both perturbation of biogeochemical cycles (eutrophication, ocean carbon sequestration) and through the introduction of contaminants (toxic organic compounds, heavy metals, trace elements), reconstructing the history of environmental change using chemical markers preserved in sedimentary or biological archives.

ESS 506 Nature and Human Use (3-0)3
Understanding of the natural environment and the environmental problems that the world faces. fundamental ecological principles, human population dynamics, biodiversity, natural resources and their use, human interaction with the environment, and personal and civic responsibility, anthropogenic changes on earth that are inflected by human population rise, environmental awareness as a basis for policy making and ethical decisions.

ESS 507 Climate Change and Modeling (3-0)3
Climate: Introduction to climate, the science of climate, elements and control of weather and climate, the nature of the atmosphere, role of oceans, the dynamics of the climate system, world pattern of climate. Climate variability: Time scales of climatic variations, long-term climate averages, annual climate variations, Earth's evolution and paleo-climatic changes. Climate Change: the Greenhouse gases and global warming,, Human activities and the climate change, sensitivity to external forcing, the cryosphere and records of environmental changes, ocean impacts and feedbacks, oceans and CO2 sequestration, Climate modeling: Types of data, Basic laws of physics for the models, systems of differential equations, coupling atmosphere-ocean and land surface-sea icesystem, physical climate modeling, and accuracy of the models.

ESS 508 Environmental Economics (3-0)3
Consumption, production and cost. Competitive markets and welfare. Equilibrium and efficiency

under different market structures. Market failure and the Coase theorem. Cost benefits analysis in imperfect markets. Natural and renewable resource economics. Policy alternatives to address environmental issues.

ESS 509 Energy Policy and Finance (3-0)3
Energy markets, game theory and strategic interaction, imperfections and regulation. World energy markets as alternative investment areas, price movements, international trade and finance, macroeconomics impacts of energy price shocks. Renewable energy policy, evaluating energy projects and energy project financing policy appraisal.

ESS 590 Seminar I in ESS (0-2)NC
Presentations of topics of general Program interest, current research activities and recent developments in the related fields by graduate students, staff members and invited speakers. M.Sc. students must register for this course at least once during their M.Sc., and M.Sc. students prepare a seminar directly related to their ongoing thesis research as part of the Earth System Science Master Program.

ESS 599 Term Project (0-4)NC
Project carried out under the supervision of a faculty member in a specific area of ESS. A written report is expected from students about their work.

ESS 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress.

ESS 690 Seminar II in ESS (0-2)NC
Presentations of topics of general Program interest, current research activities and recent developments in the related fields by graduate students, staff members and invited speakers. Ph.D. and Ph. D. on B.S. students must register for this course at least once during their Ph.D. and Ph. D. on B.S. Students prepare a seminar directly related to their ongoing thesis research as part of the Earth System Science Doctorate Program.

ESS 7XX Special Topics in Earth System Science (3-0)3
Courses not listed in the catalogue are given as Special Topics courses. Contents vary from year to year according to interest of students and instructor in charge. Courses include various earth system topics.

ESS 8XX Special Studies (4-2)NC
M.Sc. Students choose and study a topic under the guidance of a faculty member normally his/her advisor.

ESS 9XX Advanced Studies (4-2)NC
PhD Students choose and study a topic under the guidance of a faculty member normally his/her advisor.

GEODETIC AND GEOGRAPHIC INFORMATION TECHNOLOGIES PROGRAM

PROFESSORS

AKIN, Serhat: B.S., M.S., Ph.D., METU.
AKYÜREK, Zuhal: B.S., M.S., Ph.D., METU.
ATALAY, Volkan: B.S., M.S., METU; Ph.D., Université de Paris-V.
BOZKUŞ, Zafer: B.S., İTÜ; M.S., Ph.D., Michigan State University.
COŞAR, Ahmet.(***Department Chair***): B.S., METU; M.S., Bilkent University; Ph.D., University of Minnesota.
ÇİÇEKLİ, Nihan Kesim: B.S., METU; M.S., Bilkent University; Ph.D., Imperial College.
DÜZGÜN, Şebnem: B.S., M.S., Ph.D., METU.
HALICI, Uğur: B.S., M.S., Ph.D., METU.
IŞIK, Oğuz: B.C.P., M.C.P., METU; Ph.D., University College London.
KARSLIOĞLU, Mahmut Onur: B.S. Karadeniz Technical University;
B.S. and M.S. University of Bonn; Ph.D. Technical University of Munich.
KAYMAKÇI, Nuretdin: B.S., M.S., METU; Ph.D., University of Utrecht.
PINARCIOĞLU, M. Melih: B.S., M.S., METU; Ph.D., University College London.
ROJAY, Bora: B.S., M.S., Ph.D., METU.
SÜZEN,Lütfi : B.S., M.S., Ph.D., METU.
TOPRAK, Vedat: B.S., M.S., Ph.D., METU.
TUNCEL, Gürdal: B.S., M.S., METU; Ph.D., University of Maryland.
ÜNLÜ, Kahraman: B.S., Ankara University; M.S., Iowa State University;
Ph.D., University of California Davis.
YALÇINER, Ahmet Cevdet: B.S., M.S., Ph.D., METU.
YAZICI, Adnan: B.S., İTÜ; M.S., University of Tulsa; Ph.D., University of Tulane.

ASSOCIATE PROFESSORS

BİLGİN, Can: B.S., M.S., Ph.D., METU.
DEMİREL, Nuray: B.S., M.S., METU, Ph.D., Missouri University of Science and Technology.
KALAYCIOĞLU, Sibel: B.A., METU; Ph.D., University of Kent.
KENTEL, Elçin: B.S., METU; M.S. Drexel University; M.S., Ph. D., Georgia Institute of Technology.
LELOĞLU, Uğur Murat: B.S., M.S., Ph.D., METU.
MERZİ, Nuri: B.S., M.S., METU, Ph.D., Ecole Polytechnique Federale de Lausanne.
PARNAS ULUSOY, İlkay: B.S., METU; M.S., Ohio State University; Ph.D., METU.
SUTCLIFFE BABALIK, Ela: B.S., M.S., METU; Ph.D., University College London.
TANYER, Ali Murat: B.S., M.S., METU; Ph.D., University of Salford.
TİĞREK, Şahnaz: B.S., M.S., METU; Ph.D., Tokyo University.
YÜCEL,İsmail: B.S., İstanbul Technical University; M.S., Ph.D., University of Arizona

ASSISTANT PROFESSORS

ALTINÖZ, (BİLGİN), Güliz A.: B.Arch, M.S. in Restoration; Ph.D., METU.
BAŞBUĞ, Burçak Erkan: B.S., METU; M.Sc., University of Warwick; Ph.D., London School of Economics.
YAMAN (TÜYDEŞ), Hediye: B.S., M.S., METU; M.S., Ph.D., Northwestern University.

GENERAL INFORMATION: Geodetic and Geographic Information Technologies (GGIT) is an interdisciplinary program leading to M.S. and Ph.D. degrees. The main purpose of the program is to provide graduate education and pursue research in Space Geodesy (SG), Geographic Information Systems (GIS) and Remote Sensing (RS). The program is designed to meet the growing demands for skilled manpower at graduate level particularly in areas modern space technologies and their applications, GIS, spatial data analyses and remote sensing technology. The program emphasizes theoretical as well as applied multi-disciplinary research. An advisory committee is formed for each Ph.D. student according to study/research aims of the student. Each student is required to choose, in consultation with his/her advisory committee, a major stream of study from the following list:

- Space Geodesy (SG)
- Remote Sensing (RS)
- Geographic Information Systems (GIS)

CONTRIBUTING DEPARTMENTS: City and Regional Planning, Civil Engineering, Computer Engineering, Electrical and Electronic Engineering, Environmental Engineering, Geological Engineering., Mining Engineering, Architecture, Sociology, Biology, Petroleum and Natural Gas Engineering

GRADUATE RESEARCH LABORATORIES: The Department has one research lab and one student computer lab each having sufficient number of powerful PCs equipped with necessary software applications.

GRADUATE CURRICULUM

M.S. in Geodetic and Geographic Information Technologies (for students with an M.S. degree obtained from the METU Department of Geodetic And Geographical Information Technologies)

GGIT	500	M.S. Thesis	NC
GGIT	501	Geodesy and Map Projections	(3-0)3
CENG	302	Introduction to Database Management Systems*	(3-0)3
CE	413	Introduction to Geographic Information Systems**	(3-0)3
GGIT	560	Principles of Remote Sensing ***	(3-0)3
GGIT	590	Seminar	NC

4 elective courses approved by the Department of Geodetic and Geographical Information Technologies.
Total minimum credit: 24
Number of courses with credit (min.): 8

*or IS 503 Database Concepts and Applications	(3-0)3
**or CRP 438 Introduction to GIS Planning Practice	(3-0)3
***or GEOE 528 Remote Sensing	(3-0)3

Ph.D. in Geodetic and Geographic Information Technologies (for students with an M.S. from a department other than the METU Department of Geodetic And Geographical Information Technologies)

If admitted by M.S. degree

Students with an M.S. degree in GGIT are accepted to the Ph.D. program without the need to attend a deficiency program while those students with other backgrounds may be required to attend a deficiency program.

Students accepted to Ph.D. program will be asked to choose a major topic from the list below and a minor topic depending on their interests. The minor topics will vary depending on the student's background and be determined in colloboration with contributing departments. Students attending the Ph.D. program are required to take four courses from the major topics and three courses from the minor topics.

Major topics:
* Geodesy
* Geographic Information Systems
* Remote Sensing

GGIT 600 Ph.D. Thesis NC

7 elective courses
Total minimum credit: 21
Number of courses with credit (min.): 7

If admitted by B.S. degree:

GGIT	501	Geodesy and Map Projections	(3-0)3
CENG	302	Introduction to Database Management Systems*	(3-0)3
CE	413	Introduction to Geographic Information Systems**	(3-0)3
GGIT	560	Principles of Remote Sensing ***	(3-0)3
GGIT	590	Seminar	NC
GGIT	600	Ph.D. Thesis	NC

11 elective courses
Total minimum credit: 45
Number of courses with credit (min.):15

*or IS 503 Database Concepts and Applications	(3-0)3
**or CRP 438 Introduction to GIS Planning Practice	(3-0)3
***or GEOE 528 Remote Sensing	(3-0)3

GRADUATE COURSES

The program is supported by the course programs of contributing departments' course offerings as well as by GGIT coded courses: A list of the courses within the three streams of GGIT is updated and published annually.

GGIT	500	M.S. Thesis	NC
GGIT	501	Geodesy and Map Projections	(3-0)3
GGIT	530	Advanced GIS	(2-2)3
GGIT	531	Project Design in GIS	(1-4)3
GGIT	532	GIS and RS in Disaster Management	(3-0)3
GGIT	535	Information Systems for Natural Resource Management	(3-0)3
GGIT	537	Statistical Techniques in Geographical Analysis	(3-0)3
GGIT	538	Spatial Data Analysis	(3-0)3
GGIT	560	Principles of Remote Sensing	(3-0)3
GGIT	561	Digital Image Analysis	(2-2)3
GGIT	562	Integration of Remote Sensing and GIS	(3-0)3
GGIT	563	Microwave Remote Sensing	(3-0)3
GGIT	590	Seminar	(0-2)NC
GGIT	7XX	Special Topics in Geodetic and Geographic Information Technologies	(3-0)3
GGIT	8XX	Special Studies	(4-2)NC
GGIT	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF COURSES

GGIT 500 M.S. Thesis NC
Research program leading to M.S. degree. An advisor and a co-advisor is appointed from two of the contributing departments during the first semester. The students register to this course every semester starting from their second semester.

GGIT 501 Geodesy and Map Projections (3-0)3
Introduction to the Parameter Estimation in linear models, Reference Systems, Reference Frames, Coordinate Systems and Coordinate Transformations, Earth's Gravity Field, Geodetic Earth Model, Geodetic Astronomy, Methods of 3-D absolute and relative Positioning , introduction to GNSS, Gravity Field Determination, Geodetic Networks, Horizontal and vertical Datum and Datum Transformations, Basic differential geometry, introduction to Map Projections and their Classifications.

GGIT 530 Advanced GIS (2-2)3
Basic building blocks of geographic information systems; Measurement and GIS, frames, shapes and databases, data input, storage and editing. Transformations and operations; overlay and distance operations, surfaces and nearest neighbors, transforming data. Error, accuracy and precision; types of error, sources of inaccuracy and imprecision
Prerequisite: Consent of the Department.

GGIT 531 Project Design in GIS (1-4)3
Formulation of project. Literature review and determination of data requirement. Collection of data. Presentation of data in GIS format. Analysis in the project. Presentation and criticisms.
Prerequisite: Consent of the Department.

GGIT 532 GIS and RS in Disaster Management (3-0)3
Principles of disaster management. Geographical Information Systems. Remote Sensing. Landslides, floods, snow and avalanches, earthquakes, forest fires. Use of GIS and RS in natural disaster management.
Prerequisites: Introductory courses in GIS and RS.

GGIT 535 Information Systems for Natural Resource Management (3-0)3
Application of GIS principles in the environment of natural resource management problems and organizations; principles of seamless raster data architectures, raster-vector database integration, decision support system and management information, AM/FM (Automated Mapping and Facility Management)

GGIT 537 Statistical Techniques in Geographical Analysis (3-0)3
Descriptive statistics of geographical data. Measurement Scales. Probability theory. Discrete and continuous probability distributions used in geography. Statistical inference, hypothesis testing and sampling for spatial data. Parameter estimation, correlation and regression analysis of geographical data. Introduction to Spatial Statistics.

GGIT 538 Spatial Data Analysis (3-0)3
Introduction to spatial data analysis. Problem types in spatial data analysis. Point pattern analysis. Analysis of continuous spatial data. Spatial analysis of area data. Spatial modeling. Visualization of spatial data.

GGIT 560 Principles of Remote Sensing (3-0)3
Physical basis of remote sensing; basics of imaging; spatial, spectral and radiometric resolution; spaceborne sensors and platforms; radiometric and geometric correction; image enhancement; multi-band operations; classification; synthetic aperture RADAR; LIDAR.

GGIT 561 Digital Image Analysis (3-0)3
Introduction to remote sensing; image registration; radiometric enhancement; multispectral transformations; frequency domain transformations; supervised and unsupervised classification; feature reduction; image fusion; hyperspectral image processing.
Prerequisite: Consent of the Department.

GGIT 562 Integration of Remote Sensing and GIS (3-0)3
Fundamental concepts of integrating remote sensing and geographic information systems (GIS); the essentials of using ancillary data in the remote sensing images; the use of remote sensing images in GIS analysis operations; the levels and technical impediments of the integration; the required interface functions and; error sources.
Prerequisite: Consent of the Department.

GGIT 563 Microwave Remote Sensing (3-0)3
The principles and the applications of both passive (radiation) and active (radar) microwave remote sensing. The physical radiation principles for remotely measuring surface processes, plane waves, polarization, dielectric properties of manner, scattering, absorption. Microwave remote sensing systems, tradeoffs and sensor capabilities.

GGIT 590 Seminar (0-2)NC
Presentation of topics of general interest, as well as the current research by the graduate students are the main lines of the seminar program.

GGIT 7XX Special Topics in Geodetic and Geographic Information Technologies (3-0)3
Courses not listed in the catalogue. Topics vary from year to year according to interest of students and faculty in charge.

GGIT 8XX Special Studies (4-2)NC
M.S. student chooses and studies a topic under the guidance of a faculty member, normally his/her advisor.

GGIT 9XX Advanced Studies (4-0)NC
Graduate students as a group choose and study an advanced topic under the guidance of a faculty member, normally the advisor of the students.

MICRO AND NANOTECHNOLOGY PROGRAM

PROFESSORS

AKDENİZ, M. Vedat: B.S., M.S., METU; Ph.D., The Open University.
AKIN,Tayfun ***(Department Chair)***: B.S., METU; M.S., Ph.D., The University of Michigan.
ARIKAN, M.A. Sahir: B.S., M.S., Ph.D., METU.
AYDINOL,M,Kadri: B.S., M.S., Ph.D., METU.
BEŞİKÇİ, Cengiz: B.S., Hacettepe University; M.S., Illinois Institute of Technology; Ph.D., Northwestern University.
ERKOÇ, Şakir: B.S., M.S., Ph.D., METU.
HASIRCI, Nesrin: B.S., M.S., Ph.D., METU.
HASIRCI,Vasıf: B.S., M.S., METU; Ph.D., University of Reading.
KARAKAŞ, Gürkan: B.S., M.S., Ph.D., METU.
KAYNAK, Cevdet: B.S., M.S., Ph.D., METU.
MEKHRABOV, Amdulla: B.S., M.S., Azerbaijan State University; Ph.D., Lomonosov Moscow State University.
ÖZKAN, Necati: B.S., İTU: M.S., Stanford University; Ph.D., Imperial College
ÖZENBAŞ, Macit: B.S., M.S., Ph.D., METU.
ÖZTÜRK, Tayfur: B.S., İ.T.Ü.; Ph.D., Cambridge University.
TURAN, Raşit :B.S., M.S., METU; Ph.D., University of Oslo.
ÜNER, Deniz: : B.S., M.S., METU; Ph.D., Iowa State University.
VOLKAN, Mürvet: B.S., M.S., Ph.D., METU.

ASSOCIATE PROFESSORS

AKATA KURÇ, Burcu: B.S., M.S. METU; Ph.D., Northeastern University.
BAYRAM,Barış: B.S., Bilkent University; M.S., Ph.D., Stanford University.
ÇIRPAN, Ali, B.S., M.S., Ph.D., METU
DANIŞMAN, Mehmet Fatih: B.S., M.S., METU; Ph.D. Princeton University.
DURUCAN, Caner: B.S., METU; M.S., Ph.D., Pennsylvania State University.
EVİS, Zafer: B.S., METU; M.S., Ph.D., Rensselaer Polytechnic Institute.
KÜLAH, Haluk:B.S., M.S., METU; Ph.D., The University of Michigan.
ÖZYURT, Tuba O.:B.S., M.S., METU; Ph.D., Northeastern University.
TOFFOLI ÜSTÜNEL, Hande: B.S., METU; M.S., Ph.D., Cornell University
ÜNALAN, Hüsnü Emrah: B.S., METU; M.Sc., Ph.D., Rutgers University
YAZICIOĞLU, Almıla G.: B.S., M.S., METU; Ph.D., University of Illinois at Chicago
YILMAZ, Ayşen: B.S., M.S., Ph.D., METU.

ASSISTANT PROFESSORS

AZGIN, Kıvanç, B.S., M.S METU; Ph.D., University of California
BEK, Alpan, B.S.,M.S., Bilkent University; Ph.D., Ecole Polytechnique Federale de Lausanne
DERİCİOĞLU, Arcan F.: B.S., METU; M.S., Ph.D., Tokyo University.
EREL,İrem : :B.S., M.S., İTU; Ph.D., Stevens Institude of Technology.
ESENTURK, Emren N.: B.S., M.S., METU; Ph.D., University of Maryland
TOFFOLI, Daniele M.S., Ph.D., University of Trieste.
YERCİ, Selçuk: B.S., M.S., METU; Ph.D., University of Boston

GENERAL INFORMATION: The graduate program in Micro and Nanotechnology is a joint interdisciplinary program of the following Departments: Biological Sciences, Chemistry, Physics, Chemical Engineering, Electrical and Electronics Engineering, Engineering Sciences, Metallurgical and Materials Engineering, Mining Engineering and Mechanical Engineering.

This program is open to the students of undergraduate degree from physical and/or life sciences and engineering departments. Graduates of other science and engineering departments will be required to take preparatory courses depending on the individual's background according to the decision of Admission Committee up to 2 semesters. Major research subjects are the following:

1- Nanophotonics, optoelectronics, micro and nanoelectronics, nanomagnetism
2- Nanomaterials
3- Micro and Nanofabrication and characterization
4- Nanobiotechnology and BioMEMS
5- Quantum computing
6- Micro-Electro-Mechanical Systems (MEMS)

These major research subjects are supplemented by several courses from different science and engineering departments as indicated below:

CONTRIBUTING DEPARTMENTS: Biological Sciences, Chemistry, Physics, Chemical Engineering, Electrical and Electronics Engineering, Engineering Sciences, Metallurgical and Materials Engineering, Mining Engineering and Mechanical Engineering.

GRADUATE CURRICULUM

M.S. in Micro and Nanotechnology Program

MNT	500	M.S. Thesis	NC
MNT	501	Nanoscience and Engineering Principles	(3-0)3
MNT	502	Characterization Techniques at the Nanoscale	(2-2)3
MNT	591	Seminar	(0-2)NC

5 elective courses*

* 2 courses related with major subjects (restricted elective)
3 courses (unrestricted elective)

Total minimum credit: 21
Number of courses with credit (min):7

Ph.D. in Micro and Nanotechnology Program

If admitted by M.S. degree (from MNT):

MNT	600	Ph.D. Thesis	NC
MNT	691	Seminar in MNT	(0-2)NC

7 elective courses*

*2 courses related with major subjects (restricted elective)
5 courses (unrestricted elective)

Total minimum credits: 21
Number of courses with credit (min):7

If admitted by M.S. degree (not from MNT):

MNT	501	Nanoscience and Nanotechnology Principles	(3-0)3
MNT	502	Characterization Techniques at the Nanoscale	(2-2)3
MNT	600	Ph.D. Thesis	NC
MNT	691	Seminar in MNT	(0-2)NC

5 elective courses*
*2 courses from major subjects (restricted elective)
3 courses (unrestricted elective)

Total minimum credits: 21
Number of courses with credit (min):7

If admitted by B.S. degree:

MNT	501	Nanoscience and Nanotechnology Principles	(3-0)3
MNT	502	Characterization Techniques at the Nanoscale	(2-2)3
MNT	600	Ph.D. Thesis	NC
MNT	691	Seminar in MNT	(0-2)NC

12 elective courses*

* 4 courses from major subjects (restricted elective)
8 courses (unrestricted elective)

Total minimum credits: 42 Number of courses with credit (min):14

*****All elective courses are minimum 3 credits.
Restricted electives: BIO 514 (or CHEM 568), BTEC 503, CHE 520, CHE 521 (or ME 517), EE 513, EE 610, EE 617, ME 504, METE 507, METE 546, PHYS 501, PHYS 507, PHYS 535, PHYS 537, PHYS 539

GRADUATE COURSES

MNT	500	M.S. Thesis	NC	MNT	600	Ph.D. Thesis	NC
MNT	501	Nanoscience and Engineering Principles	(3-0)3	MNT	691	Seminar	(0-2)NC
MNT	502	Characterization Techniques at the Nanoscale	(2-2)3	MNT	7XX	Special Topics in Micro and Nanotechnology	(3-0)3
MNT	591	Seminar	(0-2)NC	MNT	8XX	Special Studies	(4-2)NC
				MNT	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF COURSES

MNT 500 M.S.Thesis NC
Program of research leading to M.Sc. degree arranged between the student and a faculty member. Students register to this course in all semesters while the research program or write up of thesis is in progress. Student must start registering to this course no later than the second semester of his/her M.S. study.

MNT 501 Nanoscience and Engineering Principles (3-0)3
Introduction to the concept of nanoscience and nanotechnology. Unique mechanical, physico-chemical, electrical, optical and magnetic properties of nanomaterials as a result of reduction in dimensionality. Synthesis methods of various nanomaterials. Nanofabrication techniques. Applications of nanomaterials in catalysis, electronics, optoelectronics, composite technology, environmental science, biotechnology and biomedicine. Quantum computing.

MNT 502 Characterization Techniques at the Nanoscale (2-2)3
Experimental and computational techniques of characterization at nanoscale. Theoretical and experimental studies. Structural characterization techniques such as Electron Microscopy (SEM/TEM), SPM, SAM, particle size analysis**.** Spectroscopical techniques (XPS, AES, TOF, SIMS, NMR, FTIR and Raman, EELS). Computational modeling.

MNT 591 Seminar (0-2)NC
A seminar course for M.S. students in their third or fourth semester who are near completing their thesis. Students are required to give a seminar on their thesis subject and participate in the discussion of seminars given by others. The seminar should cover the details of work carried out and main findings as well as plan of remaining work to be carried out.

MNT 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters while the research program or write up of thesis is in progress. Student must start registering to this course no later than the second semester of his/her Ph.D. study.

MNT 691 Seminar (0-2)NC
A seminar course for Ph.D. students in their fifth or sixth semester who are near completing their thesis. Students are required to give a seminar on their thesis subject and participate in the discussion of seminars given by others. The seminar should cover the details of work carried out and main findings as well as plan of remaining work to be carried out.

MNT 7XX Special Topics in Micro and Nanotechnology (3-0)3
Courses not listed in the catalogue are given as Special Topics courses. Contents vary from year to year according to interest of students and instructor in charge. Courses include various micro and nanotechnology topics.

MNT 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

MNT 9XX Advanced Studies (4-0)NC
Ph.D. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

OCCUPATIONAL HEALTH AND SAFETY PROGRAM

PROFESSORS

BİLGİÇ, Reyhan: B.S., Hacettepe University; M.S., New York University;
Ph.D., Illinois Institute of Technology.
ÇİLİNGİR, Canan: B.S., METU; M.S., METU, Loughbrough University of Technology;
Ph.D., Ege University.
DÜZGÜN, Şebnem: B.S., M.S., Ph.D., METU.
GÜNDÜZ, Murat: B.S., METU; M.S., Georgia Institute of Technology;
Ph.D., University of Wisconsin-Madison.
KARAKAŞ, Gürkan: B.S., M.S., Ph.D., METU.
KARANCI, Nuray: B.S., METU; M.S., University of Liverpool; Ph.D., University of Hull.
ÖZDEMİR, Selahattin: B.S., M.S., Ankara University; Ph.D., University of Wales.
PARLAKTUNA, Mahmut: B.S., M.S., Ph.D., METU.
TOKER, İrem Dikmen: B.S., M.S., Ph.D., METU.
YAMAN, Yavuz ***(Department Chair)***: B.S., M.S., METU., Ph.D.,University of Southampton.

ASSOCIATE PROFESSORS

DEMİREL, Nuray: B.S., M.S., METU; Ph.D., Missouri University of Science and Technology.
DİLEK, Çerağ: B.S., M.S., METU; Ph.D., Wayne State University;
Post Doc., Georgia Institute of Technology.
ÖZKAN, Türker: B.S., M.S., METU; Ph.D., University of Helsinki.

ASSISTANT PROFESSORS

GÜRSES, Senih: B.S., Hacettepe University; M.S., Boğaziçi University; Ph.D., METU.
SINAYUÇ, Çağlar: B.S., M.S., Ph.D., METU.

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The graduate program in Occupational Health and Safety is an interdisciplinary program offering both M.S. degree with thesis and M.S. degree without thesis. The aim of the program is to equip its graduates with an understanding of occupational health and safety problems of a workplace and to provide sound solutions while improving the productivity of the workplace. It is open to students with backgrounds of engineering, architecture, science and medical schools with appropriate prerequisite programs wherever applicable.

CAREER OPPORTUNITIES: Occupational Health and Safety graduates may have career opportunities in various industrial and health sectors, in addition to doing research and teaching in universities.

GRADUATE CURRICULUM

M.S. in Occupational Health and Safety Program (Thesis)

OHS	500	M.S. Thesis	NC
OHS	501	Introduction to Occupational Health and Safety	(3-0)3
OHS	511	Field Studies in Occupational Health and Safety	(3-0)3
OHS	590	Seminar	NC

2 restricted elective courses

3 electives

Total credit (min): 21
Number of courses with credit (min): 7*

M.S. in Occupational Health and Safety Program (Without Thesis)

OHS	501	Introduction to Occupational Health and Safety	(3-0)3
OHS	502	Industrial Hygiene	(3-0)3
OHS	511	Field Studies in Occupational Health and Safety	(3-0)3
OHS	590	Seminar	NC

OHS	599	Term Project	NC	Total credit (min): 30
3 restricted elective courses				Number of courses with credit (min): 10*
4 electives				

* No more than three courses could be taken from the same discipline.
** No more than five courses could be taken from the same discipline.

GRADUATE COURSES

OHS	500	M.S. Thesis	NC
OHS	501	Introduction to Occupational Health and Safety	(3-0)3
OHS	502	Industrial Hygiene	(3-0)3
OHS	503	Risk Management in Occupational Health and Safety	(3-0)3
OHS	504	Workplace Accident Investigation and Prevention	(3-0)3
OHS	505	Emergency Management	(3-0)3
OHS	507	Occupational Ergonomics	(3-0)3
OHS	508	Occupational Health and Safety Economics	(3-0)3
OHS	509	Safety Training	(3-0)3
OHS	510	Workers Health and its Promotion	(3-0)3
OHS	511	Field Studies in Occupational Health and Safety	(3-0)3
OHS	590	Seminar	NC
OHS	599	Term Project	NC
OHS	7XX	Special Topics	(3-0)3
OHS	8XX	Special Studies	(4-2) NC

RESTRICTED ELECTIVE COURSES (Thesis)

ES	513	Effects of Noise and Vibration in Working Environment	(3-0)3
OHS	502	Industrial Hygiene	(3-0)3
OHS	503	Risk Management in Occupational Health and Safety	(3-0)3
OHS	504	Workplace Accident Investigation and Prevention	(3-0)3
PSY	500	Advanced Statistics for Psychology I	(3-0)3

RESTRICTED ELECTIVE COURSES (Without Thesis)

ES	513	Effects of Noise and Vibration in Working Environment	(3-0)3
OHS	503	Risk Management in Occupational Health and Safety	(3-0)3
OHS	504	Workplace Accident Investigation and Prevention	(3-0)3
PSY	500	Advanced Statistics for Psychology- I	(3-0)3

ELECTIVE COURSES

AE	722	Occupational Health and Safety in Aerospace Industry	(3-0)3
CE	775	Construction Safety Management	(3-0)3
CHE	482	Chemical Process Safety	(3-0)3
CHE	780	Risk Analysis and Management for Chemical Processes	(3-0)3
ES	508	Statistical Methods for Engineering	(3-0)3
IE	539	Topics in Ergonomics	(3-0)3
MINE	505	Advanced Mine Environment	(3-0)3
MINE	555	Advanced Mine Health and Safety Management	(3-0)3
OHS	505	Emergency Management	(3-0)3
OHS	507	Occupational Ergonomics	(3-0)3
OHS	508	Occupational Health and Safety Economics	(3-0)3
OHS	509	Safety Training	(3-0)3
OHS	510	Workers Health and its Promotion	(3-0)3
PSY	567	Psychological and Social Aspects of Disasters	(3-0)3

PSY 571	Accident and Behavioral Models, Theories, and Its Implications	(3-0)3
PSY 576	Situation Awareness	(3-0)3
PSY 662	Advanced Issues in Organizational Safety Culture and Climate	(3-0)3
PSY 519	Human Factors and Performance	(3-0)3

DESCRIPTION OF COURSES

OHS 500 M.S. Thesis NC
Program of research leading to M.S. degree, arranged between the student a faculty member. Students register to this course in all semesters starting from the appointment of the supervisor.

OHS 501 Introduction to Occupational ……..Health and Safety (3-0)3
Recognition, evaluation and control of work related health hazards (chemical, physical, psychosocial and ergonomic), principal groups at risk, assessment of occupational health and safety directives, legislations, standards, prevention of diseases, protection of workers' health, performance, comfort and well being and early diagnosis of work related disorders and diseases, counter measures, evaluation algorithms of the impact of measures at the workplace, workplace specific human-response models, workplace health promotion activities, rating of industrial noise and vibration affecting residential areas.

OHS 502 Industrial Hygiene (3-0)3
The recognition, evaluation and control of occupational health hazards. Chemical, physical and biological hazards in work place, their emission, contamination, recognition, standards and control.

OHS 503 Risk Management in Occupational Health and Safety (3-0)3
Assessing and controlling risks and developing solutions to OHS hazards, hazard communication at workplace; risk management process: identification, basic risk assessment methods, handling and monitoring risks; principals for eliminating or reducing risks.

OHS 504 Workplace Accident Investigation and Prevention (3-0)3

History of accident investigation and prevention, importance of accident investigation and prevention, data gathering for accident investigation and reporting, accident investigation tools, principles of accident preventions, corrective actions, role of management on accident prevention.

OHS 505 Emergency Management (3-0)3
History and overview of emergency management, mitigation, preparedness, communications, response, recovery; mitigation tools, hazard identification, impediments to mitigation; GIS in emergency management; legal issues of emergency management.

OHS 507 Occupational Ergonomics (3-0)3
Principal of ergonomics, worker-workplace interactions, occupational factors affecting the worker, shift work, workplace hazards, occupational risk factors for musculoskeletal system and disorders, work physiology, lifting, workplace design, ergonomic guidelines for sedentary and standing tasks, effect of thermal factors, noise, vibration and illumination, ergonomic assessment of the workplace.

OHS 508 Occupational Health and Safety Economics (3-0)3
Health systems of different countries, economical aspects of Occupational Health and Safety, OHS systems, insurance systems, health and safety risks for different sectors, cost analysis, cost of occupational health procedures, cost of accidents, cost of hospitalization, cost of returning job activities, compensations, work loss, designing safe work places, process choosing, cost of OHS training and education programs, effect of OHS on productivity, direct and indirect benefits of OHS.

OHS 509 Safety Training (3-0)3
Importance of health and safety training, human factors on health and safety practices, human error prevention techniques, methods to develop, execute, evaluate and execute the training programs.

OHS 510 Workers Health and its Promotion (3-0)3
Occupational diseases and work related diseases; respiratory diseases, cardiovascular diseases, hearing problems, ILO and other classifications of occupational diseases, the reasons, diagnosis, screen tests and methods, preventive actions, public policy and legislation.

OHS 511 Field Studies in Occupational …….. Health and Safety (3-0)3
Field studies in selected aerospace, chemical, petroleum and natural gas, metallurgical and materials engineering industries. Consideration of a

problem pertinent to the occupational health or safety issues of of those industries, analysis of the problem, provision of sound solutions, report writing in research format.

OHS 590 Seminar (NC)
Presentation of topics of general interest, research activities and recent development in related fields by graduate students, staff members and invited speakers.

OHS 599 Term Project (NC)
A research project on a selected topic in Occupational Health and Safety. The student is expected to write a comprehensive report covering the latest literature on the subject as well as findings of his/her research work.

OHS 7XX Special Topics (3-0)3
Courses not listed in the catalogue. Contents vary from year to year according to recent developments.

OHS 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

OPERATIONAL RESEARCH PROGRAM

PROFESSORS

AZİZOĞLU, Meral: B.S., M.S., Ph.D., METU.
ÇİLİNGİR, Canan: B.S., M.S., METU; M.S., Loughborough University; Ph.D., Ege University.
KIRCA, Ömer: B.S., M.S., METU; Ph.D., Georgia Institute of Technology.
KÖKSAL, Gülser: B.S., M.S. METU; Ph.D., North Carolina State University.
KÖKSALAN, Murat: B.S., M.S., METU; Ph.D., State University of New York at Buffalo.
SERİN, Yasemin: B.S., M.S., METU; Ph.D., University of North Carolina at Chapel Hill.
SÜRAL, Haldun: B.S., M.S., Ph.D., METU.
ÖZDEMİREL, Nur Evin: B.S., M.S., METU; Ph.D., Arizona State University.

ASSOCIATE PROFESSORS

AVŞAR, Z. Müge: B.S., M.S., METU; Ph.D., Rutgers University.
BAKAL, İsmail Serdar: B.S., M.S., METU; Ph.D., University of Florida.
BAYINDIR, Pelin ***(Department Chair)***: B.S., M.S., Ph.D., METU.
DURAN, Serhan: B.S., METU; M.S., Ph.D., Georgia Institute of Technology.
GÜREL, Sinan: B.S., M.S., Ph.D., Bilkent University.
KARASAKAL, Esra: B.S., METU; M.S., Lancaster University; Ph.D., METU.
MERAL, Sedef: B.S., M.S., Ph.D., METU.
SAVAŞANERİL, Seçil: B.S., METU; M.S., Ph.D., Georgia Institute of Technology.
SEPİL, Canan: B.S., M.S., METU; Ph.D., University of Florida.

ASSISTANT PROFESSORS

BATUN, Sakine: B.S., M.S., METU; Ph.D., University of Pittsburgh.
İYİGÜN, Cem: B.S., METU; M.S., Ph.D., Rutgers University.
KARAER, Özgen: B.S., METU; M.S., Ph.D., Stanford University.
TURAL, Mustafa Kemal: B.S., Boğaziçi University; Ph.D., University of North Carolina at Chapel Hill.

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: The purpose of the Operational Research Programs is to train OR scientists skilled in the theory and practice of solving problems arising in the context of functional systems, i.e. in systems designed, constructed and operated for the purpose of fulfilling human needs and objectives. Hence, OR scientists are expected to develop models and techniques for deriving optimal solutions and to take part in solving practical problems of designing and operating systems. They are expected to contribute to planning and decision making in such institutions as planning agencies, public enterprises, military and other governmental organizations, and private industry.

At the present the department coexists and shares most of its faculty with the Department of Industrial Engineering. Students and faculty members are encouraged to take part in applied research on practical problems as well as in theoretical research.

MAJOR GRADUATE LEVEL RESEARCH ACTIVITIES: Recent research include;
- deterministic and stochastic optimization,
- multi-objective optimization,
- route planning,
- data mining,
- energy planning,
- financial planning.

GRADUATE RESEARCH LABORATORIES: The department has several powerful personal computers interconnected to the University computer system. A state of the art collection of systems and scientific applications software is available.

CAREER OPPORTUNITIES: The graduates of the programs are employed in almost all sectors of industry and in government and public agencies.

GRADUATE CURRICULUM

M.S. in Operational Research

Acceptance to the program requires a sufficient background in calculus, linear algebra, probability theory and operational research. Applicants should also satisfy any requirements that may be stipulated by the Graduate School. Qualified students without the necessary background may be accepted to the program, but they will be required to enroll in a deficiency program of undergraduate courses.

Students accepted to the M.S. program are expected to register for at least seven graduate courses in addition to the Seminar and the M.S. thesis. The following courses are required:

OR	500	M.S. Thesis	NC
OR	501	Linear Optimization Methods*	(3-0)3
OR	518	Stochastic Processes in Decision Models**	(3-0)3
OR	590	Seminar***	(0-2)NC
5 elective courses			

Total minimum credit: 21
Number of courses with credit (min): 7

*or IE 553 Linear Optimization
**or IE 562 Stochastic Processes in Decision Models I
*** or IE 590 Seminar

Ph.D. in Operational Research

If admitted by M.S. degree

Normally, qualified students with an M.S. degree in O.R. are accepted to this program. Students with M.S. degrees in other disciplines may also apply, but they must be prepared to carry out additional course work as required by the Department.

Students accepted to the Ph.D. program are expected to complete a total of 8 courses; or equivalently, a total of 15 courses counting also the 7 M.S. courses. The following are required for the Ph.D. program:

OR	502	Discrete Optimization Methods*	(3-0)3
OR	503	Nonlinear Optimization Methods**	(3-0)3
OR	600	Ph.D. Thesis	NC
OR	690	Research Topics in OR***	(3-0)3
5 elective courses***			

Total minimum credit: 24
Number of courses with credit (min): 8

*or IE 554 Discrete Optimization
**or IE 555 Nonlinear Optimization
*** or IE 690 Research Topics in IE or equivalent

If admitted by B.S. degree

OR	501	Linear Optimization*	(3-0)3
OR	502	Discrete Optimization*	(3-0)3
OR	503	Nonlinear Optimization*	(3-0)3
OR	518	Stochastic Processes in Decision Models*	(3-0)3
OR	590	Seminar*	(0-2)NC
OR	600	Ph.D. Thesis*	NC
OR	690	Research Topics in OR*	(3-0)3
10 elective courses			

Total minimum credit: 45
Number of courses with credit (min): 15

* OR 501 or IE 553; OR 502 or IE 554; OR 503 or IE 555; OR 518 or IE 562; OR 590 or IE 590; OR 690 or IE 690 or equivalent

GRADUATE COURSES

OR 500 M.S. Thesis NC
OR 501 Linear Optimization Methods (3-0)3
OR 502 Discrete Optimization Methods (3-0)3
OR 503 Nonlinear Optimization Methods (3-0)3
OR 504 Large Scale Optimization (3-0)3
OR 505 Economic Modeling for OR (3-0)3
OR 506 Methodology of Operational Research (3-0)3
OR 507-9 Models and Techniques of Operational Research I-II-III (3-0)3
OR 512 Graph Theory Applications in OR (3-0)3
OR 513 Studies in National Planning I (3-0)3
OR 514 Studies in National Planning II (3-0)3
OR 518 Stochastic Processes in Decision Models (3-0)3
OR 519 Mathematics for OR (3-0)3
OR 520 Dynamic Decision Models (3-0)3
OR 521 Economic Assessment of Investment Projects (3-0)3
OR 590 Seminar (0-2)NC
OR 600 Ph.D. Thesis NC
OR 603 Queuing Theory (3-0)3
OR 604 Theory of Functional Systems (3-0)3
OR 605 Modeling in Operational Research (3-0)3
OR 606 OR in Investment Decision Making (3-0)3
OR 607 Game Theory and Competitive Strategies (3-0)3
OR 608 OR in Energy Planning (3-0)3
OR 609 Group Research in OR (3-0)3
OR 610 Seminar on Computable General Equilibrium Models (3-0)3
OR 612 Control Theory in Operational Research (3-0)3
OR 613 OR in Transportation Systems (3-0)3
OR 614 OR in Water Resources Systems (3-0)3
OR 690 Research Topics in OR (3-0)3
OR 7XX Special Topics in Operational Research (3-0)3
OR 8XX Special Studies (4-2)NC
OR 9XX Advanced Studies (4-0)NC

DESCRIPTION OF COURSES

OR 500 M.S. Thesis NC
Program research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester.

OR 501 Linear Optimization Methods (3-0)3
Linear programming in matrix form. The revised, dual, and primal-dual simplex methods. The simplex method for bounded variables; duality and sensitivity analysis. The transportation and assignment algorithms. Basic concepts of decomposition.

OR 502 Discrete Optimization Methods (3-0)3
The linear minimal cost flow problem and its solution by the network simplex algorithm. Maximal flow, shortest route and circulation problems. The integer programming problem and its solution by branch and bound and decomposition methods. Lagrangean relaxation.

OR 503 Nonlinear Optimization Methods (3-0)3

Review of convex sets and functions. Local and global optima. Basic methods of unconstrained optimization. Kuhn-Tucker theory and methods of constrained optimization.

OR 504 Large Scale Optimization (3-0)3

Fundamental concepts in large-scale mathematical programming. Decomposition and direct methods. Algorithms for solving various classes of large scale optimization problems.

Prerequisite: OR 501 or consent of department.

OR 505 Economic Modeling for OR (3-0)3

A survey of mathematical models of consumption, production and market structures from an OR perspective. Intertemporal resource allocation. Concepts of partial and general equilibrium and modeling issues.

OR 506 Methodology of Operational Research (3-0)3

Introduction to the meaning of science and the distinction between pure and applied, natural and social sciences; characterization of Operational Research as a discipline of inquiry and as a profession. Problem solving and research; concepts and meaning of problem, model and optimal

solution; various forms of defining and measurement. Critical issues of inquiry and implementation of research results.

OR 507-9 Models and Techniques of Operational Research I-II-III (3-0)3

The meaning of decision models and the methodology of their construction. Mathematical models used in solving allocation; network flows and scheduling; investment; maintenance, replacement and reliability; queuing and competitive decision problems; game and decision theory; techniques of deriving solutions from such decision models as linear, nonlinear, integer and dynamic programming and simulation.

OR 512 Graph Theory Applications in OR (3-0)3

Fundamentals of Graph Theory. Networks, shortest path and maximal flow minimal cost problems and solution techniques. Generalized scheduling and solution techniques. CPM, PERT and other techniques, sequencing and job-shop scheduling.

OR 513 Studies in National Planning I (3-0)3

Quantitative planning of national economic policy. Study of the mathematical structure of macroeconomic equation systems. Review of short-term forecasting and policy models. Alternative approaches to medium-term planning. Frame of a development plan.

OR 514 Studies in National Planning II (3-0)3

Continuation of OR 513; elaboration of consistency and efficiency questions in multisectoral planning models; treatment of price-responsive features in input-output frameworks; programming models for sectoral capacity expansions; macroeconomic-efficiency aspects of investment projects.

OR 518 Stochastic Processes in Decision Models (3-0)3

Probability spaces and stochastic processes. Markov chains with discrete and continuous parameter spaces; characterization and limiting behaviour. Birth and death processes and their application to queuing theory. More general queues and the use of embedded Markov chains.

OR 519 Mathematics for OR (3-0)3

Vector and matrix spaces, linear transformations and solution of linear equations. Change of basis. Eigenvectors and diagonalization by similarity transformations. Topological concepts. Sequences of functions, continuity and existence of extrema; over compact sets. Directional derivatives and the gradient. Taylor's theorem and extrema; quadratic forms. Convexity and its role in constrained optimization. Laplace and geometric transformations and their use in solving differential and difference equations.

OR 520 Dynamic Decision Models (3-0)3

Modeling and solution of decision making problems of dynamic nature. Finite and infinite horizons. Bellman's principle of optimality. Mitten's sufficiency conditions. Stochastic dynamic programming. Markovian decision processes. Policy iteration method of Howard.

OR 521 Economic Assessment of Investment Projects (3-0)3

The course provides a comprehensive understanding of the reasons for the need for project evaluation and the underlying concepts and methodological issues inherent in social cost benefit analysis as applied in developing countries. The course will include detailed discussion of the shadow prices and a number of case studies will be analyzed to

illustrate the application of the general rules of calculating costs and benefits.

OR 590 Seminar (0-2)NC
This seminar is designed to promote research interest in various areas of IE. Masters students must register and fulfill departmental requirements of the seminar.

OR 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from their third semester while the research program of write-up of thesis is in progress.

OR 603 Queuing Theory (3-0)3
The analysis of functional systems having variability in arrivals and services; approaches by Kolmogorov equations, imbedded Markov processes, difference, differential equations. Decision models and solution techniques.
Prerequisite: OR 518 or consent of department.

OR 604 Theory of Functional Systems (3-0)3
Concepts and approaches of General System Theory, basic concepts of structure and function; natural mechanical systems and functions; classification of functional systems and characterization of goal seeking and purposeful systems; behaviour of functional systems.
Prerequisite: OR 506 or consent of department.

OR 605 Modeling in Operational Research (3-0)3
Decision Making in System Context. The concept and classification of Decision Models. Definition and classification of variables. Empirical/logical scientific processes for modeling. Treatment of continuous and discrete decision variables. Treatment of the effects of random variables by the theories of statistics and stochastic processes. Models with strong and weak control.

OR 606 OR in Investment Decision Making (3-0)3
The meaning and types of investment for systems producing products and providing services. Classification of investment decision problems and the mathematical models for their solutions. Deterministic, stochastic, sequential and dynamic investment decision models. Various value and types of risk taking as the fundamental dimension of some investment decision models. Various value measures for evaluating investment alternatives and types of risk taking as the fundamental dimension of some investment decision.

OR 607 Game Theory and Competitive Strategies (3-0)3
Social behaviour viewed as a competitive behaviour and the Von Neumann Morgenstern theory for its study. Human value and its measurements. Games in extensive form. Zero and Non-Zero sum games. Cooperative and noncooperative games. Games played against randomly behaving ignorant players and competitive bidding problems and mathematical models for their solutions.

OR 608 OR in Energy Planning (3-0)3
National energy accounts and balances in an input-output framework. Energy sector supply models and electric power system planning. Partial equilibrium energy models. Specific models from the literature will be studied and presented by students for class discussion.
Prerequisites: OR 501, OR 503 and OR 505 or consent of department.

OR 609 Group Research in OR (3-0)3
Participation as a team member in an actual operational research project.

OR 610 Seminar on Computable General Equilibrium Models (3-0)3
Review of the salient features of empirically based computable general equilibrium models and their use in the economy-wide planning process; simulation exercises with numerical framework.
Prerequisite: OR 514

OR 612 Control Theory in Operational Research (3-0)3
This course is designed to introduce the use of feedback and optimal control theory in the analysis and design of Production-Inventory Control Systems. The modeling aspects and several applications are discussed.

OR 613 OR in Transportation Systems (3-0)3
Mathematical models for forecasting travel demand. Determination of equilibrium network flows. Evaluation of alternative systems. Optimization of transportation networks. Transportation operations analysis including routing, scheduling and fleet management in different transportation models.

OR 614 OR in Water Resources Systems (3-0)3
The structure and characteristics of water resources systems, mathematical programming models for solving design, expansion and operational problems of the system studied.

OR 690 Research Topics in OR (3-0)3

This seminar is designed to promote research interest in various topics of O.R. Various references and state-of-the-art papers are discussed related to the topics selected.

OR 7XX Special Topics in Operational Research (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students are instructors in charge.

OR 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member normally his/her advisor.

OR 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. Student choose and study advanced topics under the guidance of a faculty member normally his/her supervisor

POLYMER SCIENCE AND TECHNOLOGY PROGRAM

PROFESSORS

BAYRAMLI, Erdal: B.S., M.S., METU; Ph.D., Mc Gill University.
BAYRAM,Göknur: B.S., M.S., Ph.D., METU.
HACALOĞLU, Jale: B.S., M.S., Ph.D., METU.
HASIRCI, Nesrin: B.S., M.S., Ph.D., METU.
HASIRCI, Vasıf: B.S., M.S., METU; Ph.D., University of Reading.
KAYNAK, Cevdet : B.S., M.S., Ph.D., METU.
ÖNAL, Ahmet M.: B.S., M.S., Ph. D., METU.
ÖZKAN, Necati: B.S., İTÜ; M.S.,Stanford University; Ph.D., Imperial College.
ÖZTÜRK, Tayfur: B.S., İTÜ; Ph.D., Cambridge University.
PARNAS, K. Levend: B.S., M.S., METU; Ph.D., Georgia Institute of Technology.
TİNÇER, Teoman (***Department Chair)***: B.S., M.S., Ph.D., METU.
TOPPARE, Levent: B.S., M.S., Ph.D., METU.
YILMAZ, Levent: B.S., M.S., METU; Ph.D. University of Illiois at Urbana Champaign.
YILMAZER, Ülkü: B.S., METU; M.S., Stevens Institute of Technology; Ph.D., The University of Iowa.

ASSISTANT PROFESSORS

GÖKTEPE EREL, İrem :B.S,ITU; Ph.D.Stevens Instıtute of Technology
AKDAĞ, Akın: B.S., M.S. METU; PhD Auburn University
BAT, Erhan: B.S., M.S. METU; PhD University of Twente

GENERAL INFORMATION: Polymer Science and Technology is an interdisciplinary program leading to M.S. and Ph.D. degrees. The main purpose of this program is to give graduate level education and research in both polymer science and in its technology. The program at METU has been developed to meet the growing need in Turkey and in its neighborhood for graduate training in polymer science and technology. The polymer field is the largest single area in chemical science and technology. The growth rate of the plastics field exceeds that of all other industries by a factor of three to four, as statistics show, which increases the need for trained personnel and there is a nationwide shortage of trained personnel in this field in Turkey. The program is unique and the first one in Turkey.

Because of its character, the program is interdisciplinary and it is administered jointly by various departments of Faculties of Arts and Sciences, Engineering and Education.

Major graduate level research activities include mechanical, thermal, flammability, electrical, optical, biomedical properties of polymers, polymer composites, and nanocomposites.

The program is so designed that the students with different backgrounds will learn the essentials of the field and do research accordingly.

GRADUATE CURRICULUM

M.S. in Polymer Science and Technology

PST	500	M.S. Thesis	NC
PST	502	Polymer Science and Technology Laboratory	(1-4)3
PST	504	Advanced Structure & Property Relationships in Polymers	(3-0)3
PST	506	Polymer Processing	(3-0)3
PST	597	Seminar	(0-2)NC
PST	598	Seminar	(0-2)NC

4 elective courses*
Total minimum credit : 21
Number of Courses with credit (min) : 7

*one of which is ES 511 for non-engineering graduates
*one of which is PST 501 if CHEM 455 or CHEM 456 not previously taken

Ph.D. in Polymer Science and Technology:

If admitted by M.S. degree:

CHE	550	Chemical Engineering Mathematics*	(3-0)3	or equivalent
PST	600	Ph.D. Thesis	NC	
PST	697	Seminar	(0-2)NC	
PST	698	Seminar	(0-2)NC	

6 elective courses**

Total minimum credit : 21
Number of Courses with credit (min) : 7

*CHE 551, ES 501, ES 502, ES 508, METE 503
** one of which is ES 511 for non-engineering graduates

If admitted by B.S. degree:

PST	502	Polymer Science and Technology Laboratory	(3-0)3	
PST	504	Advanced Structure & Property Relationships in Polymers	(3-0)3	
PST	506	Polymer Processing	(3-0)3	
CHE	550	Chemical Engineering Mathematics*	(3-0)3	or equivalent
PST	600	Ph.D. Thesis	NC	
PST	697	Seminar	(0-2)NC	
PST	698	Seminar	(0-2)NC	

10 elective courses**

Total minimum credit : 42
Number of Courses with credit (min) : 14

* CHE 551, ES 501, ES 502, ES 508, METE 503
**one of which is ES 511 for non-engineering graduates
**one of which is PST 501 if CHEM 455 or CHEM 456 not previously taken

GRADUATE COURSES

PST	500	M.S. Thesis	NC
PST	501	Polymer Chemistry	(3-0)3
PST	502	Polymer Science and Technology Laboratory	(3-0)3
PST	503	Polymer Physics	(3-0)3
PST	504	Advanced Structure and Property Relationships in Polymers	(3-0)3
PST	505	Transport Processes in Macromolecular Media	(3-0)3
PST	506	Polymer Processing	(3-0)3
PST	507	Polymer Composites, Blends and Additives	(3-0)3
PST	597	Seminar	(0-2)NC
PST	598	Seminar	(0-2)NC
PST	600	Ph.D. Thesis	NC
PST	697	Seminar	(0-2)NC
PST	698	Seminar	(0-2)NC
PST	7XX	Special Topics in Polymer Science and Technology	(3-0)3
PST	8XX	Special Studies	(4-2)NC
PST	9XX	Advanced Studies	(4-0)NC

DESCRIPTION OF COURSES

PST 500 M.S. Thesis NC
Program of research leading to M.Sc. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress. (F&S)

PST 501 Polymer Chemistry (3-0)3
Polymerization and Copolymerization. Characterization of Polymers. Bulk and solution properties of polymers. Manufacturing methods, properties and uses of commodity plastics, elastomers and fibers. Some specialty polymers and their uses. (F)

PST 502 Polymer Science and Technology Laboratory (3-0)3
Experiments on the synthesis, Characterization of polymers. Polymer compounding and processing. Project studies. (S)

PST 503 Polymer Physics (3-0)3
Single chain conformation, polymer melts, solution, gelation, segregation. Dynamics of chains, entanglement effects. Self-consistent field and random phase approximation. Renormalization group and fractal concepts. (R)

PST 504 Advanced Structure and Property Relationships in Polymers (3-0)3
Chemical and physical structure of polymers, main physical and physico-chemical properties of polymers and their relation to structure, morphology-property relationships for homopolymers, heterogeneous and composite systems, kinetics of crystallization, mechanical and transport properties of polymeric materials with industrial applications. (S).

PST 505 Transport Processes in Macromolecular Media (3-0)3
Vector-tensor algebra. Shell balances for momentum, energy and mass transport. Polymer melt rheology. Non-Newtonian and viscoelastic flows of polymeric materials. Heat transfer and diffusion in macromolecular media. Development of velocity, temperature and concentration profiles in macromolecular media. (R)

PST 506 Polymer Processing (3-0)3
Design criteria of plastics processing equipment, dies, molds and plasticating screws. Modelling and analysis of particulate solids handling, change of state and melt pumping. Polymer melt flow in channels and cavities. Extrusion, injection molding, blow molding calendering, thermoforming, composites processing and secondary operations, welding, adhesion, fastening, decoration and machining of plastics. (R)

PST 507 Polymer Composites, Blends and Additives (3-0)3
Composites with continuous and discontinuous reinforcement. Theories of reinforcement. Rheological and mechanical properties. Methods of blending blends. Structure-property relations in blends. The role of additives in plastics processing and plastic products. Modifiers for processing, mechanical, optical, surface and aging characteristics. (R)

PST 597 Seminar in Polymer Science and Technology (0-2)NC
This seminar consists of meetings among the department staff, invited guests and graduate students to discuss recent developments in Polymer Science and Technology. Each M.Sc. student is requested to prepare a seminar covering the literature survey completed and a brief outline of the research planned. (F&S)

PST 598 Seminar in Polymer Science and Technology (0-2)NC
This seminar consists of meetings among the department staff, invited guests and graduate students to discuss recent developments in polymer Science and Technology. Each MSc student is requested to prepare a seminar preferably before the final stage of writing, covering the research results collected. (F&S)

PST 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress (F&S)

PST 697 Seminar in Polymer Science and Technology (0-2)NC
This seminar consists of meetings among the department staff, invited guests and graduate students to discuss recent developments in Polymer Science and Technology. Each Ph.D student is requested to prepare a seminar covering the literature survey completed and a brief outline of the research planned. (F&S).

PST 698 Seminar in Polymer Science and Technology (0-2)NC

This seminar consists of meetings among the department staff, invited guests and graduate students to discuss recent developments in Polymer Science and Technology. Each Ph.D. student is requested to prepare a seminar preferably before the final stage of writing, covering the research results collected. (F&S)

PST 7XX Special Topics in Polymer Science and Technology (3-0)3

Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge.

PST 8XX Special Studies (4-2)NC

M.S. student chooses and studies a topic under the guidance of a faculty member, normally his/her advisor.

PST 9XX Advanced Studies (4-0)NC

Graduate students as a group choose and study an advanced topic under the guidance of a faculty member, normally the advisor of the students.

GRADUATE SCHOOL OF SOCIAL SCIENCES

Director : ALTUNIŞIK, Meliha; B.A., Ankara University; M.S., METU; Ph.D., Boston University.
Associate Director: KONDAKÇI, Yaşar; B.A., M.S., METU; Ph.D., Ghent University.
Associate Director: ERGUN, Ayça; B.A., Ankara University; M.A., Ph.D., University of Essex.

GENERAL INFORMATION: The Graduate School of Social Sciences organizes and carries out programs, conducts research and offers degrees at graduate level in the following fields:

Programs	**Degree**
Business Administration	M.B.A. (1, 2) /Ph.D.
Executive M.B.A	M.B.A.. (3)
Economics	M.S. (1, 2)/Ph.D.
Educational Sciences	M.S. (1)/Ph.D.
Human Resources Development in Education	M.A.(3)
Educational Administration and Planning	M.S. (1)/Ph.D.
Curriculum and Instruction	M.S. (1)/Ph.D.
Guidance and Psychological Counseling	M.S. (1)/Ph.D.
English Language Teaching	M.A.(1)/Ph.D.
Elementary Education	Ph.D.
Early Childhood Education	M.S.(1)
Elementary Science and Mathematics Education	M.S.(1)
English Literature	M.A.(1)/Ph.D.
History	M.A.(1)/Ph.D.
History of Architecture	M.A.(1)/ Ph.D
International Relations	M.S.(1, 3)/Ph.D.
Philosophy	M.A.(1)/Ph.D.
Physical Education and Sports	M.S.(1)/ Ph.D
Psychology	M.S.(1)/Ph.D.
Clinical Psychology	M.S.(1)/Ph.D.
Family Psychology	M.S,(3)
Social Psychology	M.S.(1)/Ph.D.
Traffic Psychology	M.S.(1,2)
Developmental Psychology	M.S. (1) /Ph.D.
Industrial and Organizational Psychology	M.S.(1,2) /Ph.D.
Political Science and Public Administration	M.S.(1, 2)/Ph.D.
Sociology	M.S.(1, 2)/Ph.D.
Interdisciplinary Programs	
Asian Studies	M.A. (2)
Area Studies	Ph.D.
Eurasian Studies	M.A.(1, 2)
European Integration	M.S.(3)
European Studies	M.S.(1, 2)
Gender and Women's Studies	M.S.(1, 2)
German-Turkish Master's Program in Social Sciences	M.A.(2)
Latin and North American Studies	M.S.(1,2)
Media and Cultural Studies	M.S.(1, 2,3)
Middle East Studies	M.S.(1, 2)
Science and Technology Policy Studies	M.S.(1, 2)/Ph.D.
Settlement Archaeology	M.A.(1)/Ph.D.
Social Policy	M.S.(1, 2)
Urban Policy Planning and Studies in Local Governments	M.S.(1, 2)/Ph.D.

(1) With thesis (2) Without thesis (3) Evening program without thesis

AREA STUDIES PROGRAM

PROFESSORS

ALTUNIŞIK, Meliha ***(Director of the Graduate School of Social Sciences)***: B.A., Ankara University; M.A., METU; Ph.D., Boston University
AYATA, Ayşe: B.S., METU; M.S., Ph.D., University of Kent at Canterbury
BAĞCI, Hüseyin: B.A., M.A., Ph.D., Bonn University
BOZTEMUR, Recep: B.A., Ankara University; M.S., METU; Ph.D., University of Utah
ERALP, Atila: B.A., METU; M.A., Ph.D., University of Southern California
ÖZVEREN, Eyüp: B.S., METU; M.A., Ph.D., State University of New York at Binghamton
TANRISEVER, Oktay F. ***(Department Chair)***: B.A., M.S., METU; Ph.D., University of London
TOKLUOĞLU, Ceylan: B.S., M.S., METU; Ph.D., Carleton University
YURDUSEV, Nuri: B.S., M.S., METU; Ph.D., University of Leicester

ASSOCIATE PROFESSORS

AKÇALI, Pınar: B.S., M.S., METU; Ph.D., Miami University
AYDINGÜN, Ayşegül: B.A., METU; M.A., Bilkent University; Ph.D., METU
ERGUN, Ayça ***(Associate Director of the Graduate School of Social Sciences)***: B.A., Ankara University; M.A., METU; Ph.D., University of Essex
ERTUĞRUL, Kürşad: B.S., METU; M.A., Leeds University; Ph.D., METU
TÜR, Özlem: B.S., M.S., METU; Ph.D., University of Durham
YALMAN, Galip: B.S., METU; M.A., Southampton University; Ph.D., Manchester University

ASSISTANT PROFESSORS

BEŞPINAR, Fatma Umut: B.A., M.A., METU; Ph.D., University of Texas at Austin
ERGENÇ, Ceren: B.S., M.S. METU; Ph.D. Boston University
KUŞÇU, Işık: B.S., Hacettepe University; M.S., Ph.D., Indiana University-Bloomington
TOPAL, Aylin: B.S., METU; M.S., Bilkent University; Ph.D., New School for Social Research

OBJECTIVES OF THE PROGRAM: The PhD Program in Area Studies seeks to enhance the academic studies on the major regions of the rapidly changing world in terms of international relations, economics, politics, culture and history. It also aims at explaining the dynamics of change in different regions and their relations with each other from an interdisciplinary perspective. Another objective of this program is to develop new approaches and perspectives on Turkey's multi-dimensional relations with various regions around the world.

The program also intends to improve the quality of research on historical, socio-cultural, economic and political characteristics of major areas in the world. It is hoped that the Program will contribute to the academic world as well as the policy-making communities in the areas of foreign policy, business, technology, culture, the mass-media, and civil society. The program seeks to contribute to the development of these areas constructively.

ADMISSION: The PhD Program in Area Studies is open to candidates with a master's degree in any field of study due to the interdisciplinary nature of the program. The applicants with the required academic qualifications and language skills take an oral exam to be accepted to the program.

Admission requirements:

- M.A./M.S. degree (or awaiting graduation from a M.A./M.S. program)
- C.GPA ≥ 3,00/4,00 (≥ 80/100)
- ALES Eşit Ağırlık ≥ 60 / GRE Quantitative ≥ 648
- METU English Proficiency Exam (EPE) ≥ 70 / TOEFL IBT ≥ 86 / IELTS ≥ 7.0

Application documents:

- Official transcripts that include all undergraduate and graduate records
- Letter of intention
- Two letters of Reference
- Graduate Exam Scores (ALES Eşit Ağırlık / GRE Quantitative)
- English Proficiency Exam Scores (METU English Proficiency Exam / TOEFL IBT / IELTS)

DEGREE REQUIREMENTS

Students must take at least 7 courses (not less than 21 credit hours), pass the PhD comprehensive exam, and defend a PhD thesis to successfully complete the program. Students who successfully complete the requirements of the program are awarded with the PhD Degree in Area Studies.

COURSES

Students have to pass at least 7 courses to complete the program:

2 Must courses
3 Elective courses on a region (Asia, Eurasia, Europe, Latin and North America, or the Middle East)
2 Elective courses on a Social Science Discipline (Business Administration, Economics, History, International Relations, Political Science, Philosophy, Psychology, or Sociology)

DESCRIPTION OF MUST COURSES

ARS 601 Area Studies (3-0)3
This PhD course is designed to introduce the key themes in Area Studies as well as a variety of disciplinary theoretical approaches used to study areas in the world. The course will also explore how regional dynamics interact with local, national and global forces. The course will begin with a discussion of the scope, development and interdisciplinary nature of Area Studies. Next, the course will examine the relevance and limitations of the main disciplinary approaches that anthropology, history, sociology, economics, political science and international relations use in studying Areas. The final part of this course will be devoted to students' individual research projects on the key debates in African, the Middle Eastern, Asian, Eurasian, European and American Studies.

ARS 602 Designing Research in Area Studies (3-0)3
This course aims to provide the students a general assessment of qualitative research methods. It will present the students various qualitative methods involved in social scientific research as well as offer awareness as to how these methods are related to broader social scientific issues. By presenting a variety of methods, the course will encourage the students to reflect upon these methods and their appropriateness in different research contexts. It will proceed with assignments asking the students to analyze different methods used in the prominent works of area studies. It will also include assignments that will demand from the student a review of the use of several research methods for an original topic of their choosing. The course will hence encourage reflective thinking both on methodology in area studies as well as on the practice of some of the methods.

Elective Courses on a Region

Asia:

ASN 501 Asia in World Affairs
ASN 505 Contemporary China
ASN 521 Advanced Topics in Asia in World Affairs
ASN 530 State, Economy, And Politics In Post-Mao China
ASN 531 Society, Economy and Politics in Japan
ASN 540 China's Economic Development and the World
ASN 561 State, Society, and Culture in India
ASN 581 East Asian Security
ASN 591 History of Korea

Eurasia:

IR 605 Eurasia in World Affairs
ADM 6173 Readings on Central Asian Perspectives
IR 682 Regional Politics, Energy and Security in the Post-Soviet Space
EAS 501 Society and Culture in Eurasia
EAS 502 The Politics of State Building in Eurasia
EAS 509 Introduction to Post-Soviet Studies
EAS 513 State and Nation Building in South Caucasus
EAS 514 Political Economy of Post-Soviet Transition
IR 538 Transcaucasia and Central Asia in World Affairs
IR 564 Russia and the European State-System
SOC 515 State and Civil Society in Eurasia
SOC 529 Migration and Ethnicity in Eurasian Societies

Europe:

IR 604 Europe in World Affairs
IR 651 Euro-Mediterranean Relations
IR 654 Ethnicity, Nationality and European Identity
IR 667 Topics in European Integration
ADM 504 State and Society in Europe
ADM 511 Dynamics of Government in the European Union
ECON 528 European Economy, Integration and Turkey
EUS 501 Economics of European Integration
EUS 502 Politics of European Integration
EUS 503 Institutions and Law of the European Union
EUS 508 Development of European Identity and the European Union
EUS 511 Politics of Migration in Europe
EUS 516 Concepts and Issues in European Security
HIST 503 European and World History
IR 520 The New World Order and the European Security
IR 544 Politics in East-Central Europe
IR 555 European Regime of Human Rights
IR 558 The Making of European Security
IR 561 Enlargement and Integration in the European Union
IR 590 International Relations of the European Union

The Middle East:

IR 603 Middle East in World Affairs
IR 650 Politics and International Relations of the Middle East
HIST 513 Social and Economic History of the Middle East, 1800-1920
HIST 514 History of Middle Eastern Nation-States, 1920-1990
IR 536 Radical Politics in the Middle East
IR 578 Globalization and the Middle East
IR 584 The Politics of Arab-Israeli Relations
MES 501 History of the Modern the Middle East
SOC 530 Kinship, Tribe, Confederation and State Central Asia and Middle East
SOC 540 Class and Ethnic Relations in the Middle East
SOC 544 Anthropology of the Middle East
SOC 550 Middle East Women, Feminism and Oriental
MES 502 Contemporary Affairs in the Middle East
MES 507 Revolutions in the Middle East
MES 508 Modern Iran: Politics in the Twentieth Century
SOC 503 Problems in Studying Women in Muslim Societies
SOC 522 Sociology of the Middle East
SOC 527 Society and Culture in Iran

SOC 590 Nations and Nationalisms in the Modern Middle East

Latin and North America:

LNA 501 Latin America: Past, Present and Future Trends
LNA 502 North America: Past, Present and Future Trends
LNA 510 Turkish-American Relations
LNA 511 Current Issues and Future Prospects in American Foreign Policy
LNA 514 The Rise and Decline of U.S. Hegemony
LNA 521 Political Economy of NAFTA
LNA 513 Contemporary Issues in Latin American Politics
ADM 5159 Politics and Society in Latin America
IR 523 Issues in American Foreign Policy
IR 594 Immigration, Integration and Transnationalism in North America

Elective Courses on a Social Science Discipline

Business Administration:

BA 6401 Accounting Theory
BA 6402 Topics in Accounting Research I
BA 6403 Topics in Accounting Research II
BA 6404 Topics in Accounting and Finance Research
BA 6801 Theory of Finance
BA 6802 Topics in Finance Research I
BA 6803 Topics in Finance Research II
BA 6811 Microeconomic Theory for Business
BA 5401 Accounting
BA 5503 Management Science
BA 5505 Research Methods in Finance and Accounting
BA 5506 Quantitative Methods in Finance and Accounting
BA 5517 Decision Analysis: Tools and Methods
BA 5724 Advanced Marketing Research

Economics:

ECON 604 Topics in International Economics
ECON 623 Advanced Studies in Political Economy
ECON 624 Financial Economics I
ECON 625 International Economics I
ECON 630 Financial Theory and Corporate Policy
ECON 631 Monetary Theory
ECON 636 International Macroeconomics
ECON 501 Microeconomic Theory I
ECON 502 Macroeconomic Theory I
ECON 503 Microeconomic Theory II
ECON 504 Macroeconomic Theory II
ECON 514 Macroeconomic Theory and Policy

History:

HIST 640 Analysis of Historical Sources
HIST 641 Current Approaches in Historical Research
HIST 501 Historical Methodology I
HIST 502 Historical Methodology II
HIST 525 Approaches in History: Selected Studies
HIST 526 Comparative Studies in Historical Sources: Selected Works

International Relations:

IR 601 Advanced Topics in Theory and Methodology in International Relations
IR 602 History, Politics and International Relations
IR 503 Theories of International Relations
IR 542 British School of International Relations
IR 566 Theory and Event
IR 656 International Political Economy and Foreign Policy
IR 659 Post-Positivist Theories of International Relations
IR 552 International Political Economy

Political Science:

ADM 6150 Advanced Studies in Political Theory
ADM 6171 Post Modernism and Radical Democracy
ADM 6246 Current Issues in Public Administration Theory
ADM 6291 Advanced Policy Analysis
ADM 6136 Political Sociology
ADM 5144 Contemporary Theories of Political Science
ADM 5154 Theories of State
ADM 5224 Epistemology and Methodology in Social and Political Context
ADM 5238 Theory of Public Administration
ADM 5258 Advances in Organisational Theory

Philosophy:

PHIL 601 Special Issues in Epistemology I
PHIL 602 Special Issues in Epistemology II
PHIL 631 Axiomatization of Scientific Theories
PHIL 632 Dynamics of Scientific Theories
PHIL 651 Studies in Metaphilosophy
PHIL 653 Theories of Scientific Methodology
PHIL 655 Research Problems in Philosophy of

Science
PHIL 501 Research Methods
PHIL 510 Topics in Epistemology
PHIL 527 Philosophy in Science
PHIL 554 Scientific Concepts and Theories

Psychology:

PSY 620 Research Methods in Industrial and Organizational Psychology
PSY 654 Social Psychology Aspects of Legal Processes
PSY 500 Research Methods
PSY 554 Recent Advances and Problems in Social Psychology

Sociology:

SOC 631 Current Issues in Sociology and Social Theory
SOC 501 Sociological Theory I
SOC 502 Sociological Theory II
SOC 507 Research Methods I
SOC 508 Research Methods II
SOC 519 Feminist Methodology in Social Sciences
SOC 528 Post-Structuralism, Deconstruction and Feminist Theory
SOC 535 Contemporary Feminist Theory
SOC 561 Ideology and Discourse Analysis
SOC 580 Current Issues in Cultural Studies and Critical Theory
SOC 598 Debates in Society and Theory

ASIAN STUDIES PROGRAM

Department Chair: Assist. Prof. Dr. Ceren ERGENÇ: B.S., M.S., METU; Ph.D., Boston University.

PROFESSOR

WASTI PAMUKSUZ, Nazlı: B.S, METU; M.S., University of Missouri-Rolla; M.S., University of Michigan, Ph.D., University of Michigan.

ASSOCIATE PROFESSORS

SOYKUT, Mustafa: B.S., M.S., Bilkent University; Ph.D., Universitaet Hamburg.
JASSAL, Smita: B.A., M.A., Ph. D., Delhi University.

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The Asian Studies is an interdisciplinary non-thesis M.S. program designed to study the history and culture of Asian societies. Developing a Master's program on Asian Studies is crucial for several reasons. To begin with, more than half of the world population lives in the East and South Asian countries that hosted the most ancient civilizations in the world. East and South Asian regions, primarily China, Japan and India, have been developing very rapidly, and playing a distinct and important role in world economy and politics. Particularly, the East Asian countries have been increasing their dominance at the global level and presenting new experience and models to other regions in the world by improving their regional economic cooperation steadily. In addition, China becomes a dominant political actor in world politics and beyond that it plays a direct role on the future of Asian countries that came to the forefront with respect to primarily energy and security issues. Finally, the Association of South-East Asian Nations (ASEAN), which was developed via regional initiatives, is one of the most successful regional cooperation organizations in the world.

The interdisciplinary character of the Asian Studies Master's Program enables multilateral and diverse discussions by combining different experiences and points of view. Additionally, the Asian Studies Program works in coordination with the Confucius Institute established in Middle East Technical University (METU) to accumulate knowledge and expertise on the region.

ADMISSION REQUIREMENTS: The Asian Studies Program is open to students with an undergraduate degree in any field of study due to the interdisciplinary nature of the program. The applicants from humanities, social sciences and sciences have the same chance of admission. The graduates of history, sociology, international relations, and political sciences may not be required to take preparatory courses.

The Admission requirements of the Graduate School of Social Sciences are valid for the Asian Studies Program as well. The applicants with the required academic qualifications and necessary language skills may be taken to written and/or oral exams by the Search Committee. The application materials include:

- Bachelor's Degree and/or Diploma, and Official Transcripts
- Letter of intention
- Two letters of Reference
- Official Score of the Graduate Exam (ALES)
- Score of English Proficiency Exams (TOEFL, IELTS, METU EPE)

The program has only non-thesis option. The non-thesis option necessitates 10 courses (30 credit hours) and a non-credit term-project to be completed. The students are also required to take one of the languages of the region (to be registered as "NC") for at least two semesters.

In the program, the students who successfully complete the requirements are awarded with the M.S. Degree in Asian Studies.

M.S. in Asian Studies

Required Courses

ASN	501	Asia in world Affairs	(3-0)3

Elective Courses

ASN	502	The Asia Pacific Region in the Global World	(3-0)3
ASN	503	Economic and Social Development in East Asia	(3-0)3
ASN	504	Social Sciences and Area Studies	(3-0)3
ASN	505	Contemporary China	(3-0)3
ASN	506	Contemporary Southeast Asia: Issues, Development, and Evolution	(3-0)3
ASN	509	Contemporary Japanese: Socio-Cultural Case Studies	(3-0)3
ASN	510	Culture in the Korean Society	(3-0)3
ASN	511	Politics and Foreign Policy of China	(3-0)3
ASN	512	Korea in the World Economy II	(3-0)3
ASN	520	Korea in the World Economy	(3-0)3
ASN	521	Advanced Topics in Asia in World Affairs	(3-0)3
ASN	530	State, Economy, and Politics in Post-Mao China	(3-0)3
ASN	531	Society, Economy, and Politics in Japan	(3-0)3
ASN	540	China`s Economic Development and the World	(3-0)3
ASN	541	Society, Economy, and Politics in Korea	(3-0)3
ASN	561	State, Society, and Culture in India	(3-0)3
ASN	571	Demography, Development, and Planning in Modern Japan	(3-0)3
ASN	581	East Asian Security	(3-0)3
ASN	589	Term Project	(0-0)0
ASN	591	History of Korea	(3-0)3
ASN	551	Korean I	(3-0)3
ASN	552	Korean II	(3-0)3
ASN	553	Korean III	(3-0)3
HIST	476	Chinese History	(3-0)3
HIST	568	History of India	(3-0)3

DESCRIPTION OF COURSES

ASN 501 Asia in World Affairs (3-0)3
This course discusses the contemporary international relations of East and South Asia. First, the history of politics, and the repercussions of this history on contemporary political, economic and security relations of the region are discussed. Second, the course deals with the foreign policies of major Asian powers in the context of regional and global world politics by relying on major debates of International Relations theories. The major discussion subjects in the course are impact of the Cold War and its aftermath, the contention over regional identity, ASEAN, the domestic and regional instability, and international/regional conflict and cooperation in East and South Asia. The course is also analyze the place of Asia in the context prevailing energy policies executed worldwide today.

ASN 502 The Asia Pacific Region in theGlobal World(3-0)3
The course focuses on economic develpments especially in certain big Asian economies such as Japan, China, South Korea, India, Taiwan and Hong Kong. They are key participants in the global economy; so, their role and influence in global economy is deeply elaborated in the past and present. Through this elaboration, the course aims to identify not only the current trends and effects of these economies but also the similarities, differences, peculiarities and generalities among Asian economies themselves, and between Asian economies and the US and European economies. The main discussion themes of this course are early European imperialism, decolonization, and economic nationalism, Japanese experience in the post-WWII era, the miraculous growth of East Asia in the late 1990s, and “Asian Model”.

ASN 503 Economic and Social Development in East Asia (3-0)3
This course is designed to introduce to the students to the economic progress and cooperation in East Asia along with differences between the institutions, economic development policies, and economic histories of the economies in the region. A primary aim of the course is to introduce some basic facts and theories of economic and social development of the East Asian countries and to compare their

experience with development experiments of the other regions of the world.

ASN 504 Social Sciences and Area Studies (3-0)3
This course aims to provide the students a general assessment of research design within social sciences with a specific focus on area studies. It will present the students various qualitative methods and research designs involved in social scientific research as well as offer awareness as to how these methods relate the broader social scientific issues.

ASN 505 Contemporary China (3-0)3
This course provides students with a broad introduction to China's political, economic, and strategic development during the modern era. The discussion begins with a general introduction of Chinese pre-modern and modern history as the roots of contemporary developments and ends with China's contemporary rise and implications for the world. The course also touches upon the ways in which China is rising such as economy and societal change. The course is divided into four parts. Part I introduces the imperial and republican history of China. This part provides historical background for analyses of domestic and foreign policies in the People's Republic of China. Part II examines China's traditional economy and economic reform and openness since 1978. Part III discusses major issues in contemporary Chinese society. Part IV examines China's foreign relations. Finally, the course discusses "China's peaceful rise" and the U.S response to it.

ASN 506 Contemporary Southeast Asia: Issues, Development, and Evolution (3-0)3
This course focuses on a general appraisal of contemporary issues in South East Asia. Since South East Asia is only a sub-region, the issues will be evaluated within the general dynamics and understanding of the Asia-Pacific.

ASN 509 Contemporary Japanese: Socio-Cultural Case Studies (3-0)3
This is an independent study module that aims to enable students to gain a critical understanding of the socio-cultural process underpinning the emergence of Japan as a major global industrial power in the second half of the twentieth century, as well as an appreciation of the dynamics of contemporary twenty-first century Japanese society.

ASN 511 Politics and Foreign Policy of China (3-0)3
This course is intended to examine Chinese Foreign Policy in two different periods: Maoist China (1949-1989) and Post-Mao China (1989-). Within the first period, China's domestic politics and its international relations with the outside world is elaborated with specific references to the dynamics of the Chinese Communist Party (CCP) The second period is mostly characterized by the rise of Chinese economic and military power with its huge population, its emergence as not only Asian but also a global actor in contemporary international politics, Tiananmen demonstrations and the end of the Cold War. The main aim of this course is to understand the major problems, transitions and developers in China's foreign policy and international role in world politics, especially in relation to the US, India, Russia, Iran and European Union's foreign policies.

ASN 520 Korea in the World Economy (3-0)3
This is a course about the Korean economy. The research reports of this course cover topics on Korea`s historical economic development since the 1960s, and analyze the current issues and policies of the Korean economy. In addition, this course aims at providing students with many valuable lessons and insights about economic policies of the developing economies.

ASN 521 Advanced Topics in Asia in World Affairs (3-0)3
Vast economic, political and social changes in East and South Asia have brought about a new dynamism to the external relations of the region. East Asia has become and important center of interest for the international community. The rise of China and India, in addition to Japan, has generated a gradual shift in the world's economic and political power towards Asia. In short, the international political landscape has become not only more complicated but also more fluid. Thus, this course discusses the ongoing changes in the region and the regional countries as well as their implications in international relations. The course also focuses on the foreign policies of the major powers towards this region and deals with the new state of affairs in global politics.

ASN 530 State, Economy, And Politics In Post-Mao China (3-0)3
The purpose of this graduated course is to explore and analyze the fundamental transformation of China from 1970s to the present. The course will focuses on economic, politic and administrative policies which provided this transformation. As there is a strong link between global economic order and the rise of China, another aim is to examine international economic and politic factors which

have affected China´s transformation. The course will also discuss the present and future role of China in terms of current global economic crises and political circumstances.

ASN 531 Society, Economy, and Politics in Japan (3-0)3
This course aims to examine social and economic structures of Japanese Society. The course focuses on both the social characteristics on which Japanese Economy is based and the economic substructure that respectively shapes Japanese Society. In this respect, the roles of various social and economic agents, including the state, corporations, workers and consumers, are examined in their effect to manipulate the economic and social life in Japan. In addition, the place of Japanese Economy within the context of global economic processes is discussed, arguing that the social and economic dynamics in Japan must be understood within the large picture of globalization.

ASN 540 China`s Economic Development and the World (3-0)3
China has achieved rapid development and an average annual growth rate of 9.5 % since it started reforming its socialist economy in the 1979. This course is designed to give a basic overview of the Chinese economy to non-economist with a focus on the historical path, current challenges and China's role in the world economy.

ASN 541 Society, Economy, and Politics in Korea (3-0)3
The aim of this course is to examine political structures, social and cultural dynamics of South Korean Society. The course focuses on both the social and cultural characteristics on which South Korean Economy is based and the economic substructure that contributes to the (re)constitution of South Korean culture and politics. In this respect, the roles of various economic and political agents, including the state, corporations, workers and consumers, in shaping the economic life in South Korean are examined. Besides, the close links between South Korean Economy and Politics to global political economic processes are discussed, arguing that the social and political economic transformation in South Korea is to be understood within the large picture of globalization.

ASN 561 State, Society, and Culture in India (3-0)3
This course is designed to introduce students to significant social, political and cultural issues in India's recent history and through its emergence as a modern nation state. In the first half of the course, our broad aim will be to analyze what was at stake in formulations of 'tradition' and 'modernity.' The latter half of the course will examine how these formulations relate to contemporary issues and everyday life in South Asia. How concepts such as gender, caste, religion, and nation change over time, will be explored.

ASN 571 Demography, Development, And Planning in Modern Japan (3-0)3
The course will include the post-war period, i.e. periods after 1945. Comparisons between Japanese case and other developed countries; and most importantly comparisons between the Japanese and the Turkish cases will be other points which will be emphasized in this course.

ASN 551 Korean Culture and Language (3-0)3
The target of this course is to examine cultural structure of South Korean Society. The course focuses on both cultural and linguistic characteristics of South Korea. In this respect, the roles of various cultural agents, including citizens, organizations and the state are to be examined. The course will give a historical background with regard to Korean culture and language. It will also examine contemporary links and interactions between Korean culture and language. The course will end with the analysis of future trends in Korean culture and language by considering the effects of current social context on Korean culture and language.

ASN 589 East Asian Security (3-0)3
This course aims to provide the security structure of East Asia. East Asia consists of two main sub-regions, namely Northeast Asia and Southeast Asia. This course will examine historical background of the region, and the political and economic structure of East Asian countries. We will especially focus on regional/global powers of East Asia. Regional organizations such as ASEAN, APEC, and ASEM will also be subjects of this course.

ASN 591 History of Korea (3-0)3
Methodology of Korean history, communal society of prehistoric times, walled-down states and confederated kingdoms, aristocratic societies under monarchical rule, fashioning of an authoritarian monarchy, age of powerful gentry families, hereditary aristocratic order of Koryo, rule by the military, emergence of the literati, creation of a Yangban society, rise of the Neo-Confucian literati, emergence of landed farmers and wholesale merchants, instability in the Yangban status and the outbreak of popular uprising, growth of the forces of Enlightenment, nationalist stirring and imperialist aggression, development of the nationalist movement, beginnings of democracy.

EURASIAN STUDIES PROGRAM

PROFESSORS

ALTUNIŞIK, Meliha ***(Director of the Graduate School of Social Sciences)***: B.A., Ankara University; M.A., METU; Ph.D., Boston University.
AYATA, Ayşe,: B.S., METU; M.A., Ph.D., University of Kent
BÖLÜKBAŞI, Süha: B.A., Ankara University; M.A., Ph.D., University of Virginia.
TANRISEVER, Oktay., B.S., M.S., METU; Ph.D., University of London.

ASSOCIATE PROFESSORS

AKÇALI, Pınar : B.S., M.S., METU; Ph.D., Miami University. **(*Department Chair*)**
AYDINGÜN, Ayşegül: B.A., METU; M.A., Bilkent University; Ph.D., METU.
BEDİRHANOĞLU, Pınar: B.A., Ankara University; M.A.,University of Reading; Ph.D., University of Sussex.
ERGUN, Ayça ***(Associate Director of the Graduate School of Social Sciences)***: B.A., Ankara University; M.A., Ph.D., University of Essex
ŞEN, Mustafa: B.A., Ankara University; M.A., Ph.D., METU.
TOKLUOĞLU, Ceylan., B.A., M.A., METU; Ph.D., Carleton University.
YILDIRIM, Erdoğan: B.A., M.A., Ph.D., METU.

ASSISTANT PROFESSOR

KUŞÇU BONNENFANT, Işık., B.A Hacettepe M.A. METU, Ph.D., Indiana University,

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The main objectives of the Graduate Program in Eurasian studies are

a) to conduct academic research on various aspects of the Eurasian region
b) to train qualified personnel, who have an interdisciplinary grasp of the region and will take role in both public and private sectors.

ADMISSION REQUIREMENTS: Owing to the interdisciplinary nature of the program, applicants may come from a wide variety of backgrounds. However, the applicants who have not graduated from the related departments such as Sociology, International Relations, Economics, Political Science and Public Administration, may be required to take some courses to complete or strengthen their background. Applicants who demonstrate the necessary language competence and aptitude level as well as the specific requirements as evaluated by an academic committee, on a competitive basis are admitted to the program.

The Eurasian Studies Graduate Program offers both thesis and non-thesis alternatives. In the thesis program, the students are required to complete seven three-credit-courses and the prothesis seminar and to write a master's thesis. In the non-thesis program, the students are required to take ten three-credit-courses and complete a term-project.

Upon the successful completion of the requirements of either program a M.S. degree in Eurasian Studies will be awarded.

M.S. PROGRAM IN EURASIAN STUDIES (THESIS AND WITHOUT THESIS)

Required Courses

EAS	500	Prothesis Seminar	NC
EAS	502	The Politics of State-Building in Eurasia	(3-0)3
EAS	509	Introduction to Post-Soviet Studies	(3-0)3
EAS	589	Term Project (Non-Thesis)	NC
EAS	599	Master'sThesis	NC

Elective Courses

EAS	501	Society and Culture in Eurasia	(3-0)3
EAS	513	State and Nation-building in South Caucasus	(3-0)3
EAS	514	Political Economy of Post-Soviet State Transition	(3-0)3
EAS	515	Gender Question in the Soviet Union and Post-Soviet Space	(3-0)3
EAS	516	Language Policies in Late Imperial, Soviet and Post-Soviet Russia	(3-0)3
EAS	517	Energy Security in Global Political Economy	(3-0)3
ADM	4182	Current Issues in Central Asian Politics	(3-0)3
ADM	5142	Comparative Ethnicity	(3-0)3
ADM	6173	Readings on Central Asian Perspectives	(3-0)3
HIST	417	Russian History I	(3-0)3
HIST	418	Russian History II	(3-0)3
HIST	443	History of the USSR I	(3-0)3
HIST	546	Nationalism in the Balkans until The First World War	(3-0)3
HIST	640	Analysis of Historical Sources	(3-0)3
IR	444	Issues and Politics in Central Asia and Transcaucasia	(3-0)3
IR	463	Russian Foreign Policy	(3-0)3
IR	538	Transcaucasia and Central Asia in World Affairs	(3-0)3
IR	544	Politics in East-Central Europe	(3-0)3
IR	564	Russia and the European State System	(3-0)3
IR	605	Eurasia in World Affairs	(3-0)3
IR	682	Regional Politics, Energy and Security in the Post-soviet Space	(3-0)3
SOC	427	Social Analysis of Race, Ethnicity and Society	(3-0)3
SOC	515	State and Civil Society in Eurasia	(3-0)3
SOC	522	Sociology of the Middle East	(3-0)3
SOC	529	Migration and Ethnicity in Eurasian Societies	(3-0)3

DESCRIPTION OF COURSES

EAS 500 Prothesis Seminar NC
The objective of this seminar is to familiarize the students with the basic concepts, theories and approaches of the field of Eurasian Studies. The seminar attempts to assist students in discovering their specific areas of interest and to enrich their knowledge about Eurasia. In weekly seminars, conducted by scholars from different disciplines, students will be familiarized with different approaches on Eurasia. It is hoped that this will allow the students to discover their area of interest and meet the related faculty. Students are expected to attend the seminars and read the assigned article for each seminar in advance. Students will write a term paper of approximately 3500-5000 words in length, word processed, and correctly referenced. Paper topics will be arranged on an individual basis with one of the faculty.

EAS 501 Society and Culture in Eurasia (3-0)3
This course aims to provide a comprehensive sketch of the Central Asian region with a special emphasis on the historical, economic, social, cultural and political histories of the regional countries.The focus is mostly the pre-Soviet and Soviet era Central Asia.

EAS 502 The Politics of State-Building in Eurasia (3-0)3
The focus of this course is some theoretical concerns related to nations, nationalism, democracy, governmental mechanisms, institution building and ethnicity in relation to the dynamics of state-building and nationality problems and policies in the context of post-Soviet period states. The course is divided both by issue and geographical area in the post-Soviet space. The issues include various aspects of state-building,and the regions include Central Asia, Caucasia, Russia and the Baltics.

EAS 503 Political Economy of Eurasia (3-0)3
This course seeks to understand the international political economy, first by examining the alternative perspectives which interpret its structures, processes and dynamics. These are liberal, nationalist, and radical approaches. Then the structure and processes of the global political developments with a focus on international trade, regional integration, development and inequality are analyzed. In this perspective, the focus is mainly on the Eurasian region, whose wealth of energy resources, reanimated historical ties, religious and ethnic relationships, and strategic interests have drawn the United States, Europe, Turkey, Russia and Iran into complex politico-economic relationships.

EAS 509 Introduction to Post-Soviet Studies (3-0)3
The principal aim of this course is to provide the students with the necessary tools and methods in terms of the main theoretical models and debates in area studies. It also aims to offer both a comprehensive conceptualization of the term "Eurasia" and some essential and basic knowledge about each country, both in a historical context and in the light of current developments and transformations.

EAS 513 State and Nation-building in South Caucasus (3-0)3
This course aims to explore the process of state and nation-building in three South Caucasus countries since the Russian conquest through the post-Soviet transformation. After a brief discussion of historical and geographical background, the processes of ethnic and national consolidation within first, the Russian Empire, and then the Soviet Union are discussed. Particular attention is paid to the transformatory experiences of the Bolshevik Revolution and Sovietization, as well as the collapse of the Soviet Union and ethnic conflicts. Finally, the latest developments in political and social institutions are discussed.

EAS 514 Political Economy of Post-Soviet State Transition (3-0)3
The aim of this course is to answer; how did the post-communist countries of Eastern Europe, Russia, and Central Asia undergo the dual transition to democratic governments and market-based economies? This course will address the post-communist countries in general, but will focus on Russia and the Newly Independent States to make the material more accessible to students with no background in the region. The course will proceed chronologically, discussing first the early transition in the late 1980s and early 1990s. Then it will turn to the challenges that the post-communist countries faced throughout the mid to late 1990s.

EAS 515 Gender Question in the Soviet Union and Post-Soviet Space (3-0)3
This course examines the interaction between state, gender and patriarchy with a particular focus on the Soviet Union and on the cases of Russian Federation, Azerbaijan and Kazakhstan. After reviewing the main theoretical debates on this interaction, the very gendered themes and spheres such as modernization, revolution, education, motherhood, abortion, family, political life and working life during the Soviet time are discussed. In the second part, the ruptures and continuities with

the Soviet gender politics are considered in the Russian Federation, Kazakhstan and Azerbaijan. The main question is to understand the impact of national identity, religion and culture on gender politics in these countries after the end of Soviet Union.

EAS 516 Language Policies in Late Imperial, Soviet and Post-Soviet Russia (3-0)3
This course examines the history of language policy in Russia from the late 19th century to the present day. Major focus is placed on the development of language policy and the role of the Russian language in the Soviet Union from the Russian Revolution to the collapse of the Soviet Union. In addition, this course deals with the development of national language policies in the former Soviet republics after they gained independence up to the present day.

EAS 517 Energy Security in Global Political Economy (3-0)3
This course examines the energy security from a global political economy perspective. It starts with the definition of the concept and grasps the interaction between the geopolitics of energy and foreign policy making. This is followed by a general examination of 'market' dimension of energy within the framework of global economy. A special emphasis is put on hydrocarbons, especially on oil and gas market structures. The role and interests of different actors such as multinational companies and international organizations regarding the oil and gas issues are also evaluated.

EUROPEAN STUDIES PROGRAM

PROFESSORS

BAĞCI, Hüseyin: B.A., M.A., Ph.D., University of Bonn
ERALP, Atila: B.A., METU; M.A., Ph.D., University of Southern California
YURDUSEV, Nuri: B.S., M.S., METU; Ph.D., University of Leicester
TANRISEVER, Oktay: B.A., METU, M.A., METU, Ph.D., University of London.

ASSOCIATE PROFESSORS

EGE, Aylin: B.S., METU; M.A., Ankara University; M.A., University of Kent at Canterbury
KAHRAMAN, Sevilay: B.A., M.A., Ph.D.,METU
ŞENYUVA, Özgehan: B.S. METU; M.S. METU; Ph.D. Universita Degli Studi di Siena
YALMAN, Galip **(*Department Chair*)**: B.A., METU, M.A., University of Southampton, Ph.D.University of Manchester

ASSISTANT PROFESSORS

ALPAN, Zeynep Başak: B.Sc., METU; M.Sc. METU; Ph.D., University of Birmingham.
AŞÇIOĞLU ÖZ, Gamze: B.A., Ankara University; L.L.M.,University of Nottingham
GÖKSEL, Asuman: B.S. METU, M.S. METU, Ph.D. Katholieke Universiteit Leuven
KALE, Başak: B.Sc., METU; M.A., London School of Economics and Political Science; Ph.D., University of Oxford & METU
TORUN, Zerrin: B.Sc., METU; M.A., University of Manchester; Ph.D. University of Sussex

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: After the II.World War, European Union (EU), as a new regional cooperation shaped in the Western Europe, has become one of the most important models of regional integration in the World with its extensive institutional structure and extending policy areas. While the legal, political and economic aspects of the European integration process were primary along the Cold War era, with the 1990s foreign policy, security and defense has become important aspects beside internal policy developments. With the mid 1980s, EU has turned towards restructuring its relations with the countries out of the union by means of enlargement policies. When looking from these sides, European integration is a multi dimensional project with its political, economic, legal, social and cultural integration aspects. Therefore, this multi dimensionality brings the European Studies into an interdisciplinary position.

European Studies gained the necessity of being a distinct specializing area in the graduate level because of the changing position of Turkey after the Helsinki Summit. We can list the aims of the Graduate Program In European Studies, prepared as an answer to that necessity as:

- to help forming specialist managerial staff about different aspects of the European integration and EU in different institutions and establishments
- to make EU policies in the post-Helsinki period examined and understood by getting touch with EU authorities
- to constitute a public opinion about EU and Turkey-EU relations by means of internal and external seminars and conferences
- to determine the changes that Turkey will encounter in policies and constitutional contexts during the integration process.

ADMISSION REQUIREMENTS:

1. To have bachelor's degree (for those students not graduated from similar departments like International Relations, Law, Economics, Political Science and Public Administration, Graduate Program Committee may suggest preparation courses)
2. Cumulative Grade Point Average 2,50/4,00-70/100.

3. To have graduate exam LES or GRE score LES ≥45 ;ALES ≥55, GRE Quantitative ≥610 , Writing ≥5.
4. To have English Proficiency exam score IYS ≥75; TOEF(old) ≥590, TOEFL ≥243, IBT≥96, IELTS≥7.5.
5. Letter of intention with a short biography of the candidate is required in English.
6. Applicants out of METU are required to submit 2 Reference Letters. Applicants from METU are reqired to submit 2 'referee' names who can give reference about them.
7. Positive opinion of the Graduate Program Examination Committee.

European Studies Program offers both thesis and non-thesis options. In the thesis case, students are required to complete seven credit-courses and prothesis seminar as well as to write a M.S. thesis .In the non-thesis case, students are required to complete ten credit-courses and complete a term project. Upon the successful completion of the requirements of either program, a M.S. degree in the European Studies will be conferred.

M.S. PROGRAM IN EUROPEAN STUDIES (Thesis and Without thesis)

Required Courses:

EUS	501	Economics of European Integration
EUS	502	Politics of European Integration
EUS	503	Institutions and Law of the European Union
ADM	504	State and Society in Europe
EUS	505	Prothesis Seminar: Issues, Approaches, and Problems
EUS	589	Term Project (Without Thesis)
EUS	599	Master Thesis

Elective Courses:

EUS	506	Common Agricultural Policy
EUS	507	Globalization and the New Geopolitics after the Crash: Locating Europe in the Present
EUS	508	Development of European Identity and the European Union
EUS	509	Europeanization and Regional Politics in the Black sea Region
EUS	510	Comparative European Labor Markets
EUS	511	Politics of Migration in Europe
EUS	512	International Relations of the European Union
EUS	513	European Union Environment and Natural Resources Policy
EUS	514	European Union and Turkish Public Procurement Law
EUS	515	Theory and Practice of Democratization in Europe
EUS	516	Concepts and Issues in European Security
EUS	517	Transforming Europe: Europeanization within and beyond the EU
EUS	518	Political Economy of the Eurozone Crisis
ADM	4135	Immigration Polices in Europe
ADM	4137	Western European Politics
IR	470	Turkey and the EC/EU
IR	473	EU in World Affairs
IR	544	Politics in East-Central Europe
IR	555	European Regime of Human Rights
IR	558	The Making of European Security
IR	581	Energy, Water and Environmental Policies in and around the EU
IR	591	Controversies in European Integration
IR	590	International Relations of the EU

DESCRIPTION OF COURSES

EUS 501 Economics of European Integration (3-0)3

Customs union theory as well as service market integration, labour market integration and capital market integration are covered in order to provide a full understanding of common market theory. Theoretical aspects of economic and monetary union are also examined. The topics are discussed in a wide perspective by taking into account the globalisation and other regional economic integration processes in the world. Common policies of the EU, such as common agricultural policy, common commercial policy, competition policy and the major EU policies such as industry policy, regional policy, environment policy, R&D policy, energy policy, and transport policy are also explained. All topics are discussed by adding "the implications for Turkey" aspect at the end of each subject.

EUS 502 Politics of European Integration (3-0)3

This course is intended to provide students with a general understanding of the process of European integration, more specifically developments in the European Union (EU) in a historical perspective. The course begins with an analysis of the basic motives and forces behind the establishment of the Union. It then turns to look at the major theoretical approaches for examining the nature of the integration process and the character and functioning of the Union. On the basis of this theoretical framework, the course provides an account of developments in the main institutions and policy areas and of the key issues confronting the Union and examines how the EU is evolving and how it is likely to develop in the years ahead.

EUS 503 Institutions and Law of the EU (3-0)3

The course aims at providing an introduction for the law and institutions of the European Union (EU). Since European Union is a unique institution based on its directly applicable rules which prevail the national laws of the Member States, the legal aspects of the European Union studies forms the core of the EU related courses as this would provide a sound basis for the students to understand the functioning, policies and the future of the European Union. This legal course shall comprise of certain discussions in matters such as the legal rules governing the composition and functioning of the organs, sources of the EU law and basic principles of EU law and the judicial review of the EU sources. Following institutional law of the EU, the legal basis of Turkey-EC relations, including but not limited to the Association Agreement and the customs union decision of the Association Council No 1/95 will also be covered in the discussions.

EUS 504 Theories of European Integration (3-0) 3

The course aims at developing knowledge and understanding on the role of theory in European Studies. Classical approaches to European integration (neofunctionalism, intergovernmentalism and interdependence theory); contemporary theoretical approaches, such as liberal intergovernmentalism and multi-level governance; the new institutionalist and constructivist approaches in EU studies will be analyzed. In addition to these, the course will examine applications of theoretical approaches to cases and examples on Europeanization, national, regional and supranational identities, the Single Market Programme, regional policy, the Common Agricultural Policy, trade policy and Economic and Monetary Union, Common Foreign and Security Policy and EU Enlargement.

EUS 505 Prothesis Seminar: Issues, Approaches, and Problems NC

This seminar is intended to highlight interesting and unique first-hand practices of European adaptation to the Union and bring them into discussion through the eyes and help of practicing invited people, namely, ambassadors, bureaucrats, politicians and academics.

EUS 506 Common Agricultural Policy (3-0)3

The central goal of this course is to convey the basic economics of many widely used agricultural trade policy schemes but especially Common Agricultural Policy (CAP) of the EU in a clear and consistent way. The course is designed for individuals who have some grasp of economic principles. However no special mathematical expertise or theoretical sophistication in economics is required. It will analyse and explain numerous trade policy mechanisms. Effects of CAP and various trade policies on domestic and international prices, consumption, production, trade and government revenue will be examined. The course will be presented roughly in four sections. First section can be entitled as "Understanding the CAP". It will begin with the history and development of the CAP. The second section will consider the mechanisms and analysis of the CAP. The third section will be devoted to the relationship between the CAP and

consumers, environment, farmers and the food industries. The last section will be on trade impact of the CAP. The course will conclude with a detailed analysis of the WTO's Agreement on Agriculture.

EUS 507 Globalization and the New Geopolitics after the Crash: Locating Europe in the Present (3-0)3

This course aims at revealing an awareness on the current issues of Europe. The main themes are globalization, crisis and the new geopolitics and the situation of Europe vis-a-vis these new developments.

EUS 508 Development of European Identity and the European Union (3-0)3

This a structured postgraduate course developed as a Permanent Course under the Jean Monnet Project 'European Integration Studies in Universities of Candidate Countries'. The course is open to the graduate students of other departments, especially those from the departments of International relations, Political Science and History.

The basic purpose of the graduate course is to give the students a general understanding of the formation of the European identity. The problem of identity in general is the first issue to be dealt with. The principal units of human identification such as nationality, ethnicity, and civilization are critically examined and European identity is placed within the civilizational form of identification. To this end, an historical review of the making of European identity from its ancient roots to the modern reflections is to be undertaken. Special identity has to be given to, on the one hand, the link between European Union identity formation and the European Union and, on the other hand the 'others' of the European identity including Turkish identity.

EUS 509 Europeanization and Regional Politics in the Black sea Region (3-0)3

Europeanization on the capacity of the regional states to achieve regional cooperation as well as cooperation with wider Europe. the course is organized into three parts. the first part will discuss the historical evolution of the region with its own separate identity. The following part will examine the process of Europeanization in each of the littoral states of the Black Sea: Bulgaria, Romania, Ukraine, Russia, Georgia and Turkey. The final part will explore the regional conflict and cooperation by discussing the regional developments in the fields of regional security, economic cooperation, democratization, political culture and civil society.

EUS 510 Comparative European Labor Markets (3-0)3

This course examines labor market characteristics and institutions in developed countries in general and western European countries in particular. Comparisons to the most flexible labor market, the US, will be a focus of the course. Underlying paradigms are the skill-biased technological change adversely affecting low-skill workers and labor market institutions –as these institutions
relate to labor market flexibility or wage rigidity.

EUS 511 Politics of Migration in Europe (3-0)3

This course aims to give an overall understanding on the fundamentals and the dynamics of the politics of migration in Europe. By the end of this course the student is expected to gain an understanding of the theories, historical developments and the complexities regarding the politics of international migration. Overall, the course aims to give a general introduction to migration studies, as well as to understanding the importance of international migration on a global and a national level.

EUS 512 International Relations of the European Union (3-0)3

Since the 1990s, there has been a steady expansion of the practical and scholarly interest in the international role of the EC/EU both as a partner to the major actors in world affairs and as an actor in its own right. The objective of this course is to give a broad introduction to ideas and issues related to the EU's international role and identity in a globalizing world. The course commences with a conceptual and theoretical analysis of the international presence and actorness of the EU. Next, it overviews the legal bases and the institutional framework of EC/EU's external relations and outlines various attempts to further develop EU's foreign and security policy, beginning with European Political Cooperation, culminating in the Common Foreign and Security Policy and the recent transition into Common European Security and Defense Policy. Against this theoretical and historical background, the course assesses the Union's relations with its peripheries to the east, south, and with the rest of the world. Finally, by way of conclusion, the challenges facing the EU foreign and security policy and the future of these policies are examined in an enlarging and unifying Europe.

EUS 513 European Union Environment and Natural Resources Policy (3-0)3

This course is designed as a graduate seminar with the overall aim of enabling the students to achieve a critical understanding of the European Union environmental policy. Main topics will include the EU structure and institutions in the context of environmental policies, framework for EU environmental policy and specific topics of environmental policies, such as climate change, biodiversity, water pollution and sustainable development. Particular attention will also be given to the European Unions adoption and implementation of a variety of environmental policy measures and examples of how environmental objectives can be integrated into other policy areas.

EUS 514 European Union and Turkish Public Procurement Law (3-0)3

The principles and rules of EU and Turkish public procurement law; EU directives on public procurement; Turkish Public Procurement Act; soft law instruments in the field of public procurement under the EU law and Turkish Law; Public-Private Partnerships (concessions, build-operate-transfer projects particularly in the construction of roads, highways, railways and airports, electric powers, water transport, waste management and water distribution); legal remedies in the field of public procurement.

EUS 515 Theory and Practice of Democratization in Europe (3-0)3

The main objective of the course is to develop a coherent understanding of the theory and practice of democratization in Europe. There will be particular focus on country experiences of power sharing, and transition to and consolidation of democracy. The seminar will cover the following specific topics: appropriate institutional design for democracy, the modes of transition and the logic of consolidation, the role of civil society, civil-military relations, the problems of political accountability, and finally democracy and the economic reform.

EUS 516 Concepts and Issues in European Security (3-0)3

Following a broader approach to security in line with critical approaches to security, the course will introduce the issues and concepts in European Union Foreign, Security and Defence Policies in a way that brings together theory and practice. Thus, the course aims to provide the students with the necessary knowledge and skills to apply theoretical concepts to cases and critically examine European Union Foreign, Security and Defence Policies.

EUS 517 Transforming Europe: Europeanization within and beyond the EU (3-0)3

EUS 518 Political Economy of the Eurozone Crisis (3-0)3

For many, corporate sector liquidity problems, banking crisis, state and household indebtedness, and capital market and capital account cycles in either the developed or the developing world since the late 70s suggested piecemeal difficulties in the adjustment of individual economies or markets to the ongoing processes of financial modernisation. The financial crisis of 2007-8 and the Eurozone crisis however seemed to call into question not only this notion of specific ineffective economic adjustment but also any ultimate improvements due to financial development.

EUS 589 Term Project

EUS 599 Master's Thesis

EUROPEAN INTEGRATION PROGRAM
(Evening Program, Without thesis)

PROFESSORS

ERALP, Atila: B.A., METU; M.A., Ph.D., University of Southern California.
TANRISEVER, Oktay: B.A., METU, M.A., METU, Ph.D., University of London.

ASSOCIATE PROFESSORS

EGE, Aylin: B.S., METU; M.A., Ankara University; Ph.D., University of Kent at Canterbury.
KAHRAMAN, Sevilay: B.A., M.A., Ph.D., METU.
YALMAN, Galip ***(Department Chair)***: B.A., METU; M.A., University of Southampton; Ph.D., University of Manchester.

ASSISTANT PROFESSORS

ALPAN, Zeynep Başak: B.Sc., METU; M.Sc. METU; Ph.D., University of Birmingham.
AŞÇIOĞLU-Öz, Gamze: B.A., Ankara University; L.L.M., University of Nottingham.
EREN, İpek: B.A., METU, M.A., London School of Economics, Ph.D., Sussex University
GÖKSEL, Asuman: B.S. METU, M.S. METU, Ph.D. Katholieke Universiteit Leuven
KALE, Başak: B.Sc., METU; M.A., London School of Economics and Political Science; Ph.D., University of Oxford & METU
TORUN, Zerrin: B.Sc., METU; M.A., University of Manchester; Ph.D. University of Sussex

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: European integration is a multi-dimensional project with its political, economic, legal, social and cultural integration aspects. Therefore, this multi-dimensionality brings the European Integration Program into an interdisciplinary position.
European Integration gained the necessity of being a distinct specializing area in the graduate level because of the changing position of Turkey with the impact of negotiation process within the EU. We can list the aims of the Graduate Program in European Integration, which were prepared as an answer to that necessity.
The aims of the Graduate Program in European Integration can be summarized as follows and the courses delivered are designed to meet these objectives:

- to educate so many people who want to expertise on EU related issues and who want to get a job in EU related departments of public corporations.
- to put emphasize on generating necessary human source of high quality who will study on European Integration
- to make EU policies in the negotiation process examined and understood by getting touch with the EU authorities;
- to constitute a public opinion about the EU and Turkey-EU relations by means of internal and international seminars and conferences, projects;
- to determine those changes that Turkey will encounter in its policies and constitutional context during the integration process;
- to provide a deeper understanding as to Turkey- EU relations, particularly by increasing familiarity of the officials to the issue in an internationalized academic environment;
- to analyze the dynamics of the adaptation process that Turkey is undergoing in the EU integration process.

ADMISSION REQUIREMENTS:

1. To have bachelor's degree (for those students not graduated from similar departments like International Relations, Law, Economics, Political Science and Public Administration, Graduate Program Committee may suggest preparation courses)
2. Cumulative Grade Point Average 2,50/4,00-70/100.
3. To have graduate exam ALES or GRE score ALES ≥55, GRE Quantitative ≥610 ,Writing ≥5.
4. To have English Proficiency exam score İYS ≥65, TOEFL ≥213, IBT≥79.

5. Letter of intention with a short biography of the candidate is required in English.
6. All applicants are required to submit 2 Reference Letters.
7. Positive opinion of the Graduate Program Examination Committee.

European Integration Program as a second education program offers only non-thesis option. In this case, students are required to complete ten credit-courses (3 must courses and seven elective courses) and complete a graduation project. Upon the successful completion of the requirements of the program, a M.S. degree in the European Integration will be conferred.

M.S. PROGRAM IN EUROPEAN INTEGRATION

Required Courses:

EI	501	Principles of EU Law and Current Legal Issues
EI	524	Relations between Turkey and the EU
EI	503	Process of European Integration
EI	589	Graduation Project
EI	892	Special Studies

Elective Courses:

Module 1: POLITICS OF EUROPEAN INTEGRATION

EI	502	Accession and Negotiation Process and Methods in the EU
EI	504	International Relations of the European Union
EI	505	European Governance
EI	506	Comparative Enlargement
EI	508	EU Immigration Policy
EI	509	European Human Rights Regime
EI	510	Citizenship and Identity in the EU
EI	511	Process of Europeanization in the Black Sea Region
EI	512	Evolution of Water Policy in Europe
EI	513	Relations between Turkey and the EU
EI	525	Globalization & Global Geopolitics and Europe

Module 2: ECONOMIC AND SOCIAL POLICIES OF EUROPEAN INTEGRATION

EI	507	Social Policy in Europe
EI	514	Economics of European Integration
EI	515	EC Competition Law and Policy
EI	516	Sectoral Polices of the EU
EI	517	EU Regional Policy
EI	518	European Labour Markets and Employment Policies
EI	519	Trade Policy and External Economic Relations of the EU
EI	520	International Trade Theories and Selected Applied Work on Turkish Foreign Trade
EI	521	EU Environmental Policy
EI	522	Political Economy of Energy Policies and the EU
EI	523	European Business
EI	526	The Accountability of Multinational Enterprises in the European Union Law and Policies
EI	527	Energy, Water and Environmental Policies in and around the EU
EI	528	European Economic Integration and Turkey

DESCRIPTION OF COURSES

EI 501 Principles of EU Law and Current Legal (3-0)3

This Course aims at providing an overview to the legal principles of the European Union (EU) which also would give the students a sound basis for other EU Law related studies. As a law related course, it comprises of discussions in certain essential matters regarding the constitutive documents of the EU since the Rome Treaty, the legal principles such as supremacy and direct applicability of European Law. Since the EU regime is defined as a legal system and in fact it creates one, the sources of the European Legal System and sine qua non of the single market namely the free movement principles, free movement of goods, workers, services and capital and the non discrimination principle to be

complied with in the enforcement of such freedoms and the relevant decisions of the European Courts on such matters are also among the issues to be covered.
As EU Law has evolved on the basis of the case law of the EU courts there will be specific emphasis on the structure, functioning and the impact of the European Courts on the European integration. In that regard the future of the judicial organs in the EU will also be discussed in the light of the recent changes in the EU such as –despite the vagueness in its future- the Constitution and the impact of the new comers in the EU. Legal texts which constitute the framework of Turkey-EU relations, including

but not limited to the Association Agreement, Additional Protocol and the Association Council Decisions will also form the subject of further discussions.

EI 502 Accession and Negotiation Process and Methods in the EU (3-0)3

This course aims to examine the evolution and framework of negotiation and accession processes within the European Union. It will attempt to look at both the previous and the more recent experiences of the accession countries in a dynamic and comparative manner. The course will be organized in a moduler format, so that specialists on the process of negotiations and accession from both the EU and member countries as well as from Turkey could contribute on the more specific aspects of the negotiation and accession processes.

EI 503 Process of European Integration (3-0)3

This course aims to examine the process of European integration in a comprehensive manner. It will focus on the intellectual and political climate which shaped the initial phase of European integration in the post-war context as well as examine the different phases of the process of European integration from 1950 until the present time. The course will attempt to look at the political, economic, legal and social aspects of European integration, emphasizing not only the formal aspects but also the informal aspects of integration.

EI 504 International Relations of the European Union (3-0)3

Since the 1990s, there has been a steady expansion of the practical and scholarly interest in the international role of the EC/EU both as a partner to other major actors in world affairs and as an actor in its own right. The objective of this course is to give a broad introduction to ideas and issues related to the EU's international role and identity in a globalizing world. The course commences with a conceptual and theoretical analysis of the international presence and actorness of the EU. Next, it overviews the legal bases and the institutional framework of EC/EU's external relations, including the foreign economic policy and outlines various attempts to further develop EU's foreign and security policy, beginning with European Political Cooperation, culminating in the Common Foreign and Security Policy and the recent move into the Common European Security and Defense Policy. Against this theoretical and historical background, the course assesses the Union's relations with its peripheries to the east, south, and with the rest of the world. Finally, by way of conclusion, the challenges facing the EU foreign and security policy and the Union's international role and identity are examined in the context of a wider Europe.

EI 505 European Governance (3-0)3

The purpose of this course is to develop an understanding of the present stage of European governance, actually denoting a European political system based on an extensive transfer of policy powers and responsibilities from national to European level and the emergence of European institutions and decision making structures. While virtually all spheres of public policy shifts to the EU agenda at least some degree, the European nation-states enter an ever porous process of Europeanization defined by an emergence of a European public policy agenda in an expanding range of fields from agriculture, trade and environment to social affairs, policing and education. The course will focus particularly on the following subjects: the transformation of European states; the emergence of a European administrative space; multi-level governance; the linkages between law, governance and democracy; changing structure of political opportunity in the EU; regulatory governance and open method of coordination; Europe as a differentiated polity; changing parameters of relations between major European institutions such as the Council of Ministers, the European Commission and the European Parliament; the impact of enlargement on European institutions such as the Committee of Regions, the Economic and Social Committee; the transformation of core executive in the new EU members.

EI 506 Comparative Enlargement (3-0)3

In this course the five enlargement steps of the EU will be examined in a detailed and comperative manner. While doing this the reasons paving the way for EU enlargement and the problems of each enlargement process will be emphasized as well.In

this course we plan to clarify the current discussions on the EU enlargement and the questions like "what is the limits of the enlargement process, is it reaching to its limitation" in terms of their importance for the future of the EU.

EI 507 Social Policy in Europe (3-0)3
The objective of this course is to provide students with analytical understanding of the background of the subject, to analyse the subject in a global context and to put it into a theoretical framework. The course is designed in the first place to examine historical background and the process of the making of European security, such as the tendencies after the World War II, the US tutelage over the European security as well as responses of France and Germany and the strategies produced and implemented during the Cold War period. Second is to analyze architectural debate that took place in the early 1990s and the formation and evolution of European Security and Defence Identity (ESDI) and the European Security and Defence Policy (ESDP) as well as analysing the transformation from being under the US tutelage to a global role that the EU aspires for. Third is to discuss whether the EU's hegemonic project is likely to turn into a historic bloc and whether the EU is to sustain its hegemonic project or to revise it. Finally, the course is designed to examine the changing place and stances of Turkey, whether Turkey is to be kept at arm's length or to be integrated into the Common European Security and Defence Policy (CESDP), and the reservations of Turkey.

EI 508 EU Imigration Policy (3-0)3
The course aims to focus on the political, economic and legal aspects of immigration and asylum in the European Union. It also covers comparative migration history among member states. Therefore the course provides a basis for understanding developments in respect of recently established EU common policy and framework.
The course includes analysis on the immigration and asylum policies of the UK, France, Germany and Austria, the Netherlands, Scandinavian Countries, southern European Countries, Central and Eastern European Countries as well as Turkey and Cyprus and their contributions to the formation of EU immigration policy. Finally the course provides a critical approach with regards to common EU policy, institutions and legal framework.

EI 509 European Human Rights Regime (3-0)3
This course, on human rights protection in Europe, has two main objectives. One is to provide an overview of the mechanisms of human rights monitoring in Europe centred on three regional organizations respectively, the Council of Europe, the European Union, and the Organization for Security and Cooperation in Europe. In so doing, the course will seek and rehearse answers to the question whether these distinct mechanisms are evolving into one common European regime of human rights. The second objective of the course is to assess and evaluate what is arguably the most effective human rights protection mechanism in the world, namely the individual complaints system set up under the European Convention on Human Rights. The course will try to unpack this system through a detailed analysis of the case law of the European Court of Human Rights

EI 510 Citizenship and Identity in the EU (3-0)3
The idea of citizenship is an old concept whose origins go back to Ancient Greece and Roman Empire. The concept has changed over time in the context of medieval cities, and later, in the post-Enlightenment Europe. There has recently been a revival of interest in the concept of citizenship due to a number of contradictory developments such as the disintegration of the Soviet Union, European integration, migration, the reassertion of nationalism and globalization. Moreover, citizenship has increasingly been challenged by the rise of new forms of identity and demands for political recognition. The aim of this course is to explore the theory and exercise of citizenship and identity within the European context. It will provide a historical analysis of the main issues concerning citizenship and identity in contemporary Europe and examine the special challenges they face in increasingly complex societies, and in the process European integration. The course will first introduce students to the origins of the concept of citizenship and identity. It will then examine contemporary theoretical and empirical perspectives on EU citizenship and European identity formation.

EI 511 Process of Europeanization in the Black Sea Region (3-0)3
This graduate course intends to explore the process of Europeanization in the Black Sea region. The course discusses the impact of the process of Europeanization on the capacity of the regional states to cooperation with the key actors in wider Europe. The course is organized into two parts.The first part will discuss the nature of Europeanization and the European Neighbourhood Policy. The second part will examine the process of Europeanization in each of the following Black Sea countries: Bulgaria, Romania, Moldova, Ukraine, Russia, Georgia, Azerbaijan, Armenia and Turkey.

EI 512 Evolution of Water Policy in Europe (3-0)3

The course will first present the evolution of water management paradigms in the European context by putting special emphasis on the rise of the 'green movement' as a response to the degradation and depletion of freshwater resources and the changing nature of water management instruments such as the introduction of privatization and pricing policies in urban, industrial and rural water uses. These evolving approaches culminated lately in the integrated water resources management (IWRM) paradigm which is based on the notion that water allocation and management are political processes. In the European context, IWRM is clearly materialized in the European Union (EU) Water Framework Directive (WFD) as the most ambitious piece of legislation for the protection and improvement of quality of all water resources in the European Union. Hence, the course will present the background, origin, main principles of the WFD along with the analyses of the complementary directives which continue to cover some aspects of the water environment in EU. Moreover, the links of EU water policy with other European policies (i.e. Common Agricultural Policy, Thematic Soil Strategy, cohesion funds, renewable energies-hydropower- etc.) will be studied to avoid the misleading sectoral approach and build comprehensive understanding of the political economy of water in Europe. Furthermore, the EU Water Initiative launched in 2002 at the World Summit on Sustainable Development in Johannesburg and designed to contribute to the achievement of the Millennium Development Goals for drinking water and sanitation in the context of poverty reduction efforts in partner countries of Africa, Latin America, Mediterranean, Eastern Europe, Caucasus and Central Asia is studied as well. The course will critically analyze this Initiative with its superficial approach and limited achievements.

The course will adopt an interdisciplinary approach: international relations (IR) with its overarching theoretical approaches, namely neorealism and neoliberal institutionalism will facilitate the discussions in the course as it relates to the transboundary nature of significant number of water resources in Europe and Turkey. Moreover, the basic sub branches of the IR, namely the international law, international institutions and international political economy will all provide the necessary tools to explore politics of water resources management in Europe and its interaction with water policy in Turkey.

EI 513 Relations between Turkey and the EU (3-0)3

This course attempts to provide a comprehensive analysis of Turkey-EU relations, focusing on the political, economic, social and institutional aspects of the relationship. The aim of this course is to examine the long-lasting Turkey-EU relationship within the context of the dynamics of EU integration. The course will examine Turkey-EU relationship within different periods before focusing on the more recent relationship after the Helsinki Summit if 1999. This recent period in the relationship will be analysed in more detail. The course plans to conclude by looking at the more recent relations between Turkey-EU after the start of the negotiation process. We plan to divide the course into different modules so that specialists on different dimensions of Turkey-EU relationship would have the opportunity to make their relevant contribution.

EI 514 Economics of European Integration (3-0)3

The aim of the course is to provide a detailed analysis on all stages of the economic integration process in Europe and the consequences of being in different stages of the economic integration process. Product market integration, service market integration, labour market integration and capital market integration are covered by using customs union and common market theories and the practice of internal market formation. Theoretical aspects of economic and monetary union and its implementation are also analyzed in detail. All topics are discussed by adding the implications for Turkey aspect at the end of each subject.

EI 515 EC Competition Law and Policy (3-0)3

The aim of this Course to brief the participants in one of the most important policies of the European integration that is EC Competition Law and Policy. Competition Law mainly deals with and intends to avoid those behaviors of undertakings (enterprises) which distort competition in the markets, one way or another. These behaviors are generally classified as restrictive agreements, abuse of dominant power in the market and mergers and acquisitions. Within the above stated general scope of the course, certain concepts which form the core of competition law, such as, undertakings, distortion of competition, restrictive agreements, dominant position, mergers and acquisitions, vertical agreements, privatization and competition law, competition advocacy and duties and powers of the EU Commission and the European Courts will be discussed with specific reference to the competition law and practice in Turkey as well. Although not a prerequisite,

sufficient degree of knowledge of economics is an asset since the topic is very much related with industrial economics and thus with basic economic concepts.

EI 525 EU Security and Defense Policy (3-0)3

The objective of this course is to provide students with analytical understanding of the background of the subject, to analyse the subject in a global context and to put it into a theoretical framework. The course is designed in the first place to examine historical background and the process of the making of European security, such as the tendencies after the World War II, the US tutelage over the European security as well as responses of France and Germany and the strategies produced and implemented during the Cold War period. Second is to analyze architectural debate that took place in the early 1990s and the formation and evolution of European Security and Defence Identity (ESDI) and the European Security and Defence Policy (ESDP) as well as analysing the transformation from being under the US tutelage to a global role that the EU aspires for. Third is to discuss whether the EU's hegemonic project is likely to turn into a historic bloc and whether the EU is to sustain its hegemonic project or to revise it. Finally, the course is designed to examine the changing place and stances of Turkey, whether Turkey is to be kept at arm's length or to be integrated into the Common European Security and Defence Policy (CESDP), and the reservations of Turkey.

EI 516 Sectoral Policies of the EU (3-0)3

The aim of the course is to provide an in depth understanding and analysis of the common agricultural policy (CAP), industry policy and R&D policy of the European Union. Common agricultural policy part covers the original CAP, all of its reforms and WTO aspects. Industry policy part covers entrepreneurship and SME policy and sectoral policy, with special emphasis on declining sectors and industries to be developed. R&D policy of the EU is analyzed with special emphasis on its contribution to the competitiveness of EU industry. All topics are discussed by considering their implications for Turkey.

EI 517 EU Regional Policy (3-0)3

This course will examine the evolution of cohesion policies in the EU, focusing in particular on regional policy with reference to the Structural Funds. The course aims to provide an analytical understanding of the development mentality of the EU's approach to regional disparities and of the significance of regional policy for European integration and European governance. To this end, the topics that the course will cover include: theoretical evaluation of the regional development approach of the EU and its relationship with Internal Market policies; latest developments in the Structural Funds regime, including the 2007-13 programme period; both policy and institutional impact on member states; and an evaluation of the success of EU regional policy. The course will also provide case studies of several regions in both new and old member states. Finally, the implications of EU regional policy for Turkey will be assessed. At the end of the course, participants should be able to understand the principles, practices and procedures applied in cohesion policies, analyse the dynamics of regional programme preparation and implementation and recognise the role of regional policy in European integration.

The course will additionally introduce the emergence of the idea of Trans-European Networks (TEN), including the Trans-European Transport Networks (TEN-T) and telecommunication networks based services (e-services) with a trans-European dimension (eTEN), the Treaty basis of the TEN and TEN as a key element of the reinforcement of Economic and Social Cohesion.

EI 518 European Labour Market and Employment Policies (3-0)3

The aim of the course is to impart the student an understanding of European labour markets. Note that, there are different labour policies within the European Union along an axis of labour flexibility and job security. Each enlargement had an impact on labour markets and labour market institutions. These experiences should shed light on the likely effects of future Turkish membership. The course will be analytically rigorous but not technically so. The perspective is economic and political. Active student participation is required and each student will be asked to analyze and present a specific country as part of the grading requirement.

Main Topics

1) Economic background and the European labour markets relative to the US: Stylised facts and an outline of differences within the EU.
2) Basic labour economics: Elementary level introduction of the analytical framework and concepts in order to form a common vocabulary.
3) Brief European demographics.
4) Analysis of European unemployment: What causes it where and why is it so persistent? Lessons for Turkey.
5) Labour market institutions and policies within the EU.
6) Active labour market policies: Where do they work?
7) Debate: Fill in the blank concept of 'flexicurity'.

EI 519 Trade Policy and External Economic Relations of the EU (3-0)3

The aim of the course is to provide an in depth understanding of the external economic relations of the EU. It covers the instruments of the common commercial policy of the EU and the agreements with third countries within the context of trade policy of the EU by including the WTO perspective; and analyses trade and capital flows within this framework. Development cooperation between the EU and developing countries is also considered. All topics are discussed by considering their implications for Turkey.

EI 520 International Trade Theories and Selected Applied Work on Turkish Foreign Trade (3-0)3

This course begins with the basic questions of International Trade Theories: Why do nations trade? Would there be gains from trade? If the answer is "Yes", what would be the composition of trade? How would the terms of trade (international price) be determined? In answering these questions, the classical (Absolute and Comparative advantage) and the neo-classical trade theory (factor endowment) and finally, the dynamic new theories (e.g., imitation lag, product cycle, intra-industry trade, etc.) will be discussed. After having this theoretical outlook, the applied work related to these trade theories concerning Turkish Foreign Trade with her trade partners (EU as a whole or EU members separately, the OECD Countries, the Middle East Countries) will be discussed at the sectoral level.

EI 521 EU Environmental Policy (3-0)3

Environmental issues which were not identified as one of the community policy areas at the beginning started to be developed and integrated into community level practices through environmental action plans since 1970s which amounts to six now. The incorporation of legal provisions confined to environment by the Single European Act signifies the formal acceptance of environmental policies and environmental law as a part of community level practices and acquis communitaire. 1992 Maastricht and 1997 Amsterdam Treaties integrated the principle of sustainable development and strengthened the environmental policies of the EU. EU environmental policies deserve analysis both with respect to developments at member state level, EU level and international level. Due to the leadership role played by the EU in a variety of environmental policy areas, the EU's role in relation to global environmental issues also needs to be examined. While the major purpose of this course is to provide an insight into EU (internal) level political and legal developments, examination of the external conducts, the role and influence of the EU as a global actor in relation to environmental politics will be considered as well.

EI 522 Political Economy of Energy Policies and the EU (3-0)3

The policies that govern energy markets are very much politicized and central to the organization of domestic and international economy. This course first of all aims to introduce major debates in energy policy, particularly as regards to oil, natural gas and electricity; and to discuss these issues in terms of their implications for both domestic and international political economy. After discussing general trends and developments in this field, the course will focus on the EU energy policy. The EU has been trying to develop a common energy policy. These attempts have seemed to reach to a new level with the current problems in terms of security of supply. The historical evolution of EU energy policy and its current issues will be discussed. Within this context the course will focus on restructuring of internal market; security of supply; and environmental concerns. Finally there will be special emphasis on different countries representing different views and applications as to energy policies within EU and in candidate countries including Turkey.

EI 523 European Business (3-0)3

This course examines financial market integration, corporate governance and human resources management (HRM) in the EU as well as the issue of Turkey's adaptation to the commercial law of the EU. Analysis of financial market integration in the EU includes developments in EU bond markets, equity markets, markets for venture capital and EU financial intermediaries, such as the banking system and clearing and settlement systems, with a particular emphasis on the effect of the euro in contributing to the completion of the single market for financial services. Corporate governance in the EU includes the issues of protection for shareholders and other parties concerned with companies; freedom of establishment for companies throughout the EU; efficiency and competitiveness of business; cross-border cooperation between companies in different Member States; and modernisation of company law and corporate governance. HRM analyses the development of human resource management in an expanded Europe, with a particular emphasis on the clash between the Anglo-Saxon and continental approaches to the way enterprises are organised and operated.

EI 524 Relations between Turkey and the EU (3-0)3

This course attempts to provide a comprehensive analysis of Turkey-EU relations, focusing on the political, economic, social and institutional aspects of the relationship. The aim of this course is to examine the long-lasting Turkey-EU relationship within the context of the dynamics of EU integration. The course will examine Turkey-EU relationship within different periods before focusing on the more recent relationship after the Helsinki Summit if 1999. This recent period in the relationship will be analysed in more detail. The course plans to conclude by looking at the more recent relations between Turkey-EU after the start of the negotiation process. We plan to divide the course into different modules so that specialists on different dimensions of Turkey-EU relationship would have the opportunity to make their relevant contribution.

EI 525 Globalization&Global Geopolitics and Europe (3-0)3

Europe, globalization, geopolitics, oil, crises, hegemony, imperialism.

EI 527 Energy, Water and Environmental Polices in and around the EU (3-0)3

EI 526 The Accountability of Multinational Enterprises in the European Union Law and Policies (3-0)3

This seminar examines the impact of the activities of Multinational Enterprises on the enjoyment of human rights and social rights, the ability of international law and European Union law to protect and to realize them. Specifically, the seminar will discuss: the voluntary and legally binding mechanisms through which MNEs are made accountable for human rights violations they commit or encourage, or in which they share complicity; the European Union internal and external policies which address multinational enterprises or the countries where they operate.

EI 528 European Economic Integration and Turkey (3-0)3

The aim of the course is to provide a detailed analysis on all stages of the economic integration process in Europe and the consequences of being in different stages of the economic integration process. Product market integration, service market integration, labour market integration and capital market integration are covered by using customs union and common market theories and the practice of internal market formation. Theoretical aspects of economic and monetary union and its implementation are also analyzed in detail. All topics are discussed by adding the implications for Turkey aspect at the end of each subject.

GENDER AND WOMEN'S STUDIES PROGRAM

PROFESSORS

ECEVİT, Yıldız: ***(Department Chair)*** B.A., Hacettepe University; M.A., Ph.D., University of Kent.
ACAR, Feride: B.S., METU; M.A., Ph.D., Bryn Mawr College.
AYATA-GÜNEŞ, Ayşe: B.S., METU; M.A., Ph.D., University of Kent.
ECEVİT, Mehmet: B.A., METU; M.A., Ph.D., University of Kent
GÜNDÜZ Hoşgör, Ayşe: B.A., M.A., METU; Ph.D., University of Western Ontario.
İMAMOĞLU, Olcay: B.S., METU; M.A., University of Iowa; Ph.D., University of Strathclyde.
SAKTANBER, Ayşe: B.A., M.A., Ph.D., METU.

ASSOCIATE PROFESSOR

AKMAN (Aslan), Canan: B.S., METU; M.A. Trinity College; Ph.D. McGill University.

ASSISTANT PROFESSORS

AYBARS, Ayşe İdil: B.A., M.A.: METU, M.A.: London School of Economics, Ph.D.: University of Ulster
BEŞPINAR, Fatma Umut: B.A., M.A.: METU, Ph.D.: University of Texas at Austin

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: Gender and Women's Studies Graduate Programme, which offers a two year interdisciplinary curriculum, aims to examine the issues of knowledge, society and gender within a feminist perspective in order to contribute towards an understanding of the social position of women and the inequality between women and men with a primary focus on the case of Turkey. In this regard, the programme has a three-fold mission - *education, research and advocacy* – and it endeavours to actualize the following five goals:

- To contribute to the development of education and research on issues of gender and women's studies both theoretically and empirically;
- To contribute to the creation of public awareness and sensitivity on the concept of gender, the field of women's studies, and the social position and problems of women in society;
- To contribute to the process of building mental constructs that are compatible with the notions of women's empowerment and equality between women and men;
- To sponsor institutional and policy oriented initiatives towards the creation of gender sensitivity both on and off campus;
- To benefit from and contribute to global developments in the area of education, research and advocacy on gender issues.

As such, in its essence the mission of the Gender and Women's Studies Programme eminates from a transformative vision of society. In order to contribute towards social change, the programme aims at linking three areas of activity and their related institutions, these are: (i)*production of knowledge* (academic institutions); (ii)*practice/implementation* (women's movement and NGOs); and (iii)*policy formation* (local, national and international decision making bodies). Within this context, the education and research activities of the Gender and Women's Studies Programme of Middle East Technical University aims, on the one hand, to critically examine the existing theory/knowledge in terms of their implications for policy and practice and on the other hand, serve as an active agent of change through establishing a feedback system between its activities and those of other relevant actors.

When considered within such a vision, METU Gender and Women's Studies Programme has a multiple task in actualizing its mission: offering a specialized interdisciplinary education of high academic caliber; providing advisory services on gender issues; and serving as a reference point for expanding a gender equality perspective within and outside the university in the production of knowledge, drawing of action plans and formulation of policies.

ADMISSION REQUIREMENTS: Admission procedure will be implemented according to the Academic Rules and Regulations Concerning Graduate Studies of METU. Owing to the interdisciplinary nature of the gender and women's studies discipline, applicants may come from a wide variety of backgrounds. Applicants, who demonstrate the necessary language competence and aptitude level measured by the objective standards of the university and the specific requirements of the graduate program in Gender and Women's Studies as evaluated by an academic committee, on a competitive basis are admitted to the program.

The Gender and Women's Studies Graduate Program offers both thesis and non-thesis alternatives. In the former, i.e. thesis program, students are required to complete seven credit-courses, the Prothesis Seminar and to write a master's thesis. The latter, i.e. the non-thesis program, requires students to take ten credit-courses and complete a term-project.

Full-time students in both programs are encouraged to finish their studies in three semesters. Upon the successful completion of the requirements of either program a M.S. degree in Gender and Women's Studies will be awarded.

M.S. PROGRAM IN GENDER AND WOMEN'S STUDIES (THESIS AND WITHOUT THESIS)

Required Courses

GWS	501	Introduction to Women's Studies	(3-0)3
GWS	505	Prothesis Seminar (Thesis)	NC
GWS	589	Term Project (Non-thesis)	NC
GWS	599	Master's Thesis (Thesis)	NC

Elective Courses

GWS	502	The Woman Question in Turkey: Interdisciplinary Conceptualizations	(3-0)3
GWS	503	Gender and Peace	(3-0)3
GWS	506	Images of Women in Western Literature from Pre-modern to Postmodern Era	(3-0)3
GWS	507	Gender and the City in Turkey	(3-0)3
GWS	510	Women's Human Rights in Turkey, the EU, and the World	(3-0)3
GWS	511	Making of Feminist Knowledge	(3-0)3
GWS	513	Women and Civil Legislation	(3-0)3
GWS	514	Women and Development	(3-0)3
GWS	518	Working Women and the Law	(3-0)3
SOC	503	Problems of Studying Women in Muslim Societies	(3-0)3
SOC	509	International Regimes and Gender Equality	(3-0)3
SOC	516	Gender, Media and Cultural Representation	(3-0)3
SOC	519	Feminist Methodology in Social Sciences	(3-0)3
SOC	526	Issues in Women's Work and Employment	(3-0)3
SOC	533	Gender Issues in Class and Patriarchy	(3-0)3
SOC	535	Contemporary Feminist Theory	(3-0)3
SOC	659	Space, Place and Gender	(3-0)3
BA	4214	Gender Aspects in Organizational Life	(3-0)3
PSY	550	Psychology of Gender and Women	(3-0)3
PSY	562	Psychology of Close Relationships	(3-0)3
HIST	510	Women's Experience with Hierarchy and the State	(3-0)3
HIST	536	Cultural Construction of Gender: Women in Central Asia and Turkey	(3-0)3
ADM	572	Gender in Politics and Political Participation	(3-0)3
ECON	471	Statistical Database for Turkey	(3-0)3
ECON	431	The Economics of Gender	(3-0)3

DESCRIPTION OF COURSES *

GWS 501 Introduction to Women's Studies (3-0)3

The course has the double purpose of introducing the student to a multidisciplinary examination of historical conditions, cultural norms and social institutions that define women's role in different societies and reviewing the evolution of women's studies as a discipline with emphasis on those theories and perspectives that allow for interdisciplinary study of women and gender. It includes a general survey of social research on gender differences, gender stratification and the gendered nature of politics, religion, occupations, family life and language.

GWS 502 The Woman Question in Turkey: Interdisciplinary Conceptualizations (3-0)3

The course attempts to examine under which circumstances a discourse of the woman question has emerged in Turkey. In this way, the course aims to examine interdisciplinary contributions which serve to explore the living conditions, social status and interpersonal relations of women along social class, political participation, occupational status, educational level and rural-urban residence dimensions so as to comprehend the conceptual parameters of the woman question in Turkey.

GWS 505 Prothesis Seminar NC

This course aims to prepare students towards designing their thesis project. Within this context the focus of the course would be on the application of basic qualitative and quantitative methods to the specific topic at hand. The students would be required to evaluate and integrate these methods so far as they are applicable to their thesis proposal which would be presented for discussion at a seminar open to GWS faculty and students at the end of the term.

GWS 512 Issues on Family and Women (3-0)3

Historical, comparative and contemporary critical analysis of family and familial ideology in relation to conceptual and empirical problematics specific to gender/women's issues: evolutionary perspectives, universal and functionalist interpretations: change and effects of urbanization and industrialization; class and stratification; domestic labor and reproduction; division of labor and inequality; patriarchy and sexuality; state and ideology; identity and power.

GWS 513 Women and Civil Legislation (3-0)3

This course aims at examining the treatment of women under the country's legal framework both as the law is written and as it is carried out in practice in the light of traditions and culture. It attempts to identify specific legal constraints to the ability of women to contribute to the development process and to indicate and discuss the remedial measures. In this context, the relevant provisions of the 1982 Constitution, Civil Law and Laws on Political Rights of Women are analyzed and discussed.

GWS 503 Gender and Peace (3-0)3

Peace is often understood as the absence of conflict, rather than the absence of potential for conflict. The latter is called positive peace that is present only in the absence of inequalities. The proposed course adopts the latter view developed by Johan Galtung and focuses on gender inequalities. While focusing on the issues of positive peace and gender at various levels (international, national, institutional, familial and individual), the course draws simultaneously on both Galtung's typology on peace and the idea that peace (non-violence) in the World cannot be achieved unless peace (non-violence) is achieved at home, and vice versa.

GWS 506 Images of Women in Western Literature from Pre-modern to Postmodern Era (3-0)3

The aim of this course if to examine gendered identities in the representative works by and about women; to read, analyse, and discuss diverse identity and socialization processes that determine gender roles; to recognize the on-going dialogue of women and politics, literature, history, art, anthropology, and psychology; to identify motifs, themes, and stereotypical patterns in different literary forms; to seek for historical, philosophical and cultural information in order to appreciate literature; to analyse, interpret and make research on concepts such as sex, gender, class, cultural diversity, women's experiences and achievements, and the impact of sexism and prejudice; to perceive the role of gender in literature in a chronological and from multidimensional perspective.

GWS 507 Gender and the City in Turkey (3-0)3

The course deals with the co-constitution of gender and cities at both theoretical and empirical levels. While doing this, the course aims to take a critical look at cities. This is done by employing four concepts, namely `daily life,` `intersectionality,` `standpoint` and `multiple economies.` At the same

time, the course looks into the relevant literature on cities and gender in Turkey both in terms of co-constitution of gender and cities and through the employment of the four concepts.

GWS 510 Women's Human Rights in Turkey, the EU, and the World (3-0)3

The term women's human rights (WHR) and the set of practices accompanying it have been at work for some decades, and very transformative as a result of the term serving as a locus of praxis. Despite their transformative power, they have been questioned in various ways in relation to the end of achieving greater gender equality. The course aims to relate to the term and accompanying practices in a self-reflexive fashion. First, either WHR and its practices or existing practices from within the perspective of WHR will be explored. Second, a critical analysis of the practices in question will be engaged .As part of this, the course deals with various relevant legal texts at the levels of the international, the EU and Turkey.

GWS 514 Women and Development (3-0)3

This course attempts to help students to critically examine the gender bias of development in the underdeveloped world where incorporation into cash economy has systematically created asymmetric relations. Focus is on the differential access, of men and women to new technology, knowledge and opportunities, and identification of the mechanisms through which women's work becomes devalued and how women are driven back into the domestic sphere and hence domesticated.

GWS 518 Working Women and The Law (3-0)3

New patterns in family structure and new trends affecting the participation of women in the labor force have focused attention on the legal environment. Governments significantly affect the labor force participation of women by the nature and extent of the statutory rights they grant to working women. To take cognizance of female-specific provisions of labor legislation, a coherent and integrated body of approach and analysis in inevitable. This course aims at providing students with updated information on the legal context.

GWS 589 Term Project NC

The objective of this course is to familiarize the students with individual research-paper and/or report writing. The students are expected to choose a well-defined theoretical and/or applied research topic in the area of gender and women's studies and to write a term paper elaborating on a specific viewpoint after reviewing the relevant literature during the semester under the supervision of a faculty member. The students will present and discuss their papers with fellow students and related faculty member at the end of the semester.

* Description of non-GWS courses are given in the listings of the appropriate departments.

GERMAN-TURKISH MASTERS PROGRAM IN SOCIAL SCIENCES

PROFESSORS

AKDER, Halis: B.S., METU; Ph.D., Goethe University.
ALTUNIŞIK, Meliha ***(Director of the Graduate School of Social Sciences)***: B.A., Ankara University; M.A., METU; Ph.D., Boston University.
AYATA, Ayşe: B.S., METU; Ph.D., University of Kent.
BAĞCI, Hüseyin: B.A., M.A., Ph.D., University of Bonn.
ÖZVEREN, Eyüp (***Dean of the Faculty of Economic and Administrative Sciences***): B.S., METU; M.A., Ph.D., State University of New York at Binghamton.

ASSOCIATE PROFESSORS

DEVECİ ÇIRAKMAN, Aslı: B.S., M.S.,METU; Ph.D., Queen's University
DEVECİ, Cem: B.S., M.S.,METU; Ph.D., Carleton University
ERGUN, Ayça ***(Associate Director of the Graduate School of Social Sciences, Department Chair)***: B.A., Ankara University;M.A., Ph.D., University of Essex.
RITTERSBERGER-TILIÇ, Helga: Vordiplom, Diplom, University of Bonn; Ph.D., University of Essen.
TÜR, Özlem: B.S., M.S., METU; Ph.D., University of Durham.

ASSISTANT PROFESSORS

BEŞPINAR, Fatma Umut: B.A., M.A., METU; Ph.D., University of Texas at Austin.
AYBARS, İdil: B.A., M.A.: METU, M.A.: London School of Economics, Ph.D.: University of Ulster

INSTRUCTORS

EMECAN, Neşe: B.A., M.A., Ph.D., Ankara University.
GÜRPINAR, Doğan: B.A., Ankara University.
KARBİ, Gamze: B.A., M.A, Ph.D., Hacettepe University.
SARIHAN, Sevim. B.A., M.A., Hacettepe University.
TOPAL, Çağatay: B.A., M.A, METU; Ph.D., Queen's University.
TRÖNDLE, Aybars: Ph.D., Marmara University.
TILMAZ, Mümin: B.A., Hacettepe University.

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The German-Turkish Masters Program in Social Sciences (GeT MA) is a unique, interdisciplinary, integrated Masters Program at the Institute of Social Sciences at the Humboldt-Universität and at METUs Graduate School of Social Sciences. All students attend their first year of studies in Ankara and their second year in Berlin.

Courses in Political Science, Sociology and International Relations offer students a specialized perspective on politics and society in Turkey and Germany, German-Turkish relations as well as the European dimension of domestic and foreign politics in both countries. Furthermore, students gain practical experience through an internship in either Turkey or Germany between their first and second year.

Upon completion of the program, a Dual-Master of Arts in Social Sciences is awarded from both Humboldt and METU. The **GeT MA** prepares students for international careers in government agencies, NGOs, administration, journalism and in research.

Web address: http://www.gtss.metu.edu.tr/

ADMISSION REQUIREMENTS: The GeT MA welcomes applications from students worldwide who have obtained a BA or equivalent in a relevant subject and possess English and intermediate German language skills. The applicants from humanities, social sciences and sciences have the same chance of

admission. Admission interviews will be held both at METU, Ankara and Humboldt, Berlin. Students can attend either of the interviews.
The application requirements include:

- B.A. or equivalent degree in any discipline of social sciences or humanities. [Students whose B.A. degree is not in social sciences or humanities, but who has a prior M.A. or M.Sc. degree in social sciences or humanities can also apply.]
- Official Score of Graduate Exam GRE Quantitative ≥610, ALES ≥55.
- TOEFL PBT ≥213; TOEFL IBT ≥79; IELTS Academic Module ≥6,5; METU-EPE ≥64,5 (Students need to present a valid English proficiency score by the application deadline)
- Statement of Purpose (in English).
- Two Letters of Recommendation. [Recommendation letters can be from university professors, language instructors, supervisors, advisors, or co-workers.]
- Any German language certificates, exam results, or transcripts you might have. [Students are **NOT** expected to have German proficiency during the application. They will be provided German language instruction as part of the GeT MA program. Students can take their graduate courses either in German or in English during their year in Berlin].
- CV (in English).
- English writing sample (1,000 to 5,000 words). [The writing sample can be any student homework, paper, senior thesis, or essay. It will simply be used to assess the written academic English level of the applicant]

GERMAN-TURKISH MASTERS PROGRAM IN SOCIAL SCIENCES
Degree Granted: Master's degree (M.A.)

FIRST YEAR

(METU, Ankara)

First Semester				**Second Semester**			
GTSS	501	Joint Seminar I: Turkey and Germany	(3-0)3	GTSS	502	Joint Seminar II: Turkey and Germany	(3-0)3
GTSS	503	Modern Turkey: Social Transformations, Economic Development and Governance Structures	(3-0)3	GTSS	502	Turkey, Middle East and Eurasia	(3-0)3
				GTSS	552	Social Science Readings in German II	(4-0)4
GTSS	551	Social Science Readings in German	(4-0)4	GTSS	556	Social Science Readings in Turkish II	(4-0)4
GTSS	555	Social Science Readings in Turkish	(4-0)4	GTSS	592	Graduate Seminar II	(3-0)0
GTSS	591	Graduate Seminar	(0-0)0	Free Elective*			
Free Elective*							

* To be approved by the advisor.

SECOND YEAR

(BGSS Humboldt-Universität, Berlin)

Three elective courses
Term Project (NC)
Internship (NC)

DESCRIPTION OF COURSES

GTSS 501 Joint Seminar 1: Turkey and Germany (3-0)3

Turkey and Germany, just as it is the case with other societies globally, face similar social, political, cultural and economic problems and challenges. This course aims to approach these problems and challenges from a comparative perspective to highlight differences and similarities. Particular attention will be paid to respective social transformations in each country as well as the bilateral relations, linkages, and potentials.

GTSS 502 Joint Seminar II: Turkey and Germany (3-0)3

Turkey and Germany, just as it is the case with other societies globally, face similar social, political, cultural and economic problems and challenges. This course aims to approach these problems and challenges from a comparative perspective to highlight differences and similarities. Particular attention will be paid to future challenges and transnational linkages within the European context.

GTSS 503 Modern Turkey: Social Transformations, Economic Development and Governance Structures (3-0)3

This course aims to introduce students to the social transformation experience, economic development and governance structures in modern Turkey. Students will be offered both the historical context and a critical review of contemporary developments. The continuities and discontinuities of the transformation process will be discussed in an attempt to provide students with the toolkit to study and make sense of future challenges and prospects.

GTSS 504 Turkey, Middle East and Eurasia (3-0)3

This course aims to introduce students to Turkey in its geopolitical context with a particular focus on the Middle East and Eurasia. Students will be offered the basics of the political, economic and social transformations in these regions. There will be special emphasis on issues of security, energy, water, democratization and regional cooperation.

GTSS 551 Social Science Readings in German I (4-0)4

This course introduces students to classical and contemporary social science texts in German. Though a critical reading and discussion of the texts, the students will have a chance to develop intermediate reading and writing skills in the German language in the area of social sciences.

GTSS 552 Social Science Readings in German II (4-0)4

This course introduces students to classical and contemporary social science texts in German. Though a critical reading and discussion of the texts, the students will have a chance to develop intermediate reading and writing skills in the German language in the area of social sciences.

GTSS 555 Social Science Readings in Turkish I (4-0)4

This course introduces students to classical and contemporary social science texts in Turkish. Through a critical reading and discussion of the texts, the students will have a chance to develop advanced reading and writing skills in Turkish language in the area of social sciences.

GTSS 556 Social Science Readings in Turkish II (4-0)4

This course introduces students to classical and contemporary social science texts in Turkish. Through a critical reading and discussion of the texts, the students will have a chance to develop advanced reading and writing skills in Turkish language in the area of social sciences.

GTSS 591 Graduate Seminar I NC

This course aims to introduce students to the basics of studying Turkey and Germany in a bilateral, regional and global perspective. Students will be exposed to different theoretical and methodical applications in an attempt to help develop a comparative and interdisciplinary outlook.

GTSS 592 Graduate Seminar II NC

This course aims to introduce students to the basics of studying Turkey and Germany in a bilateral, regional and global perspective. Students will be exposed to different theoretical and methodical applications in an attempt to help develop a comparative and interdisciplinary outlook.

MEDIA AND CULTURAL STUDIES PROGRAM

PROFESSORS

KAYA, Raşit: B.A., Ankara University; Institut Français de Press en Science de I'Information; Ph.D., Université de Paris (Paris II).
ÖZVEREN, Eyüp (***Dean of the Faculty of Economic and Administrative Sciences***): B.S., METU; M.A., Ph.D., State University of New York at Binghamton.
SAKTANBER, Ayşe: B.A., M.A., Ph.D., METU.

ASSOCIATE PROFESSORS

ERDOĞAN, Necmi **(*Department Chair)***: B.S., M.S., METU; Ph.D., University of Lancaster.
TILIÇ, Doğan: B.A., M.A., Ph.D., METU.

INSTRUCTORS

ÇAKMUR, Barış: B.S., M.S., Ph.d., METU.
GÜRKAN, Uluç: B.A., M.S., Ph.D., Ankara University.
AVCI, Özgür: B.S., M.S. METU, PhD. University of Wisconsin-Milwaukee

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The graduate program in Media and Cultural Studies (MCS) is an interdisciplinary framework for studying the relations between media and culture in the complex and changing context of contemporary societies. It aims to relate contemporary theory and criticism to mass mediated communications and culture and focuses on issues such as mass culture, popular culture, visual culture, commodification of culture, globalization, gender and subculture, media economics, media power, influence and effects, new communication technologies, normative, legal and ethical issues in media, visual representation.

The MCS graduate program draws its main disciplinary resources and academic strengths from METU's departments of History, Political science and Public Administration, Philosophy and Sociology. Students benefit from METU's tradition of academic Excellency through shared teaching across a number of optional courses alongside MCS courses. The courses offered by METU's Graduate School of Informatics and METU's Audiovisual Systems Research and Production Center (GISAM) and its technical facilities at broadcast level are additional assets for MCS.

The interdisciplinary approach enables students to choose courses both from the participating and other departments and structure their studies and specialize according to a wide range of interests.

ADMISSION REQUIREMENTS AND CURRICULUM: Admission procedure will be implemented according to the Academic Rules and Regulations Concerning Graduate Studies of METU.

The program is designed for students from diverse disciplinary backgrounds and, hence, is expected to attract students from a variety of departments. As indicated, the MCS Program offers both thesis and non-thesis options. In the former, students are required to complete seven credit-courses and a Prothesis Seminar as well as write a conventional M.S. Thesis or present an audio or audiovisual project and write a dissertation of 10000-12000 words. In the non-thesis option, students are required to take ten credit courses and complete a term project. Upon the successful completion of the requirements of either program, a M.S. degree in MCS will be conferred.

M.S. PROGRAM IN MEDIA AND CULTURAL STUDIES
(THESIS AND NON-THESIS)

Core Courses

MCS	501	Introduction to Media and Communication Theory	(3-0)3
ADM	5117	Turkish Cultural History	(3-0)3
ADM	5170	Political Economy of Communication	(3-0)3
ADM	5196	Cultural Politics	(3-0)3
ADM	5134	Media and Society	(3-0)3
MCS	500	Prothesis Seminar (thesis)	NC
MCS	589	Term Project (Non-thesis)	NC
MCS	599	Master's Thesis (thesis)	NC

Elective Courses

MCS	503	Sociology of Journalism	(3-0)3
MCS	504	Texts, Contexts and Readers	(3-0)3
MCS	506	Ethical Issues in Journalism	(3-0)3
MCS	508	New Trends in Broadcasting	(3-0)3
MCS	509	Cinema Studies	(3-0)3
MCS	511	Visions and Visualities	(3-0)3
MCS	512	Media and Politics	(3-0)3
MCS	513	Documentary Genres	(3-0)3
MCS	518	Documentary Cinema Studies	(3-0)3
MCS	520	Mass Media Discourse from Ethnocultural Perspective	(3-0)3
SOC	516	Gender, Media and Cultural Representation	(3-0)3
STPS	505	Knowledge, Science and Technology In the Information Age	(3-0)3
THEA	351/451	Cinema and Reality	(2-2)3
THEA	351/451	Introduction to Video Production	(2-2)3

DESCRIPTION OF COURSES

MCS 501 Introduction to Media and Communications Theory (3-0)3

As an introduction to theories of media and communications this course aims to offer to students a critical exposition of the explanatory frameworks provided by a range of different perspective. On the basis of an historical introduction it focuses on the theoretical contributions of major schools (namely, political economy, critical theory, structural and post structural approaches and cultural studies). The course aims a systematic expositions of the key concepts of each approach placed in its historical context and offers a critical and comparative perspective to assess the strengths and weakness of each theoretical framework.

MCS 503 Sociology of Journalism (3-0)3

The object of this course is to examine the profession of journalism in its relations to other socio-economic and political actors. The birth of journalism in an historical context and the relationship between the grand sociological theories and media theories will be studied. The relationship between media atmosphere (which consists of the level of democratic development, characteristics of state and government in a given country), nature of the media ownership and civil society, and the practice of journalism will be discussed. It will be argued that media are a constitutive element in the power structure of societies. Professional unions and existence of a professional ideology among journalists will be two major topics. Journalists' role in reproducing the dominant ideas and values will be discussed. The course also aims to develop a sociological model to understand the functioning of the media.

MCS 504 Texts, Contexts and Readers (3-0)3

The aim of this course is to construct a theoretical perspective for the analysis of media texts. For this purpose, theoretical approaches of Barthes, Bakhtin, Volosinov, Hodge, Kress, Fowler, van Dijk will be read and their methodologies will be disscussed. The course will focus on language and representation, social construction of media narratives, semiotic structure of different media,

reading and signification, with a special emphasis on culture and power. Different media genres including news, TV series, serials, continuous serials, talk shows, reality shows, advertisements etc. will be analyzed focusing on their narrative and semiotic characteristics.

MCS 506 Ethical Issues in Journalism (3-0)3
The course examines the key ethical issues confronting media professionals, journalists. 'What are the critical ethical considerations to which journalists need to be sensitive during the practice of reporting?' is the major question of the course. Topics to be covered include: What is ethics and professional ethics? Is there an ethics for journalists? Are un-ethical practices due to personal or structural reasons? What is the relationship between media and democracy? Ethical dimensions of infotainment. Ethical dilemmas in war and election reporting. Privacy, sexism, plagiarism and reporting on minorities.
Ethical responsibilities in medical reports. Duty-based ethics versus virtue based ethics. Rights and responsibilities of journalists. Codes of conduct in different countries. Emerging ethical concerns in the new electronic media, etc. The course will emphasize discussion, debate and analysis of specific concrete cases from the international and Turkish practice of journalism.

MCS 508 New Trends in Broadcasting (3-0)3
Recent changes in the structures of the media organizations together with the newly developed technology have also brought important changes to the content of the broadcasting journalism. This course will aim top give students a critical understanding of these new broadcasting trends practiced today in media industry.

MCS 509 Cinema Studies (3-0)3
Cinema Studies is a broad field that takes as its subject matter the interdisciplinary study of various aspects of the institution of cinema. Cinema Studies encompasses the studies of the modes of production and distribution of films on the one side, and the various loci and nature of the viewing experience on the other. The two sides of this process are intermediated by the interference of social, political, and cultural factors that make history, of which the films produce a certain specific representation. In addition, this course will selectively focus on at least one period, one national cinema, one genre, one auteur and one film theory.

MCS 511 Visions and Visualities (3-0)3
Since the mid-19th century, people have been producing and consuming "technical images" increasingly. This course aims to discuss the changing visions and visualities in a historical depth for being able to understand (the visions and visualities of) our age critically.This course is designed in two parts. In the first part, we make a close reading of some constitutive articles and essays on visual culture. Hence, we make a theoretical discussion on the transformation of visions and visualities in modernity, throughout the history of cinematographic and televisual apparatuses. In the second part of the course, we concentrate on a more contemporary issue (such as medical imaging, new media, etc.), which is announced at the beginning of each semester. And we give all our effort to understand the cultural realm of this contemporary issue through its visions and visualities.

MCS 512 Media and Politics (3-0)3
The objective is to take an in-depth look at the relationship between media, the political system, and the public at large.

MCS 513 Documentary Genres (3-0)3
This course is designed to explore the various forms and the styles of documentary film/video. In this course the historical development of the documentary will be discussed. The main concern will be on identifying and exploring major directions documentary has taken. During the course the critical issues that arise along the way will be analyzed. The emphasis in class sessions will be on viewing. A tight and extensive schedule of screenings will be established. The goal is to view as much as possible. Students will be expected to be involved, in researching areas of interest outside of the class. For the most part, class sessions will be devoted to watching documentaries as well as lectures about documentaries.

MCS 518 Documentary Cinema Studies (3-0)3
This course aims to provide students with basic knowledge on documentary cinema. The famous and never-ending discussion on the definition of documentary will be the starting point. This discussion will be extended to other debates such as the problematization of truth in documentary; ethical issues in documentary filmmaking; sound as a constitutive component of documentary; and new forms of documentary filmmaking within new media.

MCS 520 Mass Media Discourse from Ethnocultural Perspective (3-0)3
This course examines theoretical and practical issues of cultural identity in Western and Eastern traditions. Special attention is paid to such dimensions of cultural difference as concepts of

time and space, models of the self and traditions of signification. The course combines both theoretical sessions where relevant issues of cultural difference are discussed and practical sessions where students are provided with critical discourse analysis tools in order to evaluate mass media messages from different cultural contexts. As a result, contrasting Eastern and Western mass media discourse characteristics from ethnocultural perspective makes it possible to explore how identities are being formed and to consider how we could possibly shape them.

* Descriptions of non-MCS courses are given in the listings of the related departments. In addition to the courses listed here, students can take any relevant graduate course offered by other departments upon the consent of the advisor.

MEDIA STUDIES SECOND EDUCATION PROGRAM

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The aim of this program is to satisfy academical and intellectual interests of media professionals, graduated students who planning to be employed in media sector and other professionals which want to study on the field of media. In accordance with this purpose, our program is combining Media and Cultural Studies Program's current interdisciplinary frame and theoretical perspective with professional formation of the media sector.

Although courses offered in the programe are independent from other graduated programs' courses, they are given by scholars of Media and Cultural Studies, Political Science and Public Administration, and Sociology programs. Furthermore, this programs have an access to METU's Audiovisual Systems Research and Production Center (GISAM) and its technical facilities at broadcast level to support technical capability of courses.

Media Studies Second Education Program is totally arranged as night courses sessions in attended out of working hours that makes our courses suitable for professionals which are normally get some difficulties to attain lectures because of their working constraints. Students are required to take ten credit courses (total thirty credits that each of three and which composed of eighteen required and twelve elective) and complete a non-credit term project. Upon the successful completion of the requirements of this program, a M.S.c degree in Media Studies will be conferred by the Institute of Social Sciences.

M.S. PROGRAM IN MEDIA STUDIES

MCS	2521	Introduction to Media Studies	(3-0)3
MCS	2522	Sociology and Ethics of Journalism	(3-0)3
MCS	2523	News Writing and Reporting	(3-0)3
MCS	2524	Introduction to Cultural Studies	(3-0)3
MCS	2527	Cinema Studies	(3-0)3
MCS	2532	Media Economics	(3-0)3
MCS	2534	Filmmaking Techniques	(3-0)3
MCS	2540	Documentary Film Making	(3-0)3
MCS	2542	Media Audiences	(3-0)3
MCS	2546	Television Programming	(3-0)3
MCS	2549	New Media Technologies	(3-0)3
MCS	2554	Campaign Planning	(3-0)3
MCS	2556	Media and Society	(3-0)3
MCS	8529	Texts, Contexts and Readers	(3-0)3

DESCRIPTION OF COURSES

MCS 2521 Introduction to Media Studies (3-0)3
As an introduction to theories of media and communications, this course aims to offer to students a critical exposition of the explanatory frameworks provided by a range of different perspective. On the basis of an historical introduction it focuses on the theoretical contributions of major schools (namely, political economy, critical theory, structural and post structural approaches and cultural studies). The course aims systematic expositions of the key concepts of each approach placed in its historical context and offers a critical and comparative perspective to assess the strengths and weakness of each theoretical framework.

MCS 2522 Sociology and Ethics of Journalism (3-0)3
The course examines the profession of journalism in its relations to other socio-economic and political actors and discusses the key ethical issues confronting media professionals, journalists. The relationship between media atmosphere (which consists of the level of democratic development, characteristics of state and government in a given country), nature of the media ownership and civil society, and the practice of journalism will be discussed. The course argues that media ethics cannot be understood without refering to such socilogical dimensions of the profession. Topics to be covered include: 'What are the critical ethical considerations to which journalists need to be sensitive during the practice of reporting?' What is ethics and professional ethics? Is there an ethics for journalists? What is the relationship between media and democracy? Ethical dilemmas in war and election reporting. Privacy, sexism, plagiarism and reporting on minorities. Emerging ethical concerns in the new electronic media, etc. The course will emphasize discussion, debate and analysis of specific concrete cases from the international and Turkish practice of journalism.

MCS 2523 News Writing and Reporting (3-0)3
The course aims to introduce students with the basic skills required for a journalist or news reporter. Focusing on practical work, students will learn basics of news writing and reporting such as accuracy, newsworthiness, fairness, objectivity and respecting ethical principles and deadlines. A lot of news reading and writing will be done throughout the course to develop skills in writing hard news, features, interviews, analysis, and columns and to make students more familiar with different styles. Students will also have the opportunity to listen to and to ask questions to senior journalists who will be coming to the class as guests to talk on their specific fields of specialization such as interviews, war and conflict reporting, investigative journalism, column writing, etc.

MCS 2524 Introduction to Cultural Studies (3-0)3
The course is designed to provide students with analytical tools to conceptualise the field of cultural practices. It presents a critical review of contemporary theoretical positions developed by the Frankfurt School, neo-Gramscian Marxism, Bakhtin, de Certeau, Bourdieu, Lefebvre, Debord, etc. A brief introduction on the theory of ideology, with which most students are likely to be unfamiliar, will be made since it constitutes the basic analytical premise of cultural studies. Special attention will be paid to the interplay of ideology, culture, and power, the trans-formation(s) of the field of cultural practices, and the contestatory character of popular or mass-mediated cultural forms. Among the themes to be explored are the elite/mass or high/popular culture binaryism, the dichotomies of domination versus resistance and opposition versus ideological incorporation, the pragmatics of everyday life, and the culture of the society of spectacle. Within this context, various popular or mass-mediated cultural forms, texts and narratives (e.g. popular cinema, popular music, televised sports, and television serials) will also be referred to.

MCS 2527 Cinema Studies (3-0)3
Cinema Studies is a broad field that takes as its subject matter the interdisciplinary study of various aspects of the institution of cinema. Cinema Studies encompasses the studies of the modes of production and distribution of films on the one side, and the various loci and nature of the viewing experience on the other. The two sides of this process are intermediated by the interference of social, political, and cultural factors that make history, of which the films produce a certain specific representation. In addition, this course will selectively focus on at least one period, one national cinema, one genre, one auteur and one film theory.

MCS 2532 Media Economics (3-0)3
This course, which is accessible to Media Studies students with or without a background in economics, aims to provide an understanding on major principles, concepts, and theories in media economics. It examines the distinctive economic characteristics of the media industry. Areas that will be covered include economics of print media, broadcasting, film, and new digital media.

MCS 2534 Filmmaking Techniques (3-0)3
In this course, the conventional techniques of filmmaking are given to students in practical sense. Thereofore, starting from the development of an idea to the preparations for the shootings (pre-production) and then from shootings of the film scenes (production) to the editing of the images and sounds (post-production) are all in the scope of this course. The conventional techniques used in these phases of filmmaking will be pratically produced as filmic exercises.

MCS 2540 Documentary Film Making (3-0)3
In this course, the theoretical readings are articulated with practical exercises on documentary filmmaking. After screening of some outstanding documentary films, students discuss not only the basic issues but also elaborate the audio-visual regimes and techniques that unfold those issues in a filmic way as well. Thus, at the end of the course, the documentary filmmaking process will be clarified for the students.

MCS 2542 Media Audiences (3-0)3
The course examines different approaches to the study of media audiences and reception. It compares and contrasts the ways in which the modes of reception and appropriation of media texts are analyzed by media studies. Focusing on the interplay of encoding and decoding, it explores the ideological effects of media representations and the use of media in everyday life. It also deals with empirical audience studies, examining audiences for a variety of genres such as news and talk shows.

MCS 2546 Television Programming (3-0)3
This course covers all aspects of a production of various TV programs including forming an original idea, sponsorship, equipment, personnel and budgeting. At the end of the semester, following their project work, students are expected to reach an adequate level of expertise to be a producer.
Note: Conditions permitting, this course may be conducted in parallel with a advanced video production course, and students may produce video material in their projects.

MCS 2549 New Media Technologies (3-0)3
Recent adoptions of new media technologies, primarily including the Internet, mobile phones, and satellite television, have had critical implications for the transformation of communication environment in modern societies. In order to understand and explain this process, it is necessary to build an extensive debate and a critical perspective on communication, technology, and society relationship. This graduate course, in this context, will start with a discussion on main theoretical approaches of technology and society relationship which comprises 'technological determinism', 'social shaping of technology approach', and 'socio-technical approach'. What will follow is a further discussion about the interaction among 'power/social control' and communication technologies in modern societies. Relatedly, the topics to be covered include the distinctions between new media and old media, new media technologies and their social adoption process, the diffusion of new media technologies across the societies, structural transformation of media industries, Information/Knowledge Society, democracy and new media, and lastly new media and culture.

MCS 2554 Campaign Planning (3-0)3
This course covers all aspects of a communication campaign (from forming opinions to planning of media selection) with domestic and international case studies and term projects. Students will prepare a full project report and present their projects at the end of the semester.

MCS 2556 Media and Society (3-0)3
As a member of contemporary societies, we share a general view that the role of media in modern life is significantly increasing. However, the nature and the extent of media influence in society is a point of important debate in scholarly accounts as well as popular commentary, casual conversations and daily experiences. This course intends to give a review on main paradigms of media studies for second education students, and to fulfil absence of systematic studies on general theories about the media and society relations. The main concern of this course is to locate and clarify the fundamental scholarly assumptions as to the role of the media in society viewed from different perspectives and methodologies, in order to make them avaible for reassessment.

MCS 8529 Texts, Contexts and Readers (3-0)3
The aim of this course is to construct a theoretical perspective for the analysis of media texts. For this purpose, theoretical approaches of Barthes, Bakhtin, Volosinov, Hodge, Kress, Fowler, van Dijk will be read and their methodologies will be discussed. The course will focus on language and representation, social construction of media narratives, semiotic structure of different media, reading and signification, with a special emphasis on culture and power. Different media genres including news, TV series, serials, continuous serials, talk shows, reality shows, advertisements etc. will be analyzed focusing on their narrative and semiotic characteristics.

MIDDLE EAST STUDIES PROGRAM

PROFESSORS

AKTÜRE, Sevgi: B.Arch., M.Arch., METU; M.Arch. and Urban Design, Washington University; Ph.D., İTÜ.
ALTUNIŞIK, Meliha ***(Director of the Graduate School of Social Sciences)***: B.A., Ankara University; M.A., METU; Ph.D., Boston University.
AYATA, Ayşe Güneş: B.S., METU; Ph.D., University of Kent at Canterbury.
BAKIRER, Ömür: B.Arch., Ankara University; M.Arch., University of Chicago; Ph.D., Ankara University.
BOZTEMUR, Recep B.A., Ankara University, M.S., METU; Ph.D., University of Utah.
BÖLÜKBAŞIOĞLU Süha: B.A., Ankara University; M.A., Ph.D., University of Virginia.
CEYLAN, Yasin: B.A., Atatürk University; Ph.D., University of Edinburgh.
DAĞI, İhsan D.: B.A., Gazi University; M.A., Ph.D., University of Lancaster.
HOŞGÖR, A. Gündüz: B.A., M.A., METU; Ph.D., University of Western Ontario.
İNAM, Ahmet: B.S., METU; Ph.D., İstanbul University.

ÖZVEREN, Eyüp (***Dean of the Faculty of Economic and Administrative Sciences***): B.S., METU; M.A., Ph.D., State University of New York at Binghamton.
PEKER, Ali Uzay ***(Associate Dean of the Faculty of Architecture):*** B.A., İstanbul University; M.A., Boğaziçi University; Ph.D., İstanbul Technical University.
SAKTANBER, Ayşe: B.A., M.A., Ph.D., METU.
SOYKUT, Mustafa: B.A., M.A., Bilkent University; Ph.D. Hamburg University .
TURAN, Ömer: B.A., Ankara University, M.A., Ph.D., Catholic University of Leuven.
YURDUSEV, Nuri: B.S., M.S., METU; Ph.D., University of Leicester.

ASSOCIATE PROFESSORS

ŞEN, Mustafa: B.A. Ankara University; M.S., Ph.D. METU.
TAYFUR, Fatih: B.S., M.S., METU; Ph.D., London School of Economics and Political Science.
TOKLUOĞLU, Ceylan: B.S., M.S., METU; Ph.D., Carleton University.
TÜR, Özlem, (***Department Chair***): B.S., M.S., METU; Ph.D., University of Durham.
YILDIRIM, Erdoğan: B.S., M.S., Ph.D. METU .
YILDIRIM, Onur: B.S., METU; M.A., SUNY at Binghamton; Ph.D., Princeton University.

ASSISTANT PROFESSOR

ŞEKER, Nesim: B.S. METU, M.S., Uludağ University, Ph.D., METU.

INSTRUCTORS

DIETRICH, Richard: B.S. University of Colorado, M.S Cornell University & Ankara University, Ph.D. Ankara University
DURUKAN, Şefika Akile: B.S. Boğaziçi University, M.S. Bilkent University, Ph.D., University of Wisconsin-Madison
ULUĞTEKIN, Murat: B.A., M.A. Ankara University.

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The Middle East Studies Graduate Program aims to offer an interdisciplinary study in the following fields:

- 19th and 20th Centuries Middle East History
- Contemporary History of Islam and Islamic Thought
- Middle East Politics
- The Modern State, Political Institutions and Political Parties in the Middle East
- Regional and International Affairs in the Middle East
- War and Peace in the Middle East

- Social Change in the Middle East
- Class, Ethnicity and Gender in the Middle East
- Religion and Culture in the Middle East
- Economic Development in the Middle East

The basic objective of the program is to educate the graduate students in issues regarding the Arab World, Turkey, Iran and North Africa, to train the researchers and area experts for both public and private sectors, universities, research centers, and archives and libraries, to conduct academic and scientific research, to organize conferences and to publish in the history and contemporary affairs of the region. The program also aims at increasing the academic cooperation between research centers in the Middle East and METU, and developing the national and international dialogue among the scholars working in the field of study.

ADMISSION REQUIREMENTS: The Middle East Studies Program is open to students with an undergraduate degree in any field of study due to the interdisciplinary nature of the program. The applicants from humanities, social sciences and sciences have the same chance of admission; thought the Search Committee has the authority to decide the students to attend 'scientific preparation' courses up to 18 credit hours to build up their knowledge in the field. The graduates of history, sociology, international relations, and political sciences may not be required to take preparatory courses.

The Admission requirements of the Graduate School of Social Sciences are valid for the Middle East Program as well. The applicants with the required academic qualifications and necessary language skills may be taken to written and/or oral exams by the Search Committee. The application materials include:

- Bachelor's Degree and/or Diploma, and Official Transcripts
- Letter of intention
- Two letters of Reference
- Official Score of the Graduate Exam (ALES)
- Score of English Proficiency Exams (KPDS, ÜDS, TOEFL, METU IYS or equivalent)

The program has both thesis and non-thesis options. The thesis option requires the students to complete 7 courses (not less than 21 credit hours), one non-credit pro-thesis seminar, and to write an M.S. thesis. The non-thesis option necessitates 10 courses (30 credit hours) and a non-credit term-project to be completed. The students are also required to take one of the languages of the region (to be registered as "NC") for at least two semesters.

In both programs, the students who successfully complete the requirements are awarded with the M.Sc. Degree in Middle East Studies.

M.S. PROGRAM IN MIDDLE EAST STUDIES (THESIS & WITHOUT THESIS)

Required Courses

MES	501	History of the Modern Middle East	(3-0)3
MES	502	Contemporary Affairs in the Middle East	(3-0)3
SOC	522	Sociology of the Middle East	(3-0)3
MES	550	Seminar in Middle East Studies	NC
MES	589	Term Project	NC
MES	599	Masters Thesis	NC
MES	800-899	Special Studies	NC
Middle East Language (*Requirement: Either one of Arabic, Hebrew or Persian; and Turkish for Foreign Students*)			NC

Elective Courses

(The non-thesis program requires the students to take at least three courses from the following list)

MES	504	US Foreign Policy and the Middle East	(3-0)3
MES	505	Geopolitical Readings on the Middle East	(3-0)3
MES	507	Revolutions in the Middle East	(3-0)3
MES	508	Modern Iran: Politics in the Twentieth Century	(3-0)3

MES	509	Religious Developments in the Middle East in Late Antiquity	(3-0)3
MES	520	Political Economy of Water in the Middle East	
MES	529	United Nations and the Middle East	(3-0)3
ADM	566	Turkish Politics	(3-0)3
ARCH	440	Islamic Architectural Works through Texts	(3-0)3
AH	539	Cosmological Thought and Architecture in the Middle East	(3-0)3
AH	541	Assimilation of the Western Mode in the 18th century Ottoman Architecture	(3-0)3
CP	535	Urban Studies in the Middle East and North Africa	(3-0)3
CP	536	Urban Planning in the Middle East and North Africa	(3-0)3
HIST	441	Islam in the Contemporary World	(3-0)3
HIST	504	Ottoman and Turkish History	(3-0)3
HIST	513	Social and Economic History of the Middle East,1800-1920	(3-0)3
HIST	514	History of Middle Eastern Nation-States: 1920-1990	(3-0)3
HIST	527	History of Middle Eastern Beliefs I	(3-0)3
HIST	528	History of Middle Eastern Beliefs I II	(3-0)3
HIST	531	Emergence of Ottoman Modernization I	(3-0)3
HIST	532	Emergence of Ottoman Modernization II	(3-0)3
HIST	546	Nationalism in the Balkans	(3-0)3
IR	407	Middle East in World Affairs	(3-0)3
IR	508	Issues in Turkish Foreign Policy	(3-0)3
IR	536	Radical Politics in the Middle East	(3-0)3
IR	454	Ottoman Diplomacy and the European System	(3-0)3
IR	556	Politics, Economics and Foreign Policy in Greece	(3-0)3
PHIL	541	Special Issues in Islamic Philosophy I	(3-0)3
PHIL	542	Special Issues in Islamic Philosophy II	(3-0)3
PHIL	545	Graduate Readings in Turkish-Islamic Philosophy I	(3-0)3
PHIL	546	Graduate Readings in Turkish-Islamic Philosophy II	(3-0)3
REST	521	History of Architecture in the Middle East I	(3-0)3
REST	522	History of Architecture in the Middle East II	(3-0)3
SOC	503	Problems in Studying Women in Muslim Societies	(3-0)3
SOC	527	Society and Culture in Iran	(3-0)3
SOC	560	Globalization and Diasporas	(3-0)3

The two-semester language courses (to be registered as NC) might be taken from the following list depending on the student's field of study and the approval of the graduate advisor. The minimum grade is CC for language courses:

HIST	107/507	Ottoman Turkish I
HIST	108/508	Ottoman Turkish II
HIST	305	Advanced Ottoman Paleography and Diplomatics I
HIST	306	Advanced Ottoman Paleography and Diplomatics II
ARAB	201	Beginning Arabic I
ARAB	202	Beginning Arabic II
ARAB	203	Intermediate Arabic I
ARAB	204	Intermediate Arabic II
HEB	201	Basic Hebrew I
HEB	202	Intermediate Hebrew II
HIST	261	Historical Readings in Persian I
HIST	262	Historical Readings in Persian II
HIST	361	Historical Readings in Persian III
HIST	461	Historical Readings in Persian IV
TURK	203	Intermediate Level Turkish
TURK	271	Beginning Turkish I
TURK	272	Beginning Turkish II

MES 501 History of the Modern Middle East (3-0)3

The course is designed to provide a review of the historical, political and social settings in the Middle East in the 19th century from an interdisciplinary perspective. The course is a survey for the understanding of the modern Middle East through an in-depth analysis of historical processes as the bases of modernity in the foundation of modern political and social structures. A review of contemporary approaches to understand the Ottoman settings of the Middle East will be followed by the analysis of ethnic, religious and political organization of the region, and the study of changes in these formations throughout the nineteenth century.

MES 502 Contemporary Affairs in the Middle East (3-0)3

The course will analyze the contemporary Middle Eastern affairs through the study of processes of state and nation formation, social and economic changes in region, the impact of religion and the role of the military, and political and economic crises, regional and international conflicts and their domestic effects in the Middle East in the 20th century.

MES 504 US Foreign Policy and the Middle East (3-0)3

The Middle East with its strategic and economic significance as well as incessant volatility and instability has been a major preoccupation for US foreign policy and its hegemonic aspirations. This course aims to offer a comprehensive examination of actors, motives, instruments and the major issues shaping US foreign policy vis-à-vis the Middle East during Cold War and post 9/11 eras. It also aims to discuss changes and continuities in American involvement and diplomacy in the Middle East in the context of the Arab Spring. The course intends to bring issues of security, political economy and democratization into extended focus, while grasping the foreign policy making and implementation processes inside the United States towards Arab and non-Arab states, as well as non-state actors in the region.

MES 505 Geopolitical Readings in the Middle East (3-0)3

The course will cover analysis of Middle East through the lenses of geopolitical approaches and will focus on basic texts on the Middle East and try to reach an understanding of the Middle East based on `geopolitical discourses`. It seeks to expose how alternative readings of the Middle East and its `security problem` might be possible.

MES 507 Revolutions in the Middle East (3-0)3

The course will cover briefly the main theoretical approaches to the study of failed and successful revolutions, revolutions from above and below, passive revolution and coups, the major revolutions in the Middle East region, covering both the Arab countries and Turkey and Iran, lastly a discussion of the contemporary affairs in the region with the perspective of the region`s history and the theoretical debates on revolutions.

MES 508 Modern Iran: Politics in the Twentieth Century (3-0)3

The course will provide students and understanding of modern Iranian politics, focusing on the emergence and development of the modern Iranıan nation-state in Pahlavi period and the transformation of this state in revolutionary and post-revolutionary era. The course will center on political history while encompassing the key aspects of foreign relations as well. The course will also discuss the main axes of debate in Iranıan studies.

MES 509 Religious Developments in the Middle East in Late Antiquity (3-0)3

The course will cover development in the beliefs, practices and seets of religious communities in the Middle East in Late Antiquity. The emphasis will be on the developments in Judaism, Zoroastrianism, Christianity, Gnosticism, and Manichaeism in this period and how they shaped the world in which Islamic thought and culture later developed. In addition, the relevance of these historical developments and contemporary events will also be examined.

MES 520 Political Economy of Water in the Middle East (3-0)3

This course is aiming at dealing with: a general view of fresh water in global, regional and national scales, theoretical views on human and environmental relations, an analytical capability of political economy of Middle East, concepts such as: virtual water, hydro hegemony, trans-boundary water course, geographical and environmental facts of MENA, the role and impact of fresh water on social, political and economic development, the role and impact of scarcity of fresh water and necessity of structural changes to improve region s position in global political economy.

SOC 522 Sociology of the Middle East
(3-0)3

The Middle East in historical and world context. Islam and development of secularization in Turkey and other countries in the Middle East. Social, cultural and educational transformations in selected countries of the Middle East. Modernity post-modernity, globalization, orientalism, fundamentalism, authenticity, identity, and religion. Sociological and anthropological depictions of cultural transitions in the Middle East and Islamic world.

SCIENCE AND TECHNOLOGY POLICY STUDIES PROGRAM

PROFESSORS

DURGUT, Metin: B.S., METU; M.S., Ph.D., State University of New York.
ERAYDIN, Ayda: B.Arch., M. Arch., METU.; Ph.D., Istanbul Technical University.
ERDİL, Erkan ***(Department Chair)***: B.S., M.S., METU; Ph.D., Universiteit Maastricht.
GERAY, Haluk: B.S., M.S., Ph.D., Ankara University.
İNAM, Ahmet: B.S., METU; Ph.D., İstanbul University.
KEPENEK, Yakup: B.S., Ankara University; Ph.D., New York University
ÖZDEMİR, Başaran Funda: B.S., METU; M.S., Ph.D., Ankara.
SOMEL, Cem: B.S., M.S., İstanbul University; Ph.D., Ankara University.
ŞENSES, Fikret: B.A., University of Warwick; M.A., University of Lancaster;
Ph.D., London School of Economics.
TAYMAZ, Erol: B.S., M.S., METU; Ph.D., Case Western Reserve University.
ÜÇER, Ahmet: B.S., M.S., METU; Ph.D., University of Manchester Institute of Science and Technology
YILDIRIM Onur: B.S. METU; M.A. Princeton University, M.A. State University of New York,
Ph.D. Princeton University.

ASSOCIATE PROFESSORS

AKÖZER, Emel: B.Arch., M.Arch., Ph.D., METU.
HOŞGÖR (GÜNDÜZ), Ayşe: B.A., M.A., METU; Ph.D., University of Western Ontario.
PAMUKCU, M.Teoman ***(Vice Chair)***: B.S., M.S., Ph.D., Universite Libre de Bruxelles.
SAYIN, Erol: B.S., METU; M.S., Ph.D., Ankara University.
ÜSTÜNER, Yılmaz: B.S., M.S., Ph.D., METU.
YILDIRIM Onur: B.S. METU; M.A. Princeton University, M.A. State University of New York,
Ph.D. Princeton University.

ASSISTANT PROFESSORS

AKÇOMAK, Semih **(*Vice Chair*)**: B.S., M.S. METU, Ph.D., UNU-MERIT, Maastricht University
AKDEVE, Erdal: B.S.Dokuz Eylül University, M.S.Goteborg University, PhD.Ankara University

INSTRUCTORS

ÇAKMUR, Barış :B.S., M.S., Ph.D., METU.
ÇOLAKOĞLU, Mustafa Hilmi: B.S. METU, M.S., Hacettepe University., Ph.D., Gazi University.
DURGUN, Mehmet Serdar: B.S., M.S., TekPol, METU, Ph.D., University of Maryland Baltimore County.
ELÇİ, Şirin: B.S. METU, M.S., & PhD in S&T Policy Studies, METU
KEPENEK, Emek: B.S: Sociology , M.S.: STPS, PhD.: Sociology
MEDENİ, Tunç D. : B.S. in Management, Bilkent , M.A in Management& Organizational Learning, Lancaster University, UK, PhD in Knowledge Science, JAIST, Japan
POÇAN, Özoğlu Burçak: B.S., METU; M.S., Ph.D., Ankara University.
TANDOĞAN, Sinan: PhD in S&T Policy Studies, METU
YALÇINER, Uğur Gürşad: B.S., M.S. METU

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The graduate program in Science and Technology Policy Studies (STPS) is designed to specialize students in economic, social and cultural policy making concerning science and technology. It aims to deal with economic, sociological, philosophical, ethical, environmental as well as the engineering aspects of newly-emergent issues faced by information-based societies.

Modern science and technology have attained such a degree of complexity that the required policies can no longer be formulated adequately within the bounds of a single discipline. In order to match new levels of complexity, multi-disciplinary approaches are required to address policy issues. By encouraging both curiosity-driven and applied interdisciplinary research on science and technology, the STPS, like similar

graduate programs in other countries, aims at preparing its students towards engaging in not merely theoretical but empirical issues as well.

In order to be effective and competitive worldwide, the Turkish economic and political structures will have to invest more in both qualified human resources and R&D in the coming years. Both private and public institutions will need highly skilled manpower in order to carry out multi-dimensional tasks that are needed in the information age. This requires an ability to formulate relevant policies for furthering research and expanding domestic and technological capabilities in response to global developments. Given the shortage of expertise needed for designing and implementing science and technology policies/strategies which currently is a major concern for public organizations and leading private companies, the STPS program aims at equipping its graduates with the required qualifications to work in technology and research-oriented organizations both in government and industry or in the universities.

In addition, the program will provide a platform for:

a) the fusion of teaching and research;
b) the development of similar teaching/research programs and centers in the future;
c) the cooperation with similar institutions in other countries.

ADMISSION REQUIREMENTS: Admission procedure will be implemented according to the Academic Rules and Regulations Concerning Graduate Studies of METU". No additional conditions are required. The program is designed for students from diverse disciplinary backgrounds, and, hence, is expected to attract students from various departments. All students enrolled in the program will take four core courses which aim to equip students with the basic knowledge to understand theoretical, historical and institutional aspects of scientific and technological practices. There are two fields offered for further specialization; the first is policy oriented (*Science and Technology Policy*) while the second *(Science and Technology Studies*) focuses on issues resulting from the introduction of new technologies in the information era. Engineering, science, economics, management, architecture, and city and regional planning students are likely (but not necessarily) to choose their electives from the first field. Students from other disciplinary backgrounds (public administration, international relations, sociology, psychology, philosophy, history, etc.) may prefer to specialize in the second field. Students in need of the essential background for their field of specialization are encouraged to take at most three additional undergraduate courses upon the consent of the Department Chair.

The STPS Program offers both thesis and non-thesis options. In the former case, students are required to complete seven credit-courses (total of twenty-one credits), and Prothesis Seminar as well as to write a M.S. thesis. In the latter case, students are required to take ten credit-courses (total of thirty credits) and complete a term-project. Upon the successful completion of the requirements of either program, a M.S. degree in the STPS will be conferred.

M.S. PROGRAM IN SCIENCE AND TECHNOLOGY POLICY STUDIES (THESIS AND WITHOUT THESIS)

Required Courses

STPS	501	History of Science and Technology	(3-0)3
STPS	503	Political Economy of Science and Technology	(3-0)3
STPS	505	Knowledge, Science and Technology in the Information Age	(3-0)3
STPS	507	Research Methods in Science and Technology Studies	(3-0)3
STPS	500	Prothesis Seminar (Thesis)	NC
STPS	589	Term Project (Non-thesis)	NC
STPS	599	Master's Thesis (Thesis)	NC

Elective Courses

First Set: Science and Technology Policy

STPS	512	Technological Change In Developing Countries	(3-0)3
STPS	514	Agent Based Simulation Models in Economics of Technological Change	(3-0)3

STPS	515	Innovation Policy and Governance: Trends and Challenges	(3-0)3
STPS	519	R&D Policies and Evaluation Methods	(3-0)3
STPS	517	Innovation and SMEs	(3-0)3
STPS	521	Technology and Work Organization	(3-0)3
STPS	526	Technological Change and the Labor Process	(3-0)3
STPS	544	Technosphere, Environment and Culture	(3-0)3
STPS	552	Globalization and Technology Management	(3-0)3
STPS	554	Management of Technological Innovation	(3-0)3
RP	534	Patterns of Industrial Development and Planning	(3-0)3
ECON	632	Trade Policy and Industrial Performance	(3-0)3
ECON	691	Economics of Technology Policy	(3-0)3
STPS	522	Technology and Corporate Strategy	(3-0)3
STPS	524	Information and Communications Technologies: Socioeconomic and Regulatory Issues	(3-0)3
STPS	543	Recent Trends in Science and Technology Policy Making	(3-0)3
STPS	546	Megascience: An Appraisal of Policy Issues	(3-0)3

Second Set: Science and Technology Studies

PHIL	515	Philosophy of Technology I	(3-0)3
PHIL	516	Philosophy of Technology II	(3-0)3
SOC	442	Sociology of Science and Technology	(3-0)3
STPS	510	Systems of Innovation	(3-0)3
STPS	526	Technological Change and The Labour Process	(3-0)3
STPS	531	Intellectual Property Rights and Regulation	(3-0)3
STPS	532	Intellectual Property Rights and Implementation	(3-0)3
STPS	542	Art, Technology and Visual Culture	(3-0)3
SOC	643	Advanced Issues in the Sociology of Knowledge	(3-0)3
STPS	544	Technosphere, Environment and Culture	(3-0)3
STPS	547	Introduction to Information Network Security and Policy	(3-0)3
STPS	548	Managing Information Technology: Policies and	(3-0)3
STPS	549	IT Governance Standards	(3-0)3
STPS	550	New Economy: Impacts and Applications	(3-0)3
STPS	560	Seminar in New Technologies	(3-0)3
STPS	590	Social Science Aspects of Innovation	(3-0)3
STPS	800-899	Special Studies	NC

DESCRIPTION OF COURSES *

STPS 500 Prothesis Seminar in STPS NC

STPS 501 History of Science and Technology (3-0)3
The study of the genesis and historical trajectory of the modern science and technology. A comparative approach at two fronts: preindustrial western and non-western civilizational complexes and cosmologies. Modes of knowledge production and practical application of knowledge. Ethical-political considerations guiding pre-modern and modern approaches to reality. Particular emphasis on the history of scientific progress since the Industrial Revolution; transformation from industrial to post-industrial/information society.

STPS 503 Political Economy of Science and Technology (3-0)3
An introduction to political economy of science, technology, and policy. Basic concepts, alternative theories, and recent developments in the economics of technology and innovation. Patterns of technological activity and markets for technology. Comparative analyses of science and technology policies in industrial and developing countries, and the experience of NICs. Interactions between technology (policy) and society.

STPS 505 Knowledge, Science and Technology in the Information Age (3-0)3
Changing technologies of knowledge production. Body, self and identity in the information age. Fragmented subjectivities and cyberspace. Information as commodity and knowledge. The

transformation of cosmological principles and existing divisions of labor within techno-sphere and modern science. The flux of everyday life in reshaped places. The transformation of time-space conceptions under the impact of new technologies of virtual reality. Social repercussions for the existing institutional structures and disciplinary boundaries of modern scientific establishment.

STPS 507 Research Methods in Science and Technology Studies (3-0)3

This course intends to introduce the main terminology and concepts used in science and technology policy studies related research. The course is designed for students that will write a MS or PhD thesis, but other students can also benefit from the course.

STPS 510 Systems of Innovation (3-0)3

Long waves and industrial revolutions; Liszt and national system of production; Schumpeter and creative destruction; learning economy, tacit and codified knowledge, national innovation systems; regional innovation systems, technological systems, globalization.

STPS 512 Technological Change in Developing Countries (3-0)3

Recent trends in economic performance, innovation, technological activities, and technology transfer. Review of key concepts (technology, technique, technological capabilities, innovation, and technology transfer) and characteristics of the process of technological change in developing countries (DCs). Innovation and technological change in DCs through the 20th century. Technological change processes under inward-oriented development strategies before 1980s (Turkey, India, Latin America) and under outward-oriented development strategies (South Korea and Taiwan). Globalization and its impact on innovation and technological change process in DCs in the post-1980 period: changes in the modes of technology transfer, role of transnational corporations in technology transfer, intellectual property rights and new technologies (ICTs and biotechnologies). Analysis of the technological change process and innovation in the Turkish economy.

STPS 514 Agent Based Simulation Models in Economics of Technological Change (3-0)3

Complex adaptive systems, multi-agent simulation models, the bottom-up approach to social systems, learning and evolutionary games, genetic algorithms, agent based simulation models, network evolution.

STPS 515 Innovation Policy and Governance: Trends and Challenges (3-0)3

With the improved understanding of innovation and innovation systems and with the increase in the challenges that needs to be addressed by innovation policies, new concepts and approaches in policy-making and implementation are being developed and implemented both in developed and developing countries. Also, internationally accepted methods and tools used in policy and program design, implementation and evaluation are important for the stakeholders of the Turkish innovation system. Therefore, this course focuses on recent trends, new approaches and main challenges in innovation policy and programme cycle and aims to develop capabilities of the students on this new understanding and tools and methods**.**

STPS 516 Science and Technology Places (3-0)3

The aim of the program is to teach the students the official regulations and applications in Turkey. Some techno parks and university research and applications centers will be reviewed.

STPS 517 Innovation and SMEs (3-0)3

- Innovation determinants for SMEs.
- Realizing the importance of competitiveness for SMEs and regional development.
- Innovation capacity and abilities of SMEs.
- Design and R&D activities.
- Learning, Knowledge Transfer and Absorption Capacity for innovation.
- Institutional Capacity for SMEs.
- The role of government and universities for developing industries' competitiveness.
- The role of EU within innovation capacity and competitiveness.
- Success stories from the world.

STPS 519 R&D Policies and Evaluation Methods (3-0)3

Financing R&D and innovation; public policy; justification of public intervention in technology;

classifications of public technology policies; recent trends in technology policies, government intervention in technological change in Turkey; monitoring and evaluation of public policies/programs; evaluation concepts, causal relationship; ex-ante/ex-post evaluation, forms of additionality, analysis of evaluation reports.

STPS 521 Technology and Work Organization (3-0)3

Comparative analysis of production and service systems (Taylorism, Fordism, flexible production, etc.). Technology and labor process. Recent changes in work organizations in industry and services. The experience of developed countries and NICs. Universal validity and transferability of new production technologies and work organizations to developing countries. Work organizations in large and small scale firms in Turkey.

STPS 522 Technology and Corporate Strategy (3-0)3

The course aims to provide theoretical knowledge and practical methods/applications about Project and System Management. Project Management, Contract Management, Strategic Management, System Engineering Management, Technology Management, Project Cycle Management, R&D Projects, Information and ERP Projects, Governmental Programs will be covered

STPS 524 Information and Communications Technologies Socioeconomic and Regulatory Issues (3-0)3

Recent changes in information and communication technologies, and their impact on the economy. The structure of world telecommunications industry: states, firms, and strategies. Pricing issues. Privatization in Turkish telecommunications industry.

STPS 526 Technological Change and the Labour Process (3-0)3

Labour process theory; the relationship of man and the machine; mechanisation versus craft work; skill and knowledge at work; historical analysis of technical change in the labour process; technological change in the workplaces; contemporary debates on technology and work.

STPS 531 Intellectual Property Rights and Regulation (3-0)3

The course is aimed to increase the awareness of the students on the intellectual property rights. Additionally one of the aims is to give detailed information for obtaining the rights together with enforcement in Turkey and in the World.

STPS 532 Intellectual Property Rights and Implementation (3-0)3

Economic and scientific concerns in registration/granting of the Intellectual Property (IP) Rights, effects of IP rights in international trade, technology development, and dissemination of technological information, international Agreements on globalization in international trade, EU Policy for harmonization in the internal market, new trends in IP policies in the world, implementation of patent rights, state of the art search before preparation of the documents for patent application, drafting the description, claims, figures and abstract, patent application through patent Co-operation Treaty (PCT), patent application through European Patent Convention (EPC), implementation of industrial design rights.

STPS 542 Art, Technology and Visual Culture (3-0)3

Art vis-à-vis ancient techné and modern technology. The technological enframing and *Regelkreis* of the late industrial-modern age. The post-industrial and post-modern conditions under which contemporary modes of artistic activity take place. The possibility of art in the information age. Art as saving power and sheltering vs. Art as information flow and commodity. The ethical function of the aesthetic dimension. The question of *Umwelt*. The possibility of Truth via artworks in the information age. Towards a visual ontology.

STPS 543 Recent Trends in Science and Technology Policy Making (3-0)3

Science and technology policies of the postwar era are intended as instruments of national and regional economic competitiveness, high living standards and sustained progress. The course provides a critical study of the major science and technology policy documents in their historical settings. An appraisal of the political, economic and structural aspects of actions prescribed in such documents, the envisaged role of science and technology in achieving national and regional goals and the trends in policy making are covered.

STPS 544 Technosphere, Environment and Culture (3-0)3

Workshop/Seminar in creative studies and research on the relationship of culture and nature; assessment of habitat/oecumene within cultural and natural permanence and change; creative problem-solving and problem-definition within time/space dynamics; researching new ways of integrating multiplicities. Research into the physical manifestation of culture and values. Applied execution of ideas and creative

problem solving with different materials and designs.

STPS 546 Megascience: An Appraisal of Policy Issues (3-0)3

Generic megascience policy issues, the interactions between the development of megascience and national decision-making processes, mechanisms of international cooperation in megascience, cost, funding and budgetary issues in megascience projects, government science and technology foresight exercises in selected countries.

STPS 547 Introduction to Information Network Security and Policy (3-0)3

The course aims to create technological awareness, especially on IT technologies. The role of IT in daily life, in communications, in e-commerce, in personal usage is to be taken out of the black-box to point out possible problems and risks, together with introduction to counter concepts like e-security, IT usage policies, suggested applications.

STPS 548 Managing Information Technology: Policies and Standards (3-0)3

The course aims to create awareness and provide ability to manage IT technologies, especially at company/project scale. Methods and resources of such management, and existing efforts for standardization are exploited as milestones.

STPS 549 IT Governance (3-0)3

Contemporary issues about IT Governance as a whole; but major concentration upon-IT Organizations & Strategy,-IT Management & Best Practices,-IT Processes & Standards,-IT Project Management,-Business-IT Alignment,-IT Control Standards & Security,-IT Risk Management & Audit issues will be thoroughly discussed and practiced in this course. By focusing on Business Requirements and Business-Technology Alignment; well-applied Global Best Practices, Assessment Methodologies, Process Maturity and IT Risks will examined. Besides experiencing the technology impact and its leverage on business world, the protection & control of information & information assets will be the common perspective of this lecture. In addition to a medium weight of reading materials; membership to and follow-up of some major professional e-groups and discussion lists, research over the Internet, Control Risk Assessment & IT Audit Project assignments, in-class case studies, workshops, simulations and presentations will be the lecture's in & out of class study/practice material.

STPS 550 New Economy: Impacts and Applications (3-0)3

This course examines the concept and content of the new economy and its impact on economic agents. The near history of the new economy takes place as an introduction. Digital era and its impacts on households, firms and government are analyzed. New approaches on business transactions and its effect on labor market are taken into consideration. Both backbone of e-business such as ERP (Enterprise Resource Planning), SCM (Supply Chain Management) and e-business in action B2B (Business to Business), B2C (Business to consumer) and CRM (Customer relationship Management) takes place. The course is interactive, involves both critical discussion and project implementations (applications) about the network economy by professional presentations.

STPS 552 Globalization and Technology Management (3-0)3

21st century concepts, technologies and terminology, research, search and awareness. Philosophy of engineering ethics, change in values. Human resources for research and its management. Change in research infrastructure needs and modeling and simulation. From basic research to the product. Innovation, competition and cooperation. Technology watch. The importance of technology foresight efforts and its implementation. Effect based approach for solving problems. Capability based planning and its application to defense. Technology gap between nations and its affect on the international collaboration. Assessment of technology maturity level. Converging technology..

STPS 553 Technology, Globalization and Labor (3-0)3

During the course, the participants are expected to acquire: (i) understanding how ICT can change work organization; (ii) ICT and labour, who benefits from ICT; (iii) social aspects of innovation; (iv) the policy implications of the two literatures, how to deal with labour issues as a result of work organization and the localization versu globalization debate. And at the end of the course, the articipants are expected to posses: (i) the ability to analyze the implications of the globalization process. Firms and production are becoming globalized; (ii) the ability to compare and contrast localization issue with globalization of production, (iii) the ability to examine the appropriate policy tools that stems from the localization versus globalization issue**.**

STPS 554 Management of Technological Innovation (3-0)3

From a business perspective, the course will focus on the linkage of technology and business strategies, key R&D business processes, issues in global R&D management, methods of measuring and optimizing the return on the R&D investment, commercializing technology and the commercial development process, technology intelligence, organization and human resources issues in the R&D, and leveraging private investors including Venture Capital (VC) and public R&D support programs. Case studies from international benchmark studies and best practices will be discussed. The course will move deliberately between strategic issues (why does business do R&D?) and managerial and organizational issues (how should business do R&D?), though the focus of the course is more on better understanding of private R&D behavior for policy design.

STPS 555 Research Commercialization and Knowledge- Based Entrepreneurship (3-0)3

This course fits within the electives of the graduate Program in Science and Technology Policy Studies.

Research, innovation and entrepreneurship are the three critical pillars of the knowledge economy. Research and technology commercialization, or more specifically, knowledge-based entrepreneurship becomes one of the most important issues for the economic growth in the 21st century. However, there are many complexities and uncertainties in the linkages between scientific invention and business development. This course will focus on the recent developments concerning the knowledge transfer approaches including the new role of universities, public incentives in commercialization, improvements in intellectual property rights and mediator agencies between the academic and the industrial worlds. The distinct features and industrial dynamics of knowledge-based entrepreneurship will also be elaborated.

STPS 556 Knowledge Intensive Entrepreneurship and Commercialisation of Research Output (3-0)3

Research, innovation and entrepreneurship are the three critical pillars of the knowledge economy. However there are many complexities and uncertainties in the linkages between scientific invention and business development. This course will focus on the recent developments concerning the knowledge transfer approaches including the new role of universities, public incentives in commercialization, improvements in intellectual property rights and mediator agencies between the academic and the industrial worlds. The distinct features and industrial dynamics of knowledge-based entrepreneurship will also be elaborated.

STPS 560 Seminar in New Technologies (3-0)3

Seminars on genetics and biotechnology, flexible automation technologies, new materials, optics, information and telecommunications technologies, etc.

STPS 589 Term Project NC

STPS 590 Social Science Aspects of Innovation (3-0)3

Challenging the Role of Entrepreneurs; Opportunity Analysis: Five Phases to Success; Preparing A Cash Flow Forecast; Five Steps To Formulating A Successful Marketing Plan; Preparing The Marketing Analysis And Plan; Five Steps To Successful Database Marketing; What Is A Business Plan? Choosing Your Goals and Objectives; Setting Performance Benchmarks; Writing the Business Plan; How to Write a Loan Proposal; How to Apply for a Loan; Evaluating High-Growth Businesses; Deciding Whether to Go Public; Secure Method for E-Commerce; Trademarks; Copyrights; Patents; Documenting your Ideas; Applying for a Patent; Trade Secrets; Which Form of Ownership is Best? Forms of Doing Business.

STPS 599 M.S. Thesis NC

* Descriptions of non-STPS courses are given in the listings of the related departments. In addition to the courses listed here, students can take any relevant graduate course offered by other departments upon the consent of the advisor.

SCIENCE AND TECHNOLOGY POLICY STUDIES Ph.D. PROGRAM

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: Understanding scientific and technological change entails developing a comprehensive multi-disciplinary approach covering economic, political, social, and cultural aspects to encourage appropriate science and technology policies. Concurrently, our Ph.D. program is supported by various disciplines such as economics, administrative sciences, engineering, sociology, history, philosophy, and communication and cultural studies.

Recent developments in the knowledge-intensity of economic activity have significant broader socio-economic repercussions at the level of nation states, regions, industries, markets, and firms. In this context, Science and Technology Studies Ph.D. program aims to engage with the challenges dictated by the knowledge-intensive society, thus, presents a vision of analysing and responding such challenges through providing several concentration areas for policy making.

Science and Technology Studies Ph.D. program has a mission of encouraging scientific research and policy making particularly in the fields of technological change and innovation processes that are indispensable elements of understanding the structural changes in the current economic and social life. Consequently, the program creates a new set of opportunities and mutually empowers the existing ones for established academics in partner countries and for those at the early stages of their careers to pursue a program of research and research training in a challenging and important area of inquiry.

The program offers a wide variety of interest areas in which it concentrates on both the theoretical and policy foundations of technology.

Innovation

In any economy, the intensity of innovative activities is one of the main indicators of technical change. Those attempts should materialise in the product chain in the context of competitive pressures prevalent both in the national and international markets. Innovation and the conditions of innovation are significant factors in the development of production. The literature on innovation systems and its connections with several learning processes is growing at an increasing rate. In this framework, the program aims at mapping issues such as the study of long-run competitiveness, knowledge accumulation, and policy making.

Political Economy of Technological Change

A political economic approach is an indispensable element of any analysis aiming to grasp the repercussions of uneven development on technological change. In this context, a comprehensive investigation of all aspects of technological change, particularly concentrating on the issues concerning developing countries, appears to be another major area of interest.

Information and Communication Technologies (ICT)

The developments observed in information and communication technologies (ICT) have enormous impacts on the pace of technological change. Those developments have not only national macro effects but also serious consequences for the organisation of work.

Clustering of Innovative Activity

Regional development is a counterpart of broader development. In this sense, the existence and structure of industrial clusters, promotion of industrial activity through cluster structures, spatial distribution of resources, collaboration of different institutions such as local governments, universities, firms, and non-governmental organisations becomes essential research areas. The developments in the regional economies constitute one of the fundamentals for internationally traded goods and services whose analysis forms another focus of the program.

Technology Policy

Developing appropriate technology policies entails a consideration of issues at national, international, and supra-national levels. Science, technology and R&D policies, which form the basic instances of the mentioned levels and their specific connection with and articulation to the regulation issues constitute another area of interest within the STPS Ph.D. program. Additionally, practice-oriented issues for instance the discussion of critical technologies, energy systems, environmental impacts, and foresight studies are also included.

Technology and Work Organisation

The practice of technological change and application of associated policies require a study of theory of organisations and the structure of inter-organisational systems. The policy issues covered by the program are enriched by the introduction of organisation-related topics.

Quantitative Methods

The study of the above explained content demand for an eager analysis of the technological databases and research methods. The program furnishes the participants with qualitative and quantitative methods of research.

ADMISSION REQUIREMENTS: Admission procedure will be implemented according to the "Academic Rules and Regulations Concerning Graduate Studies of METU". No additional conditions are required. The program is designed for students from diverse disciplinary backgrounds, and, hence, is expected to attract students from various departments. The program offers Ph.D. studies for international student body. Applicants must possess a master's degree from a reputable university or institution of higher education. As an interdisciplinary program, it welcomes students whose background is in social or natural sciences as well as engineering. All students enrolled in the program will take four core courses which aim to equip students with the basic knowledge to understand theoretical, historical and institutional aspects of scientific and technological practices. Students are also required to take two elective courses. Finally, the students write a Ph.D. thesis.

Ph.D. PROGRAM IN SCIENCE AND TECHNOLOGY POLICY STUDIES

Required Courses

STPS	601	Innovation, Technology, and Economic Development	(3-0)3
STPS	602	Technology and Industrial Strategy	(3-0)3
STPS	603	Technology, Society, and Culture	(3-0)3
STPS	605	Research Methods and Analytical techniques	(3-0)3
STPS	800-899	Special Studies	NC
STPS	699	Ph.D. Thesis	NC

Elective Courses

STPS	521	Technology and Work Organization	(3-0)3
STPS	524	Information and Communications Technologies: Socioeconomic and Regulatory Issues	(3-0)3
STPS	531	Intellectual Property Rights and Regulation	(3-0)3
STPS	532	Intellectual Property Rights and Implementation	(3-0)3
STPS	542	Art, Technology and Visual Culture	(3-0)3
STPS	544	Technosphere, Environment and Culture	(3-0)3
STPS	550	New Economy: Impacts and Applications	(3-0)3
STPS	604	Current Issues in Science and Technology Policies	(3-0)3
STPS	560	Seminar in New Technologies	(3-0)3
STPS	611	Topics in Applied Econometrics 1	(3-0)3
STPS	612	Topics in Applied Econometrics 2	(3-0)3
ADM	570	Political Economy of Communication	(3-0)3
ADM	646	Current Issues in Public Administration Theory	(3-0)3
ADM	648	Technology and Organizations	(3-0)3
ADM	691	Advanced Policy Analysis	(3-0)3
EE	710	Electricity Trading	(3-0)3
ECON	642	Technology, Growth, and Development	(3-0)3
ECON	691	Economics of Technology Policy	(3-0)3
ECON	692	Evolutionary Economics	(3-0)3
PHIL	515	Philosophy of Technology I	(3-0)3
PHIL	516	Philosophy of Technology II	(3-0)3
PHIL	521	History of Science I	(3-0)3
PHIL	522	History of Science II	(3-0)3
RP	534	Changing Economic and Political Structure	(3-0)3
SOC	642	Sociology of Science and Technology	(3-0)3
SOC	643	Advanced Issues in the Sociology of Knowledge	(3-0)3

DESCRIPTION OF COURSES *

STPS 601 Innovation, Technology and Economic Development (3-0)3
This course surveys a range of topics in the area of economics of innovation and technological change. Topics to be considered include the economics of the innovative activities, the contribution of innovation and research to economic growth, and the influence of market structure and competitive environment on the production of innovations. The course further focuses on specific examples from the history of technological innovation.

STPS 602 Technology and Industrial Strategy (3-0)3
The course begins with the discussion of the relation between innovation and competitiveness. In this context, systems of innovation together with its effect on firms and technology policy is introduced. The course also focuses on the policy issues such as energy systems and environmental policy, clustering, research and development policy, and information and communication technology policy and strategy.

STPS 603 Technology, Society, and Culture (3-0)3
A comprehensive understanding of technology and its meaning in social development entails situating technology within the broader historical transformations. Beginning from the ancient Greek philosophy to the twenty-first century, the issue of technology has occupied a significant place. The course discusses philosophy of technology in this context.

STPS 604 Current Issues in Science and Technology Policies (3-0)3
The course mainly discusses the regulation of science and technology in the case of developing countries. The discussion is linked to national and regional systems of innovation. The course also extends the policy analysis to the concept of technology foresight and regional and national competitiveness.

STPS 605 Research Methods and Analytical Techniques (3-0)3
The course focuses on the use of quantitative methods in science and technology studies. It also considers a wider discussion of economic analysis for science and technology policy indicators with the use of international technology databases. The course further covers smoothing and decomposition methods, causal modeling and forecasting techniques, linear and nonlinear time series models and forecasting.

STPS 611 Topics in Applied Econometrics 1 (3-0)3
This course aims to cover data sets encountered in social sciences; sampling techniques; preparing surveys in social sciences; econometric analysis of qualitative variables; and econometric analysis of limited dependent variables.

STPS 612 Topics in Applied Econometrics 2 (3-0)3
The objective of this course is to cover the empirical models that are heavily used in analyzing cross section and panel data. Some of the important models that will be covered in this course are Fixed-Effects Models, Models with Random Effects, and Dynamic Models.

STPS 800-899 Special Studies NC

STPS 699 Ph.D. Thesis NC

* Descriptions of non-STP courses are given in the listings of the related departments. In addition to the courses listed here, students can take any relevant graduate course offered by other departments upon the consent of the advisor

SETTLEMENT ARCHEOLOGY PROGRAM

PROFESSORS

ERCİYAS, D. Burcu ***(Department Chair)***: B.A., Bilkent University; M.A., Ph.D., University of Cincinnati.
GÜVEN, Suna: B.A. Wellesley College; M.A., Ph.D., Cornell University.
KAYAN, İlhan: B.S., Ph.D., Ankara University. (part-time)
ÖZDOĞAN, Mehmet: B.A., Ph.D., İstanbul University. (part-time)
TUNA, Numan: B.C.P., M.C.P., METU; Ph.D., Dokuz Eylül University. (part-time)
TÜRKMENOĞLU, Asuman: B.S., M.S., METU; Ph.D., University of Cincinnati.

ASSOCIATE PROFESSORS

BERTRAM, Jan: BA, MA Halle / Saale; Ph.D., Tübingen University.
ÖZGENEL, Lale ***(Advisor to the President)***: BA, MA, Ph.D METU.

ASSISTANT PROFESSORS

ATAKUMAN, Çiğdem: B.S., M.S., METU; Ph.D. UCLA.
IOANNIDOU-PİŞKİN, Evangelia: B.A., Aristotelean University of Thessaloniki; M.A., Ph.D. Leicester University.
SERİN, Ufuk: B.Arch., M.S., METU; M.A., Ph.D., Pontificio Instituto di Archeologia Cristiana, Roma.

INSTRUCTOR

KOLAT, Çağıl : B.S., M.S., Ph.D., METU. (part-time)

AIMS AND OBJECTIVES OF THE GRADUATE PROGRAM: The objective of the program is to provide students with a solid academic preparation in archaeological theory, research techniques and modern interpretative methods with particular emphasis on settlement and environmental archaeology. Settlement archaeology has as its aim a holistic reconstruction of the cultures of ancient settlements, urban communities and their hinterlands.

Settlement archaeological research is by definition a multidisciplinary undertaking requiring expertise from the disciplines of the natural and social sciences, architecture and city planning, as well as specialized techniques related to the retrieval, recording, analysis and data bank management of archaeological data (GIS), site conservation and cultural resource management. Disciplines and interdisciplinary sub-disciplines required in addition to archaeology include geology, environmental geomorphology, archaeozoology, paleontology, paleobotany, archaeometry, ancient history, anthropology, sociology, urban geography, classical architecture, and city planning.

The objective of the program is to train students in both scientific and technological levels and social science and humanities disciplines necessary to conduct archaeological research according to contemporary international standards. The primary purpose is to train students as advanced scholars in settlement archaeology for university level of teaching, research and active participation in national and international archaeological projects in Turkey.

ADMISSION REQUIREMENTS: The two year postgraduate interdisciplinary study program in settlement archaeology is open to all holders of a degree of bachelor of art/science, and their equivalents in the following and related disciplines: Archaeology, Anthropology, Sociology, Art History, Ancient History, Classical Languages, Geography, Geology, Architecture, and City Planning. Candidates are subject to an interview before acceptance to the program.

To obtain the M.Sc. in Settlement Archaeology, candidates are required to complete a minimum of 27 credit hours in taught courses, including six required courses (two of which are field work requirements) and three approved electives as shown in the curriculum sequence given below. A thesis is also required.

GRADUATE CURRICULUM

DEFICIENCY YEAR

First Semester

CP	211	City in History I	(3-0)3
SA	503	Anatolian Archaeology	(3-0)3
ARME	531	General Archaeology	(3-0)3

FIRST YEAR

First Semester				Second Semester			
SA	501	Theory in Archaeology	(3-0)3	SA	510	Spatial Analysis in Archaeology	(3-0)3
SA	505	Geoarchaeology	(3-0)3	SA	512	Environmental Archaeology	(3-0)3
				SA	598	Field Methods in Archaeology I	(3-0)3
	2 approved electives				1 approved elective		

SECOND YEAR

Third Semester							
SA	500	Seminar in Settlement Archaeology	NC	SA	597	Field Methods in Archaeology II	(3-0)3
SA	599	Thesis	NC				

Fourth Semester			
SA	599	Thesis	NC

M.S. PROGRAM IN SETTLEMENT ARCHAEOLOGY

Required Courses

SA	501	Theory in Archaeology	(3-0)3
SA	505	Geoarchaeology	(3-0)3
SA	510	Spatial Analysis in Archaeology	(3-0)3
SA	512	Environmental Archaeology	(3-0)3
SA	598	Field Methods in Archaeology I	(3-0)3
SA	597	Field Methods in Archaeology II	(3-0)3
SA	500	Seminar in Settlement Archaeology	NC
SA	599	Thesis	NC

Elective Courses

SA	502	Artefact Analysis and Quantification	(3-0)3	SA	518	Archaeology as Anthropology	(3-0)3
SA	503	Anatolian Archaeology	(3-0)3	SA	527	Aerial Archaeology	(3-0)3
SA	506	Workshop in Settlement Archaeology	(3-0)3	SA	528	Landscape Analysis for Archaeologists	(2-2)3
SA	509	Human Biological and Cultural Evolution: Archaeological Approaches, Theory and Interpretation	(3-0)3	SA	531	Experimental Archaeology	(3-0)3
				AH	535	Seminar in Greek Architecture	(3-0)3
				AH	536	Seminar in Roman Architecture	(3-0)3
SA	514	GIS Applications in Settlement Archaeology	(3-0)3	ARCH	422	Classical Antiquity in Anatolia	

			(3-0)3
ARCH	482	Conservation of Archaeological Sites	(3-0)3
ARME	501	General Archaeometry	(3-0)3
ARME	540	Conservation and Restoration of Archaeological Objects	(3-0)3
ARME	541	Archaeological Materials and Their Properties	(3-0)3
CP	517	Issues in Urban Archaeology	(3-0)3
GEOE	528	Remote Sensing	(3-2)4
GEOE	560	Rocks and Minerals in Archaeological Studies	(3-2)4
HIST	540	Analysis of Historical Sources	(3-0)3
SOC	523	Data Analysis	(3-0)

DESCRIPTION OF COURSES

SA 501 Theory in Archaeology (3-0)3
The goal of this course is to familiarise the student with the theoretical and methodological developments in the field of archaeology. The intellectual foundations of archaeological research and how material culture is investigated, analyzed and interpreted will be discussed. Current trends, problems in theory of archaeology, modern interpretative techniques constitute the main issues at stake. The interdisciplinarity of archaeological study will be emphasized through both theoretical and methodological approaches.

SA 502 Artefact Analysis and Quantification (3-0)3
This course is an introduction to analysis and quantification of archaeological artefacts. It discusses research questions, interpretation and social significance of artefacts as well as analytical methods to be used so as to identify, record and present information correctly for a finds report. Topics include: theoretical issues on artefact analysis; extracting meaning from the artefact; changes in artefact style and its relation to culture; issues of methodology; establishing parameters for the analysis; quantification; illustration of artefacts; practical work; reporting on the results of practical work.

SA 503 Anatolian Archaeology (3-0)3
This course aims at introducing the archaeological data from Anatolia pertaining to the period from ca. 10.000 BC through the end of the Byzantine Period. This elementary course will focus on the settlements and the material culture discovered at these settlements in an attempt to provide a background to students of the Settlement Archaeology Graduate Program that come from departments other than Archaeology. While it is a good review for the students of our program, students from other programs who are interested in the ancient cultures of Anatolia may benefit greatly from this course.

SA 505 Geoarchaeology (3-0)3
This course discusses paleo-morphological and geological processes as applied to settlement archaeology. The main topics of the course include environmental systems, natural formation processes, spatial context of the sites in their physical settings, human impact on the landscape, paleo-environmental reconstructions.

SA 506 Workshop in Settlement Archaeology (3-0)3
This course concentrates on advanced research methods relevant to settlement archaeology. The course aims to teach the students methods of scientific research, verbal-visual communication and team work skills of settlement archaeology applied on site. The main topics of the course include field survey design/applied techniques, excavation management methods, data management, relative/absolute dating methods and cultural resource management. The students will be familiarised with case studies of classical sites from Anatolian archaeology.

SA 509 Human Biological and Cultural Evolution: Archaeological Approaches, Theory and Interpretation (3-0)3
This course examines archaeological theories about the development of human society. The main element is the debate about what constitutes the driven force in any given social formation. This is illustrated with archaeological examples mainly of early periods . There is a particular emphasis on the natural environments, as this is perceived as the main force by several archaeologists. Some modern trends advocating that the study of ancient societies could help present societies to plan better their future are also presented.

SA 510 Spatial Analysis in Archaeology (3-0)3
This course introduces the basic concepts, assumptions and methods of data collection, however the primary focus is on spatial analysis at regional, local and intra-site scales and within social and ecological contexts. Throughout the course, we will survey various methods of data identification, collection and analysis which are used to interpret artifact distributions at various geographical frames

from intra-site to regional scales. In doing so, we will pay particular attention to theories that inform the development and use of different interpretations.

SA 512 Environmental Archaeology (3-0)3

This course deals with the study of past environment and landscapes of Middle East and Balkans and their implications for settlement archaeology. Major topics of the course include past environments on a global scale, paleo-climates, the evolution of coastal areas and sea levels through time, investigation of the past landscapes, reconstructing the plant environment, polynology, macrobotanical remains, the animal environment, microfauna and macrofaunal remains, the human environment, and the human impact on various environmental contexts.

SA 514 GIS Applications in Settlement Archaeology (2-2)3

The aim of this course is to acquaint students with the great potential offered by GIS for the investigation of spatial relationship in archaeological data. The course consists of two parts: In part I, basic concepts and characteristics of GIS are discussed. Basic features of GIS, such as Digital Terrain Models, which have direct relevance to archaeology are stressed.

Part II deals with archaeological applications of GIS. Using case studies the potentials of GIS as a research tool will be discussed, e.g. site catchment analysis and archaeological site inventory systems. Students will have the opportunity to gain practical experience in the use of GIS using archaeological data which is available at the data bank of the METU museum.

SA 518 Archaeology as Anthropology (3-0)3

This course traces the history of archaeological thought and explore the diversity of theoretical approaches that comprise the modern field of archaeology. The course introduces students to the major issues of archaeology and the schools of thought that continue to influence archaeological debates around those issues, in a historical context.

SA 522 Advanced Topics in Environmental Archaeology (3-0)3

This course examines the contribution of environmental evidence to archaeological debates in a broader view. It takes examples of major archaeologically visible events and social-economical formations (such as Neolithisation, Urbanisation, Collapse of Cultures, Trade, Social Stratification, Rituals) and looks at the information that can be introduced to the archaeological enquiry by animal/plant data. The course is not "period" centered; in contrast, it aims to present environmental "approaches" in wider archaeological problems which are then generic and can be applied to various contexts and dates according to the interest of student.

SA 527 Aerial Archaeology (3-0)3

Aerial photography is a useful and powerful tool to identify natural and/or artificial features existing on the earth's surface. Archaeological information can be easily extracted from aerial photographs both by 3D (stereoscopic) analysis and from scanned photographs on the screen. The main objective of the course is to train students in the interpretation of aerial photographs for the identification of these features.

SA 528 Landscape Analysis for Archaeologists (2-2)3

Archaeology program Several undergraduate /graduate courses are offered in the university that involve certain field studies. Most of the students in these courses have a general difficulty in the recognition of physiographic features of earth's surface. Graduate students particularly in Settlement are believed to be familiar with morphological features and natural processes that exist in the vicinity of a site. The main objective of this course is, therefore, to teach and introduce basic features and earth's surface to the student and to enable him/her to interpret topographic maps and extract information from landforms that surround the site.

SA 531 Experimental Archaeology (3-0)3

A project designs for research to study the agricultural and domestic economy of Bronze and Iron Age in Anatolia. Experiments conceived out of the archaeological data to explore the questions raised by archaeologists.

SA 597 Field Methods in Archaeology II (3-0)3

The students are expected to participate in archaeological work (survey or excavation) during the summer months and in the context of this course they are expected write a report including daily activities, documentation on excavation, samples of database, drawings and other practical activities they were involved in.

SA 598 Field Methods in Archaeology I (3-0)3

This course will provide hands-on experience in the field to students of archaeology. Field practice will be conducted on campus during when the students will actively participate in documentation, measuring, mapping, drawing and surveying. It is intended as a preparation for actual archaeological filed work expected from the students in the following summer months.

Ph.D. PROGRAM IN SETTLEMENT ARCHAEOLOGY

ADMISSION REQUIREMENTS:

- To have an M.A/M.S. degree
- To satisfy the minimum requirements of Social Sciences Institute-METU
- To be successful at the interview

To obtain a Ph.D. in Settlement Archaeology candidates are required to complete a minimum of 21 credit hours in taught courses, including two required courses and five approved electives. The doctoral qualifying examination is hold after 4 semesters of study. The Ph.D. candidate is obliged to complete the doctoral thesis within the 4 semesters following the doctoral qualifying examination.

GRADUATE CURRICULUM
DEFICIENCY YEAR

First Semester				Second Semester			
SA	501	Theory in Archaeology	(3-0)3	SA	510	Spatial Analysis in Archaeology	(3-0)3
SA	505	Geoarchaeology	(3-0)3	SA	512	Environmental Archaeology	(3-0)3
SA	598	Field Methods in Archaeology I	(3-0)3				

FIRST YEAR

First Semester				Second Semester			
SA	560	Landscape Archaeology	(3-0)3	SA	566	Current Approaches in Archaeological Research	(3-0)3
		3 Approved Electives				2 Approved Elective	

*3 of the elective courses must be taken from the courses with SA code, one from each group.

Required Courses

SA	501	Theory in Archaeology	(3-0)3
SA	505	Geoarchaeology	(3-0)3
SA	510	Spatial Analysis in Archaeology	(3-0)3
SA	512	Environmental Archaeology	(3-0)3
SA	560	Landscape Archaeology	(3-0)3
SA	566	Current Approaches in Archaeological Research	(3-0)3
SA	600	Advanced Seminar in Settlement Archaeology	NC
SA	699	PhD Thesis	NC

Elective Courses

Theory and Interpretation (Group 1)

SA	518	Cultural Anthropology	(3-0)3
SA	561	Issues in Archaeological Heritage Management	(3-0)3
SA	562	Issues in Archaeology. Power, Politics and Ethnicity	(3-0)3
SA	563	Social Representations in Archaeology. The Cognitive Approach	(3-0)3
SA	564	Advanced Issues in Anatolian Archaeology	(3-0)3

Practice (Group 2)

SA	502	Artefact Analysis and Quantification	(3-0)3
SA	506	Workshop in Settlement Archaeology	(3-0)3
SA	514	GIS Applications in Settlement Archaeology	(3-0)3
SA	531	Experimental Archaeology	(3-0)3
ARCH	482	Conservation of Archaeological Sites	(3-0)3
ARME	540	Conservation and Restoration of Archaeological Objects	(3-0)3
ARME	541	Archaeological Materials and Their Properties	(3-0)3
GEOE	528	Remote Sensing	(3-2)4
GEOE	560	Rocks and Minerals in Archaeological Studies	(3-2)4

Environment and Settlement (Group 3)

SA	503	Anatolian Archaeology	(3-0)3
SA	509	Human Biological and Cultural Evolution: Archaeological Approaches, Theory and Interpretation	(3-0)3
SA	527	Aerial Archaeology	(3-0)3
SA	528	Landscape Analysis for Archaeologists	(2-2)3
SA	565	Domestic Archaeology	(3-0)3
AH	521	Themes on Ancient Domestic Architecture	(3-0)3
AH	535	Seminar in Greek Architecture	(3-0)3
AH	536	Seminar in Roman Architecture	(3-0)3
AH	543	Anatolian Seljuk Architecture (11-14th Centuries)	(3-0)3
AH	655	Spaces and Practices of Displaying the Past	(3-0)3
ARCH	422	Classical Antiquity in Anatolia	(3-0)3
CP	517	Issues in Urban Archaeology	(3-0)3

DESCRIPTION OF COURSES

SA 560 Landscape Archaeology (3-0)3

While archaeological data has to be recorded as a fixed entity in space and time, the reality is that the human encounter with the landscape has cultural dimensions that are quite fluid and complex. Archaeology provides unique insight to understand the cultural construction of landscapes in terms of people's sense of place, time, power, memory, imagination and identity. Therefore, throughout the course we will be surveying theories and methods that will bridge the gap between the physical reality of data and the cultural logic behind the people's relationship to their surroundings.

SA 561 Issues in Archaeological Heritage Management (3-0)3

"Heritage" is a concept that is constructed at the intersection of the global, national and local politics. This course introduces students to this contestation and the ambigous nature of the concept, while it attempts to anchore the practice of archaeological heritage management in the ethics and responsibilities of the archaeologist.

SA 562 Issues in Archaeology, Power, Politics and Ethnicity (3-0)3

Archaeological evidence, especially deriving from the Classical period, is often very generous in providing us with information on exercise of power, sometimes by individuals and at other times by groups of people, the role of power politics in the form and function of settlements, and not so generous but still informative on questions of identity. While the archaeological data opens a window into the past applications of power, politics and ethnicity, we archaeologists add yet another perspective to the study of ancient settlements with our own biases originating from the quiet power struggles and rejuvenated national identities of our times. In this course, these two perspectives, one from the past into the future and the other from today into the past will be examined through their impact on ancient settlements and our perception of them today.

SA 563 Social Representations in Archaeology, the Cognitive Approach (3-0)3

The course contains two parts. Different approaches and methods of the cognitive archaeology will be discussed in theoretical part. The second shows samples from Neolithic Period to the Late Bronze

Age and includes ethnographical and historical samples. An emphasis is on the analysis of settlement structures. The goal of the course is to impart the basics of the cognitive archaeology with regard to social representations.

SA 564 Advanced Issues in Anatolian Archaeology (3-0)3
The course is aimed to develop students' critical abilities through intensive study of current issues in Anatolian archaeology. Archaeological theory such as "explanations of culture change" and relationship between "ethnicity and "material culture" will be approached through case studies, partially in a seminar format.

SA 565 Domestic Archaeology (3-0)3
The lecture has the main emphasis on the reconstruction of activities in houses/settlements and the interpretation of archaeological findings (Neolithic to Early Iron Age, approximately 8000-800 BC cal.).

SA 566 Current Approaches in Archaeological Research (3-0)3
This course aims to prepare the students for the PhD qualification exam and is directed towards reviewing archaeological research by focusing on critical evaluation of contemporary theories and methods. It aims to equip students with the tools of studying a topic comprehensively to develop their own research techniques and interpretations.

SA 600 Advanced Seminar In Settlement Archaeology NC

SA 699 Ph.D. Thesis NC

SOCIAL POLICY PROGRAM

PROFESSORS

ECEVİT, Yıldız: B.A., M.A., Hacettepe University; Ph.D., University of Kent.
ERDİL, Erkan: B.S., M.S., METU; Ph.D., Maastricht University and METU.
GÜNDÜZ HOŞGÖR, Ayşe: B.A., M.A., METU; Ph.D., University of Western Ontario.
TANSEL, Aysıt: B.S., METU; M.S., University of Minnesota.Ph.D., State University of New York at Binghamton.
YAZICIOĞLU, Kamil (Part-Time): MD, PhD: GATA.

ASSOCIATE PROFESSORS

AKAR, Hanife: B.A., Anadolu University; M.S., Ph.D., METU.
AŞÇIGİL, Semra F.: B.S., Boğaziçi University; Ph.D, METU.
DAYIOĞLU TAYFUR, Meltem: B.A., Ohio Wesleyan University; M.A., University of Michigan; Ph.D., METU.
ERCAN, Hakan: B.S., M.S., METU; Ph.D., University of Iowa.
JASSAL, Smita: B.S., M.S., PhD: Delhi University.
KALAYCIOĞLU, Sibel: B.A., METU; Ph.D., University of Kent.
RITTERSBERGER TILIÇ, Helga: Diploma, University of Bonn; PhD, University of Essen.
YILDIZ, Bilge (Part-Time): MD, PhD: GATA.

ASSISTANT PROFESSORS

AYBARS, Ayşe İdil: B.A., METU; M.S., LSE; Ph.D. University of Ulster
BAYIRBAĞ, Mustafa Kemal: B.Cp., METU; M.S. METU; Ph.D. Carleton University
BEŞPINAR, Fatma Umut ***(Chairpersoon)***: B.A., METU; M.A., METU; Ph.D., University of Texas at Austin
ÇELİK, Birten: M.S., Ph.D: Dokuz Eylül University.
EREN VURAL, İpek: B.S., METU; M.S., LSE; PhD, University of Sussex.
KALKAN, Kerem Ozan: B.S., METU; M.S., Bilkent; PhD, University of Maryland.
ÖZEN, İlhan Can: B.A.: Bilkent University; MS, Ph.D: Johns Hopkins University
TOPAL, Çağatay: B.S., M.S., METU; PhD: Queens University Kingston.

INSTRUCTORS

FIĞLALI TAŞKIN, Ayşegül (Part-Time): B.S., M.S., Ph. D.: METU
ÖNDER, Özhan (Part-Time): B.S, Mimar Sinan University, M.S, METU, PhD, METU

AIMS AND OBJECTIVES OF GRADUATE PROGRAMS: Social policy includes an academic analysis of the policies which aim at increasing the welfare level of the citizens and of the activities which are realized within this direction. The main goal of these policies is to ensure a socially and economically fairer share and the way of use, that would carry economic activity into further levels, of sources distributed by the market mechanism. Processes like instability, unbalanced growth and income distribution anomalies which threaten many countries today, lead to an increase and deepening of social problems especially in the countries where social security institutions are weak. This situation anticipates an essential (radical) regulation of employment and labor markets, education, work life, health and social security systems, by taking the new problems and developments into consideration. It is possible to secure vital elements such as productivity, prolificacy, employment, development, social welfare and social reconciliation in a country, only by the development of strong and effective social policies.

ADMISSION REQUIREMENTS AND CURRICULUM: Admission procedure will be implemented according to the Academic Rules and Regulations Concerning Graduate Studies of METU.

The program is designed for students from diverse disciplinary backgrounds and, hence, is expected to attract students from a variety of departments. As indicated, the SPL Program offers both thesis and non-thesis options. In the former, students are required to complete seven credit-courses and a Prothesis Seminar as well as write a conventional M.S. Thesis and write a dissertation of 10000-12000 words. In the non-thesis option,

students are required to take ten credit courses and complete a term project. Upon the successful completion of the requirements of either program, a M.S. degree in SPL will be conferred.

M.S. PROGRAM IN SOCIAL POLICY
(THESIS AND WITHOUT THESIS)

Must Courses:

SPL	501	Social Policy and Development
SPL	502	Social Policy Research and Project Development

Elective Courses

SPL	511	Unemployment and Social Policy
SPL	512	Health and Social Policy
SPL	513	Gender Perspectives on Development
SPL	514	Population Dynamics and Social Policy in Turkey
SPL	515	The European Union and Gender Equality Policies
SPL	517	Disability and Social Policy I
SPL	518	Disability and Social Policy II
SPL	519	Citizenship: Turkish Experiences
SPL	550	Sociological Perspectives
SPL	522	Social Policies of Disadvantage
SOC	307	Issues in State and Social Policy
SOC	312	Political Sociology
SOC	314	Work and Organization
SOC	384	Sociology of Development
SOC	405	Industrial Sociology
SOC	510	Urban Theory and Policy
SOC	518	Social Movements and Civic Action
SOC	526	Issues in Women's Work and Employment
SOC	539	Social Policy and Welfare Issues in Turkey
SOC	541	Labor Market and Social Rights
SOC	543	Family, Marriage and Kinship Dynamics in Turkey
SOC	554	Challenges of Social Policy in the EU and Turkey
SOC	641	Sociology of Industrialization and Modernization
ADM	305	Bureaucracy and Turkish Bureaucracy
ADM	304	Public Policy
ADM	419	Labor Law
ADM	487	Regional Policy and Governance
ADM	504	States and Society in Europe
ADM	551	Politics of Social Policy
ECON	404	Health Economics
ECON	432	Economics of Inequality and Discrimination
ECON	465	Development Economics
ECON	469	Economics of Labor
ECON	497	Comparative European Labor Markets
ECON	693	Education Health and Human Capital I
ECON	694	Education Health and Human Capital II
IR	427	Politics of Social Welfare in Europe
BA	513	Corporate Governance and Social Responsibility
BA	515	Business Ethics
EDS	552	Education and Social Policy
HIST	360	Ottoman Labor History (19th Century)

DESCRIPTION OF COURSES

SPL 501 Social Policy and Development (3-0)3

The course aims to familiarize students with current debates relating to the human development paradigm and the capabilities approach as proposed by Amartya Sen, and to examine their value as sociological tools for enhanced social policy. Conceptual issues on social policy in a development context will be examined. The perspective of human development and the capabilities expansion will be applied to analyze Turkey´s experience in people-centred development. Current thinkers of Human Development Paradigm and the Capabilities Approach will be examined on the basis of readings from the Journals of Human Development, published by Taylor and Francis Group of the Routledge Press. The course will address multiple issues relating to the interrelationship between social policy and development. Ongoing sociological debates on the concepts of inequality, equality of opportunities, poverty, capabilities expansion, redistribution, the role of the state, market and the civil society will be re-examined from the perspective of the human development paradigm/capabilities approach.

SPL 502 Social Policy Research and Project Development (3-0)3

This course aims to relate recent discussions in the philosophy of science to methodological issues in social sciences and humanities. Various philosophical issues which have implications for social science research and limitations of the social sciences are discussed.

SPL 511 Unemployment and Social Policy (3-0)3

This course is intended for graduates of different disiplines who wish to increase their understanding of the unemployment policy process. Focus will be on the impact of globalisation on unemployment policy. Topics such as : theories of the causes of unemployment, analyzing the activities of EU governments, in particular the policies of the welfare state; and types and varieties of unemployment concerning gender, different age groups and skill and qualification levels; sociological understanding of the impact of unemployment in everyday life of the actors, will be covered in the course. Course also aims to discus the social, economic and political framework of Turkey, by focusing on the role allocation of the (labour) market, the state and family related to unemployment.

SPL 512 Health and Social Policy (3-0)3

The major focus of this course is to analyze the social determinants of health, health inequality through the lens of social justice. The course aim is to develop an understanding how social policies impact health? The minor focus of this course is to analyze the Turkish health system and the forces driving its change.

SPL 513 Gender Perspectives on Development (3-0)3

The course focuses on the gendered nature and impact of development to understand the assumptions and socio-political consequences of the 'ideology' of development and the ambivalent effects of its strategies. The institutionalization of gender inequalities and the role of states in reproducing them is a theme that runs through the course. The reasons for the continuing marginalization of women and the nature of disadvantages they face in the structuring of labor markets, is investigated.

SPL 514 Population Dynamics and Social Policy in Turkey (3-0)3

The course aims to concentrate on relations between population dynamics and social policy in Turkey. The course first introduces fundamental knowledge about population structure and population processes in Turkey. In this part graduates will be familiar with population policies and plans of the country. After picturing out the population dynamics of Turkey, demographic structures (population size, age structure, and residential distribution) and demographic processes (fertility, mortality, migration) and their policy implications will be discussed. The course will also cover regional demographic differential and its policy implication in Turkey. This course will be finalized with discussions on population projections and their policy implications. At the end of the course the students are expected to examine population dynamics as a fundamental factor for the development of strong and efficient social policies.

SPL 515 The European Union and Gender Equity Policies (3-0)3

This course explores the conceptual foundations, approaches as well as the practices of EU and Gender Equality policy development framework. Current intellectual thought and debate on EU and equal opportunity policies and legislation within the framework of the European Social Model will constitute the main focus of this course's content. Course participants will be guided, based on latest readings, to understand and to discuss gender equality policies with a detailed examination and

interpretation of EU's anti-discrimination policy framework. The course will further examine the manner in which equality policies are incorporated and/or mainstreamed in the European integration process, in relation to the political power processes of the Union, in particular. The course expects to provide to the participants/students the opportunity to compare and contrast the intellectual interpretations and responses that have been developed on gender equality. Gender equality policy framework in Turkey and the implementation of relevant public policies will be studied as a primary focus area. Finally, intellectual and policy challenges of understanding the dynamics and transpositions of the national political factors and the supranational institutions in the formulation of gender equality policies will be studied.

SPL 517 Disability and Social Policy I (3-0)3

The social and medical models in disability policies. International disability rights and legislations. The disability policies and legislations for disabilities in Turkey. The rights of the disabled. The health policies for the disabled. Being disabled and being woman. The ethical responsibilities of community against the disabled. Disability and work related issues.

SPL 518 Disability and Social Policy II (3-0)3

The understanding of the terms of disability, impairment and handicapped. International disability rights and legislations. The disability policies and legislations for disabilities in Turkey. The rights of disabled.

SPL 519 Citizenship: Turkish Experiences (3-0)3

This course aims to review the recent debate on citizenship by focusing on Turkish experiences. It is expected that analyzing the process of citizenship development in Turkey and studying the practice and theoretical framework of citizenship rights and duties will help to design sound social policies. the course will start with an introduction to the fundamental concepts of citizenship and followed by the discussion of the liberal and publican (and communitarian) approaches to citizenship and its civil, political and social elements. the course will also examine the new modalities of citizenship which have been proposed to redefine the extent and content of citizenship to include rights based on identity and difference. The second part of the course is reserved to Turkish experiences. Starting with the Ottoman legacy state formation and nation building in the Early Republican Period will be examined. Then the developments in the post-1980 period and the current debates on citizenship in Turkey will be reviewed. The course will be finalized by discussing the studies on citizenship rights and duties in Turkey.

SPL 522 Social Policies of Disadvantage (3-0)3

Mainly focusing to the division of the state and civil society, and current transformations on their relations, the course aims to ask, with its participants, several questions concerning disadvantageousness. There the main debates the course will cover are: What disadvantageousness is; in which forms and/or fields does it operate; what are the valid practical policies on the run; what sort of needs there are; what are the fundaments of mistakes taken; and what sort of social policies can be viable to deal with the questions of the field.

SPL 550 Sociological Perspectives (3-0)3

Classical and contemporary sociological theories, sociological perspectives of the classical figures (Marx, Weber, Durkheim, Simmel), introduction to contemporary sociological theory, sociological perspectives of the contemporary social theorists (Foucault, Derrida, Deleuze and Guattari, Bourdieu).

* Descriptions of non-SPL courses are given in the listings of the related departments.

URBAN POLICY PLANNING AND LOCAL GOVERNMENTS PROGRAM

PROFESSORS

ERSOY, Melih: B.C.P., METU; M.C.P., Columbia University; Ph.D., METU.
KELEŞ, Ruşen: B.A., Ph.D., Ankara University. (Part time)

ASSOCIATE PROFESSORS

ŞENGÜL, H. Tarık: B.C.P., M.S., METU; Ph.D., University of Kent at Canterbury
KESKİNOK, H. Çağatay: B.C.P., M.S., Ph.D., METU.
BALABAN, Osman: B.S., M.S., Ph.D., METU
AYTEKİN, Attila: B.S., METU; M.A., Bilkent University; Ph.D. Binghampton University, SUNY
ÇINAR, Tayfun: B.A., M.S., Ph.D., Ankara University (Part Time)

ASSISTANT PROFESSOR

BAYIRBAĞ, Mustafa Kemal ***(Department Chair)***: B.C.P., M.S, METU; Ph.D., Carleton University.

INSTRUCTOR

BİRLER, Ömür: B.A, METU; M.A, Bilkent Üniversity; Ph.D. Carleton University

AIM: The complexity of urban problems and policy processes require a multi-disciplinary approach. Urban Policy Planning and Local Governments (UPL) is a joint program established by the Department of Urban and Regional Planning and the Department of Political Science and Public Administration to meet this objective.

The aim of the graduate program is to specialize students in the fields of urban policy analysis and design, urban project management and local government. The program offers M.S. and Ph.D. degrees.

As part of the multi-disciplinary approach, the program admits not only the graduates of these two main disciplines, but also the students from other fields such as law, economics, management, psychology, sociology, engineering and architecture.

The program has two main orientations. On the one hand, it provides a synthesis of different disciplines, by enjoying the contributions of each field. On the other hand, the program aims to strengthen the link between theory and practice of urban management and policy making, By doing this, it challenges the pragmatic approaches which have traditionally dominated the urban policy processes.

The graduates of different disciplines, especially who work in municipalities, planning agencies and other policy oriented institutions are encouraged to apply to the program.

The students are allowed to choose between thesis and non-thesis programs on the basis of their interests and future professional choices.

M.S. PROGRAM IN URBAN POLICY PLANNING AND LOCAL GOVERNMENTS (Thesis)

CURRICULUM

First Semester

Must Courses

(*For the Graduates of Political Sciences and the Related Departments)*

UPL	515	Urban Planning Theory and Practice	(3-0)3

(For the Graduates of City and Regional Planning)

UPL	503	Theory and Practice in Public Administration	(3-0)3

(For the Graduates of Other Departments)

UPL	503	Theory and Practice in Public Administration	(3-0)3
UPL	515	Urban Planning Theory and Practice	(3-0)3

Elective Courses

UPL	527	Legal and Administrative Analysis of Urbanization	(3-0)3

Second Semester

Must Courses

UPL	522	Urban Policy Planning and Local Governments Studio I	(4-4)6
UPL	540	Environmental Politics and Policy	(3-0)3

(*For the Graduates of Political Sciences and the Related Departments)*

CRP	372	Planning Theory	(3-0)3

(For the Graduates of City and Regional Planning)

UPL	518	Contemporary Political Theory	(3-0)3

(For the Graduates of Other Departments)

UPL	518	Contemporary Political Theory	(3-0)3
CRP	372	Planning Theory	(3-0)3

Elective Courses

UPL	517	Public Economy and Local Government Finance	(3-0)3
UPL	528	Historical Roots of Urban Politics and Local Governments	(3-0)3
UPL	532	Urban Politics	(3-0)3

Third Semester

Must Courses

UPL	511	Urban Policy Planning and Local Governments Studio II	(4-4)6
UPL	504	Prothesis Seminar	NC
UPL	599	Urban Policy Planning and Local Government Thesis	NC
XXX	8XX	M.S Special Studies	NC

Total Course Load is 8 (with UPL504_Prothesis Seminar). Total minimum credit is 27
Elective Courses can be taken from the courses of City Planning, Political Sciences and Public Administration and other related departments.

M.S. PROGRAM IN URBAN POLICY PLANNING AND LOCAL GOVERNMENTS (Without Thesis)

CURRICULUM

First Semester

Must Courses

(*For the Graduates of Political Sciences and the Related Departments)*
UPL 515 Urban Planning Theory and Practice (3-0)3
(For the Graduates of City Planning and the Related Departments)
UPL 503 Theory and Practice in Public Administration (3-0)3
(For the Graduates of Other Departments)
UPL 503 Theory and Practice in Public Administration (3-0)3
UPL 515 Urban Planning Theory and Practice (3-0)3

Elective Courses
UPL 527 Legal and Administrative Analysis of Urbanization(3-0)3

Second Semester

Must Courses

UPL 522 Urban Policy Planning and Local Governments Studio I (4-4)6
UPL 588 Urban Policy Planning and Local Government Project Course NC
UPL 540 Environmental Politics and Policy (3-0)

(*For the Graduates of Political Sciences and the Related Departments)*
CRP 372 Planning Theory (3-0)3
(For the Graduates of City Planning and the Related Departments)
UPL 518 Contemporary Political Theory (3-0)3
(For the Graduates of Other Departments)
UPL 518 Contemporary Political Theory (3-0)3
CRP 372 Planning Theory (3-0)3

Elective Courses
UPL 517 Public Economy and Local Government Finance (3-0)3
UPL 528 Historical Roots of Urban Politics and Local Governments (3-0)3
UPL 532 Urban Politics (3-0)3

Third Semester

Must Course
UPL 511 Urban Policy Planning and Local Governments Studio II (4-4)6

Total Course Load is 11 (with UPL588 Project Course). Total minimum credit is 36
Elective Courses can be taken from the courses of City Planning, Political Sciences and Public Administration and other related departments.

Ph.D. PROGRAM IN URBAN POLICY PLANNING AND LOCAL GOVERNMENTS

CURRICULUM

First Semester

Must Courses

UPL	601	Urban Space and Politics	(3-0)3
UPL	603	Qualitative Research Methods	(3-0)3

Elective Courses

UPL	527	Legal and Administrative Analysis of Urbanization	(3-0)3

Second Semester

Must Courses

UPL	602	Planning, Politics and Public Policy	(3-0)3
UPL	604	Quantitative Research Methods	(3-0)3

Elective Courses

UPL	517	Public Economy and Local Government Finance	(3-0)3
UPL	528	Historical Roots of Urban Politics and Local Governments	(3-0)3
UPL	532	Urban Politics	(3-0)3

Third Semester

Must Courses

UPL	610	Prothesis Seminar	NC
UPL	699	Ph.D. Thesis	NC
XXX	9XX	Ph.D. Special Studies	NC

Total Course Load is 9 (with UPL610 Prothesis Seminar). Total minimum credit is 24.
Ph.D students should take 4elective courses to fill the course load.
Elective Courses can be taken from the courses of City and Regional Planning, Political Sciences and other related departments.

DESCRIPTION OF COURSES

UPL 503 Theory and Practice in Public Administration (3-0)3
The course is designed to introduce definition of the discipline of public administration and basic problem areas; discussion of Turkish public administration system and its problems, alternative methods of solution.

UPL 511 Urban Policy Planning and Local Governments Studio II (4-4)6
Formulation of multi-dimensional policy designs for the solution of selected urban problems; means whereby interventions can be made on legal, administrative, financial and economic variables and development of tools that can contribute to the formation of urban space.

UPL 515 Urban Planning Theory and Practice (3-0)3
Basic planning approaches and typologies, techniques and principles; planning hierarchy, physical planning types and tools; principles of zoning, sectoral planning examples such as residential, city center, industry, recreation and historical conservation.

UPL 517 Public Economy and Local Government Finance (3-0)3
Definition of state's economic and financial functions; public goods theory; decentralization of state's economic and financial functions; the concept of local income and revenue types; methods of income sharing between administrations; characteristics of public revenue and expenditures and government budget in Turkey; historical

evolution of local government finance and principles governing local government budgeting in Turkey.

UPL 518 Contemporary Political Theory (3-0)3
This course is aimed to introduce students to the work of major political thinkers of the 20th century with the central focus on the problems of domination and inequality. It begins with the four major thinkers of the previous century who have influenced heavily the 20th century political philosophy: Kant, Hegel, Nietzsche and Marx. Then, we will read essays and short passages by Arendt, Foucault, Habermas, Rawls and Mouffe with the aim of reaching certain generalizations and comparisons. Our major questions would be: What kind of different attitudes toward the problems of domination and inequality can be delineated? What is the relationship between domination and inequality? Do they inevitably suppose each other?

UPL 522 Urban Policy Planning and Local Governments Studio (4-4)6
Analysis of selected urban problems in their legal, administrative, financial, economic dimensions and their impacts on the formation of urban space; examination of the opportunities offered or constraints imposed by legal, administrative, financial and economic variables with respect to the solution of problems. In addition to these, students from disciplines other than urban planning will be directed towards exercises that would introduce them to the general framework and basic concepts of urban planning as well as planning tools.

UPL 527 Legal and Administrative Analysis of Urbanization (3-0)3
Legal and administrative framework regulating the functioning of urban administrations; theory of public goods; municipal goods, their management and control; division of labour between central and local governments; analysis of elements hindering the legal and administrative effectiveness of this division; control over municipal activities and models directed towards enhancing the effectiveness of this control.

UPL 528 Historical Roots of Urban Politics and Local Governments (3-0)3
The production of space approach of Henri Lefebvre, his notion of everyday life and its relation to urban studies and especially urban history; sources for writing Ottoman urban history, sources for writing European urban history; the connections of modernity and urbanism on the basis of Eastern and Western European cities; pre-modern multi-ethnic cities in imperial settings; the transition from empire to nation-state and its impact upon urban space; the crossroads of urban history and cultural and intellectual history; the relation between upper classes and 'commoners' Ottoman cities.

UPL 532 Urban Politics (3-0)3
The course is designed to introduce the students to the basic concepts of urban politics and policy sciences. The students will be able to analyze better the political processes and decision-making concerning local communities. The course is supposed to contribute students to combine their knowledge in Urban Design and Local Government with Political Theory.

UPL 540 Environmental Politics and Policy (3-0)3
Global environmental challenges pose serious threats to human wellbeing and settlements. Along with international organizations and national states, cities are now particularly influential in policymaking to protect the global environment. This course will explore the foundations and evolution of environmental politics and policy at three fundamental levels of governance: the global, national and sub-national levels. The course will provide the students with key aspects of major environmental problems, evolution of the international politics of environmental issues as well as specific organizations, actors and policies of contemporary environmental governance.

UPL 599 Urban Policy Planning and Local Government Master Thesis NC

UPL 504 Prothesis Seminar NC

UPL 588 Urban Policy Planning and Local Government Project Course NC

UPL 601 Urban Space and Politics (3-0)3
Evaluating paradigmatic assumptions of urban and political theorists according to the theoretical debates around issues of urban politics and space. Identifying conflicts among political actors, civil society and capital in shaping the urban space. Analysing state policies, political mobilization and urban social movements.

UPL 602 Planning, Politics and Public Policy (3-0)3
Political nature of urban planning and public policy making is studied. Course provides an advanced analysis of urban politics and policy making. Students are provided with the knowledge and analytical tools to understand and operate within the urban political process and urban policy making. Strategical skills and the ability to contribute to the formulation and implementation of public services will be developed.

UPL 603 Qualitative Research Methods (3-0)3
In this course various qualitative research techniques are examined. The course provides a basic understanding of qualitative methods for conducting empirical social science research. It covers the process of social science research, serving methods, obstacles to empirical research and ethnical issues in social science research.

UPL 604 Quantitative Research Methods (3-0)3
This course focuses on statistical models and methods used in empirical research. Analysis and interpretation of variety of data sets and statistical models that assess single/multiple outcome or criterion variable is examined.

UPL	**610**	**Prothesis Seminar**	**NC**
UPL	**699**	**Ph.D. Thesis**	**NC**
XXX	**8XX**	**Special Studies**	**NC**
XXX	**9XX**	**Special Studies**	**NC**

GRADUATE SCHOOL OF MARINE SCIENCES

Director : *Kıdeyş,* Ahmet Erkan; B.S., Selçuk University; M.S., METU; Ph.D., University of Liverpool.
Associate Director: TUĞRUL, Süleyman; B.S., M.S., Ph.D., METU.
Associate Director: SALİHOĞLU, Barış; B.S., M.S., METU; Ph.D., Old Dominion University.

PROFESSORS

KIDEYŞ, Ahmet Erkan ***(Director)***: B.S., Selçuk University; M.S., METU; Ph.D., University of Liverpool.
ÖZSOY, Emin: B.S., METU; M.S., University of Miami; Ph.D., University of Florida.
TUĞRUL, Süleyman ***(Associate Director)***: B.S., M.S., Ph.D., METU.
UYSAL, Zahit: B.S., Ege University; M.S., Ph.D., METU.
YEMENİCİOĞLU, Semal: B.S., M.S., Ph.D., METU.
YILMAZ, Ayşen: B.S., Hacettepe University; M.S., Ph.D., METU.

ASSOCIATE PROFESSOR

GÜCÜ, Ali Cemal: B.S., Ege University; M.S., Ph.D., METU.

ASSISTANT PROFESSORS

FACH SALİHOĞLU, Bettina A.: B.S., M.S., Fachhochschule Wilhelmshaven;
Ph.D., Old Dominion University.
SALİHOĞLU, Barış ***(Associate Director)***: B.S., M.S., METU; Ph.D., Old Dominion University.
KOÇAK, Mustafa: B.S., Ege University; M.S., Ph.D., METU.
ARKIN, Sinan Şadi: B.A., Johns Hopkins University; M.S., Ph.D., Imperial College London.

INSTRUCTORS

IBELLO, Valeria: B.S., M.S., Ph.D., Università degli Studi di Napoli–Federico II.
ZENGİNER YILMAZ, Arife: B.S., M.S., METU.

GENERAL INFORMATION: The Graduate School of Marine Sciences offers curricula in Atmospheric Sciences, Chemical Oceanography, Marine Biology and Fisheries, Marine Geology and Geophysics, and Physical Oceanography. The programs are envisioned to provide future scientists with thorough education and training in their fields. Special emphasis is given to studying the national marine environment, in keeping with the Institute's objectives of developing and improving the marine resources of Turkey.

Students with a B.S. degree (or equivalent) in one of the natural sciences or engineering, and interest in working at sea may apply. Experience with computers is desirable. Training of graduate students is greatly enhanced by active participation in research programs carried out at sea, and in the laboratories of the Institute.

The Institutes' campus is situated in Erdemli, about 45 km west of Mersin on the southern coast of Turkey. Office buildings, laboratories, computing and remote sensing facilities, a library and other services are located within the campus. Housing for staff and students and a harbor facility are also located on campus.

RESEARCH INTEREST AND FACILITIES: The Institute is involved in research in the seas surrounding Turkey. The research encompasses a wide range of topics in the disciplines offered by the Institute. Some of the recent studies are field investigations and numerical modeling of the general oceanic circulation, water mass formation and exchange between the ocean basins, ecosystem modeling and pollution studies, nutrient dynamics, primary production, fish population dynamics, fish stock assessment studies, marine biodiversity, plankton dynamics, exotic and invasive species, conservation biology and endangered species, marine protected areas (MPA), acoustical methods in fisheries science, topography and structure of sub-bottom sediments and rocks, and application of remote sensing to oceanography, the interactions between marine environment and genome, identify the origin and diversity of organisms (Population genetics and DNA

barcoding study), and also affection of pollutant on genome (from the gene to the ecosystem) is searching with gene expression. Major emphasis is given to long term, multi-national cooperative studies, providing basin wide comprehensive data sets for analyses.

The Graduate School of Marine Sciences has the following research facilities available for training and research:

Research vessels: The Institutes' research ship, the 40 m R/V Bilim 2, is equipped for biological, chemical, geophysical and physical studies, as well as for fisheries research. The ship has a capacity of staying out at sea for 45 days with a group of about 14 scientists. The 16 m Lamas 1 is a trawler and equipped for demersal and acoustic fisheries surveys in and beyond the Turkish territorial waters in the eastern Mediterranean. The third vessel, Erdemli is a Gulet for near-shore oceanographic surveys; which is also suitable for diving.

Computing facilities: The computing facilities at the Institute include local multi-processor systems (several blade and workstation configurations up to 128 cores and 50 Gb memory), in a continuous state of development by new additions, high speed LAN at 10Gb and 1GB, wireless networks, peripheral equipment such as printers, plotters, A/D converters, numerous desktop and laptop PC's, and communication interfaces.

Remote Sensing: Institute has an extensive high resolution data archive from NOAA AVHRR, Seawifs and Modis Satellites. Regional Cilmatologic Data products are available through the web interface for model verification and climate research. Satellite receiving facilities are no longer available; instead satellite data is downloading via international data centers (NASA, ESA) and processing in the institute.

Laboratories and Equipment: An 800 square meters of Marine Ecosystem and Climate Research Center (DEKOSİM) laboratory is available in campus. Biology, chemistry, geology labs and instrument maintenance rooms are included in this laboratory.

Major Laboratory Equipment:

Atomic absorption spectrophotometer, HPLC, Gas chromatography, UV-VIS Spectrophotometer, Spectrofluorometer, CHN Element analyzer, Dissolved oxygen meter, Isotop (C^{14} and H^{3}) Measuring system, LI 1800 uw Underwater Spectroradiometer, Portable incubators for fecal coliforms and primary production analysis, Mini-fluorometer, Stereomicroscope systems (epifluorescence, image analysis systems), Flow Cytometer, 4-channel auto-analyser, Ion Chromatography, High volume air samplers with size selective sampling inlet, Wet precipitation sampler, Nepholemeter, Sun photometer, PM10 particle sampler, and High volume particle sampler, ICP mass spectrometer, Real Time Thermal Cycler (PCR machine) Roche 480, Thermal cyclers (PCR machines) BIORAD, Gel electrophoresis apparatuses, Gel documentation system.

Field Equipment:

Mooring systems with underwater Seabird Temperature, Conductivity, Dissolved oxygen, Chlorophyll Fluorometer, Turbidity sensors and surface meteorological instruments.

Seabird CTD profiling system, Acoustic Doppler Current Profiler, Seabird Rosette samplers (8lt and 12lt), large volume Nansen bottles, 120 kHz SIMRAD – EY60 portable scientific echosounder, 38, 120 and 200 kHz SIMRAD - EK60 hull-mounted scientific echosounders, COSMOS pelagic /bottom trawl nets and hydrophones/trawl sensors, passive hydrophones for marine mammal detection, WP2 plankton closing net, Nansen closing net, Hensen net, Fishing nets, Automatic Winkler titration system, In-situ fluorometer, Irradiance meter, Uniboom shallow seismic system, Current meters, Precision depth recorder, Knudsen 320B Rockmount subbottom profiling and side scan sonar system, various corers.

MASC	500	M.S. Research and Thesis	NC
MASC	501	Seminars in Marine Sciences	(0-2)NC
MASC	502	Seminars in Marine Sciences	(0-2)NC
MASC	503	Introduction to Oceanography	(3-0)3
MASC	511	Marine Pollution	(3-0)3
MASC	512	Chemical Oceanography	(3-0)3
MASC	513	Conventional and New Techniques in Chemical Oceanography	(3-0)3
MASC	514	Advanced Chemical Oceanography	(3-0)3
MASC	516	Marine Organic Chemistry	(3-0)3
MASC	518	Marine Analytical Chemistry	(3-0)3
MASC	519	Physical Chemistry of the Oceans	(3-0)3
MASC	520	Processes of the Euphotic Zone	(3-0)3
MASC	521	Nutrient Chemistry	(3-0)3
MASC	523	Marine Surface Chemistry	(3-0)3
MASC	525	Chemistry of Redox Dependent Processes	(3-0)3
MASC	526	Atmospheric Chemistry	(3-0)3
MASC	528	Geochemical Cycles	(3-0)3
MASC	530	Introduction to Physical Oceanography	(3-0)3
MASC	531	Dynamic Oceanography I: Fluid Dynamics	(3-0)3
MASC	532	Dynamic Oceanography II: Rotating Fluids	(3-0)3
MASC	533	Oceanographic Methods	(3-0)3
MASC	534	Waves I: Linear Waves	(3-0)3
MASC	535	Waves II: Non-Linear Waves	(3-0)3
MASC	536	Structure and Function of Marine Ecosystems	(3-0)3
MASC	537	Turbulence	(3-0)3
MASC	538	Boundary Layers	(3-0)3
MASC	540	Ecosystem of the Mediterranean Waters	(3-0)3
MASC	541	Mixing and Diffusion Processes	(3-0)3
MASC	542	Fish fauna of the Turkish Seas	(3-0)3
MASC	544	Dynamic Meteorology	(3-0)3
MASC	545	Estuarine Chemistry and Processes	(3-0)3
MASC	546	Computational Fluid Dynamics	(3-0)3
MASC	547	Modelling in Marine Environment I	(3-0)3
MASC	548	Modeling in Marine Environment II	(3-0)3
MASC	549	Stratified Fluids	(3-0)3
MASC	550	Satellite Oceanography	(3-0)3
MASC	551	Marine Geophysics	(3-0)3
MASC	552	Siliclastic Sequence Stratigraphy	(3-0)3
MASC	553	Carbonate Sequence Stratigraphy	(3-0)3
MASC	555	Fisheries Acoustics	(3-0)3
MASC	557	Acoustical Oceanography	(3-0)3
MASC	558	Introduction to Fisheries Science	(3-0)3
MASC	567	Advanced Topics in Oceanographic Data Processing	(3-0)3
MASC	568	Signal Processing	(3-0)3
MASC	569	Phytoplankton Pigments in Oceanography	(3-0)3
MASC	570	Bio Statistics	(3-0)3
MASC	571	Marine Ecology	(3-0)3
MASC	573	Fisheries Oceanography	(3-0)3
MASC	574	Microbiology of Water	(3-0)3
MASC	575	Dynamics of Fish Populations	(3-0)3
MASC	576	Biological Aspects of Marine Pollution	(3-0)3
MASC	577	Production in the Sea	(3-0)3
MASC	578	Marine Biology	(3-0)3
MASC	579	Hydrobiology	(3-0)3
MASC	580	Marine Benthos	(3-0)3
MASC	581	Marine Planktonology-I: Phytoplankton	(3-0)3
MASC	582	Marine Planktonology-II: Zooplankton	(3-0)3
MASC	583	Marine Geology	(3-0)3
MASC	584	Bathymetric Mapping	(3-0)3
MASC	585	Tectonics	(3-0)3
MASC	586	Marine Sedimentology	(3-0)3
MASC	587	Introduction to Seismic Stratigraphy	(3-0)3
MASC	588	Geochemistry of Sediments	(3-0)3
MASC	589	Geology of Continental Margins	(3-0)3
MASC	590	Marine Minerals	(3-0)3
MASC	591	Marine Seismic Methods I	(3-0)3
MASC	592	Marine Seismic Methods II	(3-0)3
MASC	593	X-Ray Identification of Sedimentary Minerals	(3-0)3
MASC	595	Depositional Sedimentary Environment	(3-0)3
MASC	596	Special Topics in Marine Sciences	(3-0)3
MASC	597	Special Topics in Marine Sciences	(3-0)3

MASC	598	Special Topics in Marine Sciences	(3-0)3
MASC	599	Special Topics in Marine Sciences	(3-0)3
MASC	600	Ph.D. Research and Thesis	NC
MASC	601	Seminars in Marine Sciences	(0-2)NC
MASC	602	Seminars in Marine Sciences	(0-2)NC
MASC	800-899	Advanced and Special Studies in Marine Sciences	NC

DESCRIPTION OF COURSES

MASC 500 M.S. Research and Thesis NC

MASC 501 Seminars in Marine Sciences (2-0) NC

MASC 502 Seminars in Marine Sciences (2-0) NC

MASC 503 Introduction to Oceanography (3-0)3

Biological Oceanography: Marine plants and animals. Energy fixation, growth and abundance of organisms. Seasonality of production.

Chemical Oceanography: Chemical properties of sea water, alkalinity, C, N, P and S cycles, oxic and anoxic environments, redox processes.

Geological and Geophysical Oceanography: Evolution of the earth and morphology; minerals, rocks and sediments, basics of echo-sounding, sub-bottom profiling and side-scanning sonar methods.

Physical Oceanography: Physical properties of sea water, oceanic circulation, waves, oceanographic processes in the Turkish Seas.

MASC 511 Marine Pollution (3-0)3

General aspects of marine pollution, pollution; pollution from land-based sources; atmospheric input; distribution of pollutants in the marine environment; environmental impacts; strategies of marine pollution monitoring; trend monitoring, legislation.

MASC 512 Chemical Oceanography (3-0)3

Principal physical and chemical properties of water and sea water; chemical composition of sea water; conservative/nonconservative and dissolved/ particulate components of sea water; source and sink terms; processes in the sea; nutrient and carbon cycles in the oceans; standard methods for chemical analysis of sea water.

MASC 513 Conventional and New Techniques in Chemical Oceanography (3-0)3

Sampling techniques dissolved and particulate chemical constituents in the marine environments (air, seawater, biota, sediment sampling); preservation techniques; in-situ and near real time measurements; instrumentation on board and laboratory; remote sensing techniques; processing interpretation and presentation of chemical data.

MASC 514 Advanced Chemical Oceanography (3-0)3

Advanced physical chemistry of sea water, dynamic equilibria in the chemical systems in the ocean. Chemistry of interstitial waters; formation and geochemistry of sediments. Chemical models of the ocean.

MASC 516 Marine Organic Chemistry (3-0)3

Sources and sink terms of natural organic compounds in aquatic environments; their chemistry and distributions; interactions with metal ions, burial rates in sediments and their diagenesis.

MASC 518 Marine Analytical Chemistry (3-0)3

A review of some elementary concepts in analytical chemistry; statistics used for the evaluation of analytical data; ionic equilibria in aquatic environment; solubility of ionic salts; acid dissociation and pH-pC diagrams; redox potential and pH-pE diagrams.

MASC 519 Physical Chemistry of the Oceans (3-0)3

Fundamentals of hydrodynamics and physical oceanography; diffusion; differential equations of the conversation of mass and their analytical and numerical solution; plumes; the physical chemistry of water and of concentrated electrolytes; collides and their coagulation.

MASC 520 Processes in the Euphotic Zone (3-0)3

The optical properties of the upper water column; photosynthetic activity; light adaptation; nutrient availability; nutrient uptake kinetics; primary production; remineralization processes and grazing;

general aspects of the ecosystem of the lower trophic levels in the marine environment.

MASC 521 Nutrient Chemistry (3-0)3
Speciation of nutrients in seawater; sampling and measurement techniques; sources and removal processes; spatial and temporal distributions in the oceans and enclosed seas; nitrogen and phosphorus cycles in the sea, factors controlling the Redfield ratio (N:P); concepts of preformed and oxidized nutrients.

MASC 523 Marine Surface Chemistry (3-0)3
Importance of interfaces especially between air-water and water-solid surfaces on the material transport and speciation; chemistry of surfaces; their composition.

MASC 525 Chemistry of Redox Dependent Processes (3-0)3
Chemistry of redox sensitive elements in water and sediments of oxic anoxic nature; redox processes controlling the vertical distributions of nitrogen, sulfur, iron and manganese in marine environments; environmental conditions controlling the rate of redox reactions; coupling and zonation of different redox cycles.

MASC 526 Atmospheric Chemistry (3-0)3
The goal of this course is to lay out a frame work of principles that can be used to understand air pollution and global change problems. It will start with defining the basic physical and chemical principles governing the natural and polluted atmosphere. Then they will be applied to specific problems related to pollution and global change such as indoor pollution, urban photochemical smog, acid rain, stratospheric ozone depletion, greenhouse warming and climate forcing due to atmospheric aerosols. The course will also include some elements of air pollution statistics and introduction to the atmospheric chemical transport models.

MASC 528 Geochemical Cycles (3-0)3
Descriptive and quantitative aspects of earth as bio-geochemical system; fundamental study methods of equilibria; transport processes; chemical kinetics; biological processes; their application to carbon, sulfur, nitrogen, phosphorus and other elemental cycles; stability of bio-geochemical systems; nature of human perturbation of their dynamics.

MASC 530 Introduction to Physical Oceanography (3-0)3
Physical property fields, currents, waves and tides, general circulation of the oceans, T-S analysis, ocean-atmosphere interaction, oceanographic processes in the Turkish Seas.

MASC 531 Dynamic Oceanography I: Fluid Dynamics (3-0)3
Basic review of calculus, physical properties of fluids, kinematics of the flow field, conservation of mass, forces and deformations in a moving fluid, stress and rate of strain tensors, derivation of the equations of motion, transformation to rotating earth, Bernoulli theorem, vorticity dynamics, viscous and irrotational flow examples for incompressible homogeneous fluids.

MASC 532 Dynamic Oceanography II: Rotating Fluids (3-0)3
Geophysical fluid dynamics, equations of motion applied to the ocean, Basic balances leading to geostrophic flow, inertial motion. Geostrophic degeneracy and closure. Shallow water equations, inertia-gravity and Kelvin waves, shelf waves, Rossby waves, quasi-geostrophic theory. Wind driven ocean circulation, examples of geophysical fluid dynamics problems.

MASC 533 Oceanographic Methods (3-0)3
Theory of measurement systems, accuracy and resolution, mechanical and electronic systems, analog and digital data transmission, automated systems. Design of surveys, cruise plans, operational and safety procedures, ship-borne, autonomous, fixed platform and satellite measurements, oceanographic instrumentation. Temperature, salinity, oxygen, current, tide and wave measurements, echo-sounding, navigation and positioning. Chemical oceanographic sampling and analyses, plankton sampling, productivity measurements, bottom sampling and sedimentary analyses, seismic sounding.

MASC 534 Waves I: Linear Waves (3-0)3
Irrotational motions with free boundaries, perturbations, linear and nonlinear theories, periodic and random waves, momentum and energy fluxes. Wave progression, dispersion, modulation, reflection, refraction, scattering, diffraction, radiation and the notions of phase and group velocities. The Cauchy-Poission problem, wave makers, wind waves, capillary and long waves, basin and edge waves, waves on beaches.

MASC 535 Waves II: Non-Linear Waves (3-0)3
Stokes 2nd order approximation, mass transport, radiation stresses with application to waves on current, short wave modulation of long waves, waves on beaches. Wave-wave interactions, long-waves of small amplitude and dispersion: the Boussinesq and k-dV equations, solitary waves and solutions.

MASC 536 Structure and Function of

Marine Ecosystems (3-0)3
Introduction to large ecosystems of the world oceans; Arctic, Pacific, Atlatic and Southern Oceans; Marginal Seas and Estuaries; El Niño Southern Oscillation and North Atlantic Oscillation, influence of physical properties on ecosystem dynamics, influence of climate variability and climate change on ecosystem dynamics.

MASC 537 Turbulence (3-0)3
Turbulent motions, equations of motion, turbulent energy, Reynolds stress, energy flow, inhomogeneous fluids, conservation of scalar properties, Richardson number. Fundamentals of boundary layer theory, turbulent boundary layers, similarity theory and statistics. Effects of wall roughness, viscous sub-layers and turbulent skin friction. Oceanic and atmospheric mixed layer dynamics.

MASC 538 Boundary Layer (3-0)3
Fundamentals of boundary layer theory. Transfer of momentum, vorticity and heat across boundary layer, Laminar, turbulent and transition flows. Effects of wall roughness. Skin friction and forces on bodies. Types of oceanic and atmospheric boundary layers with applications to upwelling and circulation.

MASC 540 Ecosystem of the Mediterranean Waters (3-0)3
The history and evolution of the Mediterranean. Sun wind and rain. Circulation of the Mediterranean waters. Light and translucency. Life in Mediterranean water system, plankton, benthos, the sand, rocks and caves.

MASC 541 Mixing and Diffusion Processes (3-0)3
Convection, diffusion and dispersion of conservative and non-conservative substances in the ocean and the atmosphere. Turbulent diffusion of momentum, and scalar properties, convection in stratified fluids, and mixing length theories. Surface mixed layers in the atmosphere and the ocean, entrainment and mixing layer development, radiative and turbulent transfer of heat, momentum, buoyancy and moisture at the surface.

MASC 542 Fish fauna of the Turkish Seas (3-0)3
The course contains various biological aspects of the fishes inhabiting Turkish seas, including feeding habits, spawning strategies, growth patterns, origin, migration habitat partitioning of the ecologically and commercially important species. The field-work, in which students practice fish identification, is carried out in a trawl survey and around the institute's harbor by snorkeling.

MASC 544 Dynamic Meteorology (3-0)3
Atmospheric thermodynamics, wet and dry equations of state, adiabatic relationships, geopotential and potential temperature, equations of motion; shallow-water, Boussinesq and quasi-geostrophic approximations, gradient and thermal wind, energy conversions. Hadley circulation, jet streams and fronts, frontogenesis and cyclogenesis, air masses, structure and mechanics of the general circulation and mid-latitude synoptic systems, planetary boundary layers.

MASC 545 Estuarine Chemistry and Processes (3-0)3
Definitions, formation, estuary classification. Physical and chemical processes in estuaries, material transport in to the estuaries; major elements and nutrients, their average abundances in estuarine waters; the reactions and speciation of trace elements; organics and biochemistry of estuaries; some aspects of estuarine sedimentary processes; human impact on estuaries.

MASC 546 Computational Fluid Dynamics (3-0)3
Modeling and solution of flow field partial differential equations. Spatial discretizations, time-stepping; accuracy, stability and generality considerations, numerical diffusion, dispersion. Vorticity stream function and primitive variable formulations. Applications to external and internal flows.

MASC 547 Modeling in Marine Environment I (3-0)3
Mathematical models of circulation, mass transport and propagation, finite difference techniques, grid systems, numerical consistency, stability and convergence, numerical diffusion, conservative advection schemes. Primitive equations, quasigeostrophic and shallow water models, solution techniques for ordinary and partial differential equations arising in the marine environment, operational models and data assimilation.

MASC 548 Modeling in Marine Environment II (3-0)3
Numerical techniques in models of marine ecosystems; Predator-Prey Models, Scale analysis and Lagrangian Models, Nutrient and Phytoplankton Models, Zooplankton Models, Ecosystem Models.

MASC 549 Stratified Fluids (3-0)3
Density stratification in rotating and non-rotating fluids, conservation laws, thermodynamic and state equations, Boussinesq and quasigeostrophic

approximation. Internal waves, instability theories, turbulent shear flows, buoyant, thermal and thermohaline convection mechanisms. Plumes, thermals, convection cells, salt finger and diffusive types of double-diffusive transport, fronts and intrusions.

MASC 550 Satellite Oceanography (3-0)3
The course is oriented towards providing a basic understanding of the application of satellite-obtained data to oceanography. Topics to be covered include description of hardware, principles of data transmission, remote sensing of the sea and image processing.

MASC 551 Marine Geophysics (3-0)3
Principles of the geophysical surveys carried out at sea. Positioning techniques, sea bed imaging, seismic exploration, seismic data acquisition, marine gravity, earth's magnetic field, heat flow, investigations of the sea floor using electrical methods and seabed exploration using radiometric methods.

MASC 552 Siliclastic Sequence Stratigraphy (3-0)3
Application of the depositional sequence stratigraphic concepts to the interpretation of siliclastic depositional systems. Developments of siliclastic sequence stratigraphy. Con-temporaneous depositional systems linked to eustatic highstand, lowstand and trans-gressive.

MASC 553 Carbonate Sequence Stratigraphy (3-0)3
Principles of the carbonate sequence stratigraphy. Types of carbonate depositional systems; ramp margins, rimmed margins and isolated platforms. Various seismic examples from the carbonate depositional systems.

MASC 555 Fisheries Acoustics (3-0)3
A general concept of sound waves and sonar systems; wave generation, propagation, reflection and transmission and absorbtion in the sea. Sonar equation, signal, noise, reverberation, sound scattering by fish and zooplankton. echointegration, stock assessment, behaviour of fish.

MASC 558 Introduction to Fisheries Science (3-0)3
Sampling strategies for fisheries; determination of age, sex, maturity and fecundity; food and feeding of fishes; indices to assess the state of the populations; introduction to fish stock assessment; use of computer programs in fisheries sciences.

MASC 567 Advanced Topics in Oceanographic Data Processing (3-0)3
Special problems of processing data obtained from oceanographic instruments including CTD, ADCP, drifters and floats, profiling or time-series sampling equipment. Analog and digital transmission protocols and automatic processing of real-time and delayed-time oceanographic data.

MASC 568 Signal Processing (3-0)3
Analysis of periodic and aperiodic signals, discrete and fast Fourier transforms, covariance, spectral analysis of time-series, sampling, aliasing, digitization errors, random signals. Signal filtering, windowing, deconvolution, detection of signals in noise.

MASC 569 Phytoplankton Pigments in Oceanography (3-0)3
Marine phytoplankton and their pigment structures. The importance of pigment measurements in the sea. Metabolism of plant cells and functions of phytoplankton pigments. Techniques in qualification and quantification of pigments and their temporal and spatial variability in oceans.

MASC 570 Bio Statistics (3-0)3
Descriptive statistics, probability distributions, estimation and hypothesis testing. Analysis of variance, correlation and regression. Analysis of frequencies. Diversity indices, similarity-dissimilarity, cluster analysis, multidimensional scaling, principle component analysis.

MASC 571 Marine Ecology (3-0)3
Introductory concepts, marine environment. Plankton and primary production, zooplankton, energy flow and mineral recycling, nekton, fish, benthos and benthic communities. Human impact on marine biota.

MASC 572 Aquaculture (3-0)3
Principles of aquatic culture. Nutrition and nutritional requirements of some organisms.
Bioeconomics and choice of culture organisms. Production economy, culture of some economically important organisms in marine and fresh water environments.

MASC 573 Fisheries Oceanography (3-0)3
Behaviour and orientation of fish. Influences of environmental factors; temperature, light and oxygen. Principles of applied oceanography. Sea surface temperature, mixed layer depth and stratification in the sea. Known links in fisheries oceanography; examples of stock collapse and recovery.

MASC 574 Microbiology of Water (3-0)3
Introduction and development of marine microbiology, Significance of marine microbiology in oceanography. Marine microorganisms: bacteria, fungi algae, colorless protozoa, their distribution in the sea and in the sediment. Influence of physical, chemical and biological factors on aquatic microorganisms. Microorganisms and water pollution. Role of microorganisms in the water. Economic aspects of water microbiology.

MASC 575 Dynamics of Fish Populations (3-0)3
Definitions, historical development and factors affecting fish stocks. Theory of fishing. Under and over-fishing problems and optimal fishery. Analytical and holistic models in single species fish stock assessments. Recruitment, growth and mortalities. Multi species approach. Data requirement, analysis and some application examples.

MASC 576 Biological Aspects of Marine Pollution (3-0)3
Definition of pollution, kinds and sources of pollution, accumulation, storage and excretion of pollutants, transfer within the food chain, effects on marine organisms: Plankton, invertebrates and vertebrates.

MASC 577 Production in the Sea (3-0)3
Definition of primary and secondary production. Phyto and zoo-plankton, sampling design and sampling techniques. Methods for measuring primary and secondary production, factors affecting primary production: nutrients, light and temperature, organic micronutrients and inhibitors, grazing, seasonal changes in primary and secondary production, role of primary production in marine economy.

MASC 578 Marine Biology (3-0)3
Divisions of marine environment. Classification of marine organisms: Phytoplankton, zooplankton, marine plants and invertebrates. Biology of marine organisms: Cnidaria, Ctenophora, Annelida, Mollusca, Arthropoda, Echinodermata, Crustacea and Tunicata, their habitat, feeding, reproduction and respiration.

MASC 579 Hydrobiology (3-0)3
Rules of growth of aquatic organisms. Colonization and life conditions of inland waters. Biological self purification. Forecast of water quality. Loading capacity of waters. Performance of organisms in wastewater treatment plants.

MASC 580 Marine Benthos (3-0)3
Classification of benthic organisms. Sampling of benthos; sampling methods, treatment and sorting of samples, preservation and storage of samples. Benthic organisms and pollution; effects of pollution on the distribution of benthic organisms in space and time.

MASC 581 Marine Planktonology-I: Phytoplankton (3-0)3
Introduction to marine phytoplankton. General characteristics, classification. Sampling techniques, fixation and preservation. Identification and enumeration. Size classes and contribution to productivity. Factors affecting phytoplankton growth. Distribution, blooming and grazing. Adaptation to pelagic life. Succession and associations. Interactions with other marine organisms.

MASC 582 Marine Planktonology-II: Zooplankton (3-0)3
Introduction to marine zooplankton. General characteristics and classification. Sampling and processing techniques. Vertical migration and distributions. Physiology of zooplankton. Interaction with other marine organisms and relation to fisheries.

MASC 583 Marine Geology (3-0)3
Basic concept of marine geology including the structural and oceanographic setting, the ocean margins and oceanic sediments, as well as history and evolution of the ocean basins and Turkish Seas based on the analysis of marine geology and geophysics.

MASC 584 Bathymetric Mapping (3-0)3
Principles of bathymetric mapping. Understanding the basic methods and techniques by using exercise maps in the laboratory. Several field exercises and report writing.

MASC 585 Tectonics (3-0)3
The solid earth crust-mantle system and its movements. Structure, evolution and the origin of the ocean basins and continental margins. Plate tectonics hypothesis. Relationships of terrestrial and oceanic features.

MASC 586 Marine Sedimentology (3-0)3
Marine processes of erosion, transportation and deposition, composition, single-grain, texture and structural relationship of sediments. Consolidation of the water-sediment gas system; diagenesis. Sedimentary environment; examples of sedimentological problems relevant to coastal and seafloor engineering.

MASC 587 Introduction to Seismic Stratigraphy (3-0)3
Principles of seismic sequence analysis, seismic reflection configurations and stratigraphic interpretation of seismic facies, application of seismic reflection configuration to global changes of sea-level, sediment-bedrock relationships. Interpretation of tectonic and depositional systems on the continental shelves.

MASC 588 Geochemistry of Sediments (3-0)3
Principal geochemical cycles and processes in the hydrosphere and lithosphere, radiometric dating.

MASC 589 Geology of Continental Margins (3-0)3
Comparison of types of continental margins. Deep and shallow geological structure. Processes of formation and evolution of continental margins. Petroleum and mineral deposits comparison to continental analogues.

MASC 590 Marine Minerals (3-0)3
Occurrence of minerals in the marine environments; iron and manganese oxides, placer deposits, phosphorites, carbonates, evaporates, hydrothermal deposits, silica polymorphs etc.

MASC 591 Marine Seismic Methods I (3-0)3
Physical properties of acoustic waves and elementary equations of wave motions. Definitions of acoustic energy, energy flux density, acoustic intensity and acoustic impedance. The superposition principle, interference of acoustic waves and the complex waves. Seismic ray theory, application of seismic image principle.

MASC 592 Marine Seismic Methods II (3-0)3
Equations of acoustic wave transmission, Snell's Law. Transmission losses of the sound propagation. Geophysical applications of underwater acoustics. Interpretation of seismic records in the field and in the laboratory.

MASC 593 X-Ray Identification of Sedimentary Minerals (3-0)3
Theory and application of x-rays to the study of crystalline solids; identification and quantitative techniques.

MASC 595 Depositional Sedimentary Environment (3-0)3
Sources of sediments, classification of ancient and modern sedimentary environment. Relationship between material and environment. Important factors controlling the type of deposited sediments. Structure of depositional environment, types of beddings and the texture of sediments.

MASC 596 Special Topics in Marine Sciences (Variable Content) (3-0)3
Approval by the Department.

MASC 597 Special Topics in Marine Sciences (Variable Content) (3-0)3
Approval by the Department.

MASC 598 Special Topics in Marine Sciences (Variable Content) (3-0)3
Approval by the Department.

MASC 599 Special Topics in Marine Sciences (Variable Content) (3-0)3
Approval by the Department.

MASC 600 Ph.D. Research and Thesis NC

MASC 601 Seminars in Marine Sciences (2-0)NC

MASC 602 Seminars in Marine Sciences (2-0)NC

MASC 800-899 Advanced and Special Studies in Marine Sciences (4-2)N

GRADUATE SCHOOL OF INFORMATICS

Director: BAYKAL, Nazife; Prof. Dr.,
B.S., M.S., Ph.D., METU.
Associate Director: BOZŞAHİN ZEYREK, Deniz Prof.Dr.
B.A., Hacettepe University;. ***M***.A., University ***of Kansas, Ph. D. Hacettepe University***
Associate Director: ARİFOĞLU, Ali; Dr.,
B.S., Hacettepe University; M.S., Ph.D., METU.

GENERAL INFORMATION: The Graduate School of Informatics has the purpose of

- conducting multidisciplinary academic programs, research and development projects
- taking active role in the task of developing and diffusing basic Informatics courses to university students
- increasing the cooperation between the university and industry in the field of Informatics

in order to meet the need for qualified professionals created by the increasing spread of information and communication technologies in all sectors.

GRADUATE PROGRAMS: The institute offers eleven programs leading to M.S. degree in Information Systems (thesis and non-thesis), Cognitive Science, Modeling and Simulation, Informatics-Online, Software Management, Medical Informatics (thesis and non-thesis), Bioinformatics, Game Technologies and Work Based Learning. There are three programs leading to Ph.D. degree in Information Systems, Medical Informatics and Cognitive Sciences.

M.S. AND Ph.D. PROGRAMS IN INFORMATION SYSTEMS

PROFESSORS

BAYKAL, Nazife ***(Director of the Graduate School of Informatics)***: B.S., M.S., Ph.D., METU.
ÇETİN YARDIMCI, Yasemin ***(Program Director)***: B.S., M.S., Boğaziçi University; Ph.D., Vanderbilt University
DEMİRÖRS, Onur: B.S., METU; M.S., Ph.D., Southern Methodist University

ASSOCIATE PROFESSORS

ÖZKAN, Sevgi: B.A., M.A., Cambridge
University; M.Sc, .London University; Ph.D., METU.
KOÇYİĞİT, Altan: B.S., M.S., Ph.D., METU.
BETİN CAN, Aysu: B.S., METU; Ph.D., University of California Santa Barbara.
GÜNEL, Banu: B.S., METU; M.S., University of Bristol; Ph.D.Queen's University Belfast

ASSISTANT PROFESSORS

EREN, P. Erhan: B.S., Bilkent University; M.S., Ph.D. University of Rochester.
TEMİZEL TAŞKAYA, Tuğba: B.S., DokuzEylül University;
Ph.D., University of Surrey.

INSTRUCTOR

ARİFOĞLU, Ali ***(Associate Director of the Graduate School of Informatics)***: B.S., Hacettepe University;
M.S., Ph.D., METU

AFFILIATED FACULTY

PROFESSORS

BİLGEN, Semih: B.S., METU; M.S., Rensselaer Polytechnic Institute;
Ph.D., University of Manitoba (Department of Electrical Engineering)
ÇAĞILTAY, Kürşat: B.S., M.S., METU; Ph.D., Indiana University (Department of CEIT)
YILDIRIM, Soner: B.S., Hacettepe University; M.S., Michigan State University;
Ph.D., University of Southern California (Department of Instructional Technology)
DÜZGÜN, Şebnem: B.S., METU; M.S., METU; Ph.D., METU (Department of Mining Engineering)

OBJECTIVES: Information systems are computer and telecommunication systems that store, interpret and communicate information. The widespread use of information technologies and systems in all sectors has created the need for professionals who are able to develop, use and maintain such systems. Healthcare Information Systems, Management Information Systems, Geographical Information Systems, Command, Control and Communication Information Systems are only some examples of the wide spectrum of applications. The objectives of the Information Systems graduate programs are:

- to educate graduates from different disciplines in the theoretical and practical aspects of information systems,
- to meet the interdisciplinary graduate needs of the academia, industry, and the public and private sectors,
- to foster and support interdisciplinary research in the field.

CAREER OPPORTUNITIES: Graduates of the programs can work in any field related with information systems.

PROGRAM STRUCTURE: The courses are grouped into three tracks: Technology, Management and IS Domains. In addition to the core courses, students are required to take elective courses from these tracks in order to enhance their level of interdisciplinary knowledge. Elective courses will be taken to specialize in one of the tracks. It is crucial for the success of the program that the faculty advisors guide the students closely and help them choose elective courses suitable for their specific objectives and backgrounds.

The M.S. program has thesis and non-thesis options. In order to receive a Ph.D. degree, the total number of courses and credit hours taken in the master's and doctoral programs may not be less than 16 courses and 48 credit hours.

DEGREE REQUIREMENTS

M.S. Degree Requirements - Thesis Option:
- 5 core courses
- 3 elective courses
- 1 seminar course (non-credit)
- Master's Thesis (non-credit)

M.S. Degree Requirements – Without Thesis Option:
- 5 core courses
- 6 elective courses
- 1 seminar course (non-credit)
- Term Project (non-credit)

Ph.D. Degree Requirements:
- 5 core courses
- at least 3 elective courses (exact number of elective courses to be taken is decided individually depending on the student's background)
- 1 seminar course (non-credit)
- Ph.D. Thesis (non-credit)

GRADUATE CURRICULUM

M.S. PROGRAM (THESIS / WITHOUT THESIS OPTIONS)

Deficiency Courses

Introduction to Computers and Programming (CENG 200/210/220/230 or equivalent)
Algorithms and Data Structures (CENG 301/EE 441 or equivalent)
Fundamentals of Business (BA 1101 or equivalent)
Introduction to Probability and Statistics (STAT 221 or equivalent)

Core Courses

IS	501	Introduction to Information Systems	(3-0)3
IS	502	Information Systems Project	(3-0)3
IS	503	Database Concepts and Applications	(3-0)3
IS	504	Computer Networking for Information Systems	(3-0)3
IS	507	Introduction to Software Engineering	(3-0)3
IS	589	Term Project	NC
IS	590	Graduate Seminar	NC
IS	599	Master's Thesis	NC

Students who have already taken some of the core courses listed above (or their equivalents) should take elective courses to replace them.

Elective Courses

All students should take at least two elective courses from their major track and at least one elective course from their minor track.

Ph.D. PROGRAM

Core Courses

IS	501	Introduction to Information Systems	(3-0)3
IS	502	Information Systems Project	(3-0)3
IS	503	Database Concepts and Applications	(3-0)3
IS	504	Computer Networking for Information Systems	(3-0)3
IS	507	Introduction to Software Engineering	(3-0)3
IS	590	Graduate Seminar	NC
IS	699	Ph.D. Thesis	NC

Students who have already taken some of the core courses listed above (or their equivalents) should take elective courses to replace them.

Elective Courses

All students should take at least two elective courses from their major track and at least one elective course from their minor track.

Technology Track

IS	508	Computer System Organization	(3-0)3
IS	514	Multimedia Information Systems	(3-0)3
IS	523	Object-Oriented Analysis and Design	
IS	524	Software Design Patterns	(3-0)3
IS	526	Software Quality Management	(3-0)3
IS	527	Software Verification	(3-0)3
IS	541	Computer Networking Applications	(3-0)3
IS	550	Web Services and Service Oriented Architecture	
IS	551	Computer Security and Cryptography	(3-0)3
IS	580	Knowledge Representation and Data Mining	(3-0)3
IS	707	Formal Verification – Theory and Practice	(3-0)3
IS	714	Wireless Networks	(3-0)3
IS	724	Introduction to Software Testing	(3-0)3
IS	725	Mobile Software Engineering	(3-0)3
IS	728	Software Architecture	(3-0)3
IS	742	Sensor Networks	(3-0)3
IS	744	Introduction to Grid Computing	(3-0)3
IS	748	Mobile and Pervasive Computing	(3-0)3
IS	768	Applications of Audio Information Systems	(3-0)3
IS	771	Security Engineering	(3-0)3

CENG	556	Distributed Data Base Management Systems	(3-0)3
CENG	553	Database Management Systems	(3-0)3
CENG	557	Object-Oriented Analysis and Design Information Systems	(3-0)3
CENG	567	Design and Analysis of Algorithms	(3-0)3
CENG	530	Computer Networks and Communications	(3-0)3
CENG	532	Distributed Computing Systems	(3-0)3
CENG	702	High Speed Networks	(3-0)3
CENG	704	Electronic Commerce on the Internet	(3-0)3
EE	430	Digital Signal Processing	(3-0)3
EE	511	Communication Electronics	(3-0)3
EE	512	Introduction to Optical Fiber Communications	(3-0)3
EE	533	Information Theory	(3-0)3
EE	534	Coding Theory	(3-0)3
EE	535	Communication Theory	(3-0)3
EE	542	Computer Networks	(3-0)3
MATH	522	Coding Theory	(3-0)3
IAM	501	Introduction to Cryptography	(3-0)3

Other courses by consent of advisor.

Management Track

IS	529	Software Project Management	(3-0)3
IS	530	e-Transformation and Management	(3-0) 3
IS	531	Managing Innovation And Enterpreneurship	(3-0) 3
IS	532	Human Factors in Information Systems	(3-0)3
IS	533	Decision Support Systems	(3-0)3
IS	535	Regulatory and Legal Aspects of Information Systems	(3-0)3
IS	536	Information Systems Infrastructure for Contemporary Organizations	(3-0)3
IS	537	IT Governance	(3-0)3
IS	722	Systems Engineering	(3-0)3
IS	739	Information Systems in Organizational Design and Applied Systems Thinking	(3-0)3
IS	740	Information Technology Acceptance in Organisations	(3-0)3
IS	752	Information Security Management	(3-0)3
IS	777	Technology Entrepreneurship and the Lean Startup	(3-0)3
IS	785	Social Network Analysis	(3-0)3
BA	5102	Strategic Management	(3-0)3
BA	5201	Organization and Management	(3-0)3
BA	5202	Human Resources Management	(3-0)3
BA	5222	Negotiation Process	(3-0)3
BA	5312	Topics in MIS	(3-0)3
BA	5503	Management Science	(3-0)3
BA	5601	Elements of Sequencing and Scheduling	(3-0)3
BA	5602	Operations Management	(3-0)3
BA	5620	Tools and Techniques of Total Quality Management	(3-0)3
BA	5801	Business Economics	(3-0)3
CENG	574	Statistical Data Analysis	(3-0)3
IE	451	Decision Analysis	(3-0)3
IE	454	Network Flows and Project Management	(3-0)3
IE	512	Business Process Redesign	(3-0)3
IE	513	Strategic Planning	(3-0)3
IE	524	Network Flows and Project Management	(3-0)3
IE	545	Total Quality Management	(3-0)3
IE	559	Applied Optimization	(3-0)3
IE	567	Applied Stochastic Modeling	(3-0)3
IE	568	Statistical Applications in Engineering	(3-0)3
IE	571	Systems Simulation	(3-0)3
IE	581	Artificial Intelligence, Expert Systems and Decision Support Systems	(3-0)3

Other courses by consent of advisor.

IS Domains Track

IS	543	Information Retrieval	(3-0)3
IS	564	Design, Development and Evaluation of Instructional Software	(3-0)3
IS	566	Image Processing Algorithms	(3-0)3
IS	573	Human Computer Interaction	(3-0)3
IS	720	Research Methods in Information Systems	(3-0)3
IS	746	Mobile Business	(3-0)3
IS	747	Cloud Computing: Technology and Business	
IS	782	Principles of Geospatial Information Technologies	(3-0)3
IS	783	Social Media Analytics	(3-0)3
CENG	504	Electronic Commerce Technology	(3-0)3
CENG	466	Fundamentals of Image Processing	(3-0)3
CENG	476	System Simulation	(3-0)3

CENG	538	Advanced Graphics and User Interfaces	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	564	Pattern Recognition	(3-0)3
CENG	569	Neurocomputing	(3-0)3
CENG	575	Simulation Modeling and Analysis	(3-0)3
CENG	580	Distributed Artificial Intelligence	(3-0)3
EE	543	Neurocomputers	(3-0)3
IE	472	Simulation Modelling	(3-0)3

Other courses by consent of advisor.

DESCRIPTION OF COURSES

IS 501 Introduction to Information Systems (3-0)3

Information Systems in the Enterprise, Organizations, Management, and Strategy, e-Business and e-Commerce, Ethical and Social Issues , Security and Control in the Digital Firm, Enterprise Applications and Business Process Integration, Knowledge Management, Redesigning the Organization with Information Systems, Business Value of Systems, Managing International Information Systems

IS 502 Information Systems Project (3-0)3

This course aims to give students professional experience in information systems development. Student teams work on the specification, design, implementation and acceptance testing phases of different information systems projects. Each team works on a different phase of a different project and produces professional quality documentation. The documentation is distributed among all teams, who then collectively participate in formal review sessions held in class for each phase of each project. Project topics may be selected from diverse areas such as engineering, business management, provided that the project plan is realistic and the estimated duration fits a semester.

IS 503 Database Concepts and Applications (3-0)3

Introduction to database concepts: data abstraction/independence, data models (Entity-Relationship model, Enhanced Entity-Relationship Model, Object Oriented model, relation/network/hierarchical model), database languages (DDL, DML), database administrator/user. Storage and File Structures. Indexing and hashing. Relational Model: formal query languages (Relational algebra, Relational calculus), commercial query languages (SQL). Relational database design: integrity constraints, database dependencies, normal forms. Transaction processing, concurrency control and recovery techniques.

IS 504 Computer Networking for Information Systems (3-0)3

Introduction to computer networking concepts.Application layer protocols and network programming. Principles of reliable data transfer. Transmission Control Protocol and User Datagram Protocol.Congestion control.Internet protocol and routing. Link layer technologies and medium access protocols. Network security.

IS 507 Introduction to Software Engineering (3-0)3

The course introduces the fundamentals of software management and software system models with an emphasis on software development process models, project management techniques and contemporary modeling notations.

IS 508 Computer System Organization (3-0)3

The course provides the basics of computer organization and advanced architectures used in the design of modern computers. Together with fundamentals of computer organization, instruction level parallelism, memory hierarchies, storage systems and multiprocessor systems are given.

IS 514 Multimedia Information Systems (3-0)3

Architectures for Multimedia Systems, Digital Audio, Video Technology and Image Compression, Computer Graphics, Multimedia Information Systems, Multimedia Communication Systems.

IS 523 Object-Oriented Analysis and Design (3-0)3

Introduction to object oriented analysis and design.Requirements analysis with use cases.Responsibility Driven Design. Gang-of-Four design patterns. Iterative development with the Unified Process.

IS 524 Software Design Patterns (3-0)3

The course focuses on fundemental software design patterns, antipatterns, and refactoring bad design to design patterns. Hands-on experience on reuse of design patterns will be established by a severalhomeworks and a class project. The course

includes reviews of UML, object-oriented design. Students will be able to efficiently communicate program structures using patterns and to develop software
of high quality.

IS 526 Software Quality Management (3-0)3

This course presents models of software process improvement. Primary topics include software process improvement frameworks, software quality management and quality assurance standards, software process modeling languages, software process metrics, processimprovement in other disciplines. Students will select a related topic for further research and will prepare a research paper on this topic.

IS 527 Software Verification (3-0)3

The course introduces software verification processes that determine whether deliverables of a given activity conform to the requirements of that activity. The discussion includes review, inspection, walkthrough processes as well as independent verification. Issues related to the installation of these processes within an organization and to the impact of software quality are also investigated. Several examples are studied and verification meetings are organized to apply the techniques introduced.

IS 529 Software Project Management (3-0)3

This course introduces the issues and basic methods used in managing software development projects and presents timely topics and new developments in software project management. Topics include software project planning, software measurement, software project visibility and control, peopleware and a brief introduction to applicable software engineering research methods.

IS 530 e-Transformation and Management (3-0)3

e-Government (e-Gov) design and Management, Components of e-Government, e-Gov Maturity, e-Organization, e-Transformation, e-Government: world trends, e-Turkey, e-Europe The course covers the e-Government transformation process and models for measuring and implementing the transformation. It also emphasizes on e-Org which is one of the major components of e-Gov. The best e-Gov and e-Org practices over the world will be presented and the metrics of maturity will be applied to some of the national organizations. Students will be grouped in small project teams to measure different e-Transformation capabilities of the organizations and the governments as well. Depending on the choices of the students, either survey or application type projects will be studied

IS 531 Managing Innovation and Enterpreneurship (3-0) 3

Translating opportunities into competitive advantage is critical for entrepreneurs and technical managers. This course explores the invention and innovation concepts, characteristics of innovation, types of innovation, diffusion of innovation. Management of innovation will be explored in the scope of this course. The impact of competitive advantage by the introduction of new product, process or services will be addressed.

IS 532 Human Factors in Information Systems (3-0)3

Uses and users of IS.Anticipated developments in IT.Study of person-computer interaction.Physical interface.Cognitive interface.Software tools.Communication and information services.IT and jobs.IS in the office.Designing interactive systems. Basic user issues on motivation, errors, reliability. Programming aspects.Quality of life.

IS 533 Decision Support Systems(3-0)3

Individual and organizational decision making.Normative and behavioral models of decision making. Utility functions. Basic concepts of DSS.Simulation for decision support, Data collection, database management, data mining,Business Intelligence,EIS, ES, Intelligent DSS. Integration of MSS. Basics of modeling, model building blocks. Implementation issues.

IS 535 Regulatory and Legal Aspects of Information Systems (3-0)3

Legal issues involved in liability, warranty, patentibility and copyright. Issues of competition, monopoly, structural regulation, privacy and intellectual property.

IS 536 Information Systems Infrastructure for Contemporary Organizations (3-0)3

Introduction to the concepts and techniques of groupware and network computing.E-business.Information and telecommunications technology.The future of Internet .Intranets .Electronic commerce, critical issues and barriers to adoption. This is an interactive course with student participation and lab workshops. Students will be asked to develop programs at the IS lab on DB2, Oracle or Domino, using HTML, PERL, LOTUS or JAVA.

IS 537 IT Governance (3-0)3

Contemporary issues about IT Governance as a whole; but major concentration upon IT Organization, Management, Processes, Project Management, Control Standards & Security, Risk Management & Audit issues will be thoroughly discussed and practiced in this course. By focusing on Business Requirements and Business-Technology Alignment; well-applied Global Best Practices, Assessment Methodologies, Process Maturity and IT Risks will examined.

IS 541 Computer Networking Applications (3-0)3
TCP/IP overview, Multimedia Networking, Quality of Service, Ethernet Networks, Wireless and Mobile Networks, Sensor Networks, Optical Networks.

IS 543 Information Retrieval (3-0)3
Theoretical and modelling issues in information retrieval: automatic indexing; techniques for searching and ranking output; retrieval output evaluation; classical and user-oriented approaches to automatic classification; relevance feedback; markov models; distributed retrieval; document filtering; cross-language retrieval; the role of decision models and machine learning, in particular learning by observation and learning by induction, in the above processes.

IS 550 Web Services and Service Oriented Architecture (3-0)3
This course introduces basic concepts in Web services, their application areas in particular for e-business and e-commerce, latest standards, Grid services, service oriented architecture, semantic Web and mobile web services.

IS 551 Computer Security and Cryptography (3-0)3
Introduction to privacy, data security, communication security and file security in computers and computers networks.Introduction to cryptography, its role in electronic data processing. Block ciphers, stream ciphers and DES, data encryption standard. Trusted computer systems, issues in authentication and verification.

IS 564 Design, Development and Evaluation of Instructional Software (3-0)3
Overview of Computer Aided Instruction (CAI): Types, strengths and weaknesses, effective CAI. Implications of the learning theories for courseware design and authoring.Features, advantages and limitations of different CAI modes. Planning and managing CAI projects. Designing and producing CAI. Evaluation and revision. Computer managed instruction. Computerized testing.

IS 566 Image Processing Algorithms (3-0)3
Digital Signal Processing Fundamentals,Fourier Transform of Images, Image Enhancement, Edge Detection, Image Restoration, Morphological Image Processing, Image Segmentation, Representation and Description, Wavelets and Multiresolution Processing, Gabor Filters, Object Recognition.

IS 573 Human Computer Interaction (3-0)3
This course will provide students with a sound introduction to the discipline of HCI and examine the issues of human factors and the design of computer application interfaces. The course will have a more psychological and social focus rather than a technical one. It will be organized around a collection of readings and real-world exercises concerned with applying HCI research to the design of computer interfaces.

IS 580 Knowledge Representation and Data Mining (3-0)3
The course introduces principles and techniques of data mining and knowledge discovery. It emphasizes the advantages and disadvantages of using these methods in real world systems and provides hands-on experience. Its technical focus is on qualitative and quantitative knowledge based systems and learning systems. Topics include key issues of data mining and machine learning, decision trees, artificial neural networks, Bayesian learning, instance based learning, expert systems, fuzzy systems, and genetic algorithms.
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IS 707 Formal Verification – Theory And Practice (3-0)3
This course aims to introduce students to a crucial part of the design cycle: mathematically proving that the design satisfies desirable or required properties, referred to as formal verification. An introductory treatment of theoretical framework is accompanied with state of the art verification tools.

IS 714 Wireless Networks (3-0)3
Wireless link characteristics, wireless media access, wireless and mobile network architectures, transport protocols over wireless networks, mobile IP, wireless LANs, introduction to ad hoc networks, personal area networks, sensor networks, wireless security.

IS 720 Research Methods in Information Systems (3-0)3

This course provides students with an integrated framework for research in Information Systems. Course underlines main research paradigms including positivist, post-positivist, critical theory and constructivist paradigm. Theoretical and practical bases are provided for leading research models under the main themes as quantitative, qualitative, mixed-methods and design based research. The course uses problem-based self-directed learning to enhance students' methodological skills and to assist them in applying these skills to the research process.

IS 722 Systems Engineering (3-0)3

Introduction to Systems Engineering Management, Systems Engineering Management in Acquisition, Systems Engineering Process Overview, Requirements Analysis, Functional Analysis and Allocation, Design Synthesis, Verification, Systems Engineering Process Outputs, Work Breakdown Structure, Configuration Management, Technical Reviews and Audits, Trade Studies, Modeling and Simulation, Metrics, Risk Management

IS 724 Introduction to Software Testing (3-0)3

The relationship of software testing to quality is examined with an emphasis on testing techniques. Topics include test types and techniques, defining test plans according to standards, estimating, managing, and improving the test process through metrics.

IS 725 Mobile Software Engineering (3-0)3

Introduction to principles of software engineering for mobile devices and best practices. The course will start by reviewing the current mobile software platforms and will then focus on one selected mobile software platform to provide students with hands-on software engineering expertise in developing mobile applications. Students will learn skills for designing, developing, testing, maintaining and deploying mobile applications, with particular emphasis on software engineering topics including software architecture, software process, quality assurance, and usability.

IS 728 Software Architecture (3-0)3

Fundamental concepts of software architecture. The role of architecture in software engineering. Designing applications from an architecture-centric perspective. Architecture design techniques and approaches. Architectural styles and patterns. Implementation and deployment. Software architecture modeling and architecture documentation.

IS 739 Information Systems in Organizational Design and Applied Systems Thinking (3-0)3

Foundations of Information Systems Management covering the essential concepts in Information Technology Management like planning, organizing, leading and controlling with strong practical orientation. A systemic approach to organizational structures considering information hierarchy around modern day constraints. Analysis and design of information systems as meshed with organizational design. Basic information concepts, data processing technology and its applications. Information Systems development methodology in terms of systems analysis, design and implementation.

IS 740 Information Technology Acceptance in Organisations (3-0)3

This course aims to give students a basic understanding of different aspects of Information Technology (IT) management with a particular focus on IT acceptance. Understanding the factors that influence acceptance of information technology is of interest both to researchers in a variety of fields as well as procurers of technology for organizations. In that, researchers have studied a range of issues related to IT Acceptance. At the highest level, "acceptance" has been regarded as the theoretical analysis of innovation diffusion. This approach is appropriate to start with basics of IT acceptance. However, rather than general technological innovations, precise analysis of information technology acceptance has become a central concern of disciplines. This course aims to focus directly on the determinants and importance of user acceptance, rather than the broad issues of social diffusion. A number of theoretical approaches shall be investigated throughout the semester for a complete understanding of the issues involved with IT acceptance. In that regard, in addition to independently examining these approaches, other fundamental issues including information technology management frameworks, information technology governance, control of information technology will also be covered in class particularly concentrating on the relationships between these fundamental issues and information technology acceptance.

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IS 742 Sensor Networks (3-0)3

Sensor networks are type of computer networks composed of tiny, autonomous nodes equipped with wireless transmission and sensing capabilities. Sensor networks are revolutionizing a variety of applications such as environmental monitoring, home automation, and logistics. This new area of research combine current research trends from a number of different disciplines some of which can

be named as hardware and software design, information and signal processing, and communication networks.

This course on sensor networks will introduce the characteristics of these networks and will mainly focus on networking aspects, protocols and architectures for Wireless Sensor Networks. It aims to provide a thorough description of the most important issues and questions that have to be addressed in a wireless sensor network.

In addition, this course will try to make the crucial aspects of these research fields accessible to the student. Through the assignments on academic papers about sensor networks, this course will also introduce students to the diverse literature on wireless sensor networks, and expose them to the fundamental issues in designing and analyzing wireless sensor network systems. Students will study related technologies and standards ranging from networking, operating system support and algorithms, to security and quality of service.

IS744 Introduction to Grid Computing (3-03)3

The course introduces the basic concepts of Grid computing, its history, its architecture, standards, Grid services, Grid middleware, implementation issues in Grid environment, resource management, data management, security infrastructure, future directions of Grid research and development.

IS 746 Mobile Business (3-0)3

The Mobile Business course provides an overview of technical as well as business aspects of mobile communications. After introducing mobile communications related fundamentals, it explores the mobile business ecosystem by covering issues regarding mobile commerce, services and business models, from the perspectives of device manufacturers, operators, entrepreneurs, developers, and consumers.

IS 747 Cloud Computing: Technology and Business (3-0)3

This course provides an overview of technical and business issues in cloud computing and highlights the trends in this rapidly evolving information technology area. The course content covers cloud computing fundamentals; current trends and applications; technical infrastructure and models; business implications; recent technological developments; business models and management; security and privacy; research challenges and outlook. Current topics and research areas in cloud computing are explored from various aspects highlighting technical and business issues.

IS 748 Mobile and Pervasive Computing (3-0)3

This course provides an overview of technical issues related to mobile and pervasive computing,while also highlighting business implications of these evolving technologies. The course contentcovers pervasive computing fundamentals; past, present and future applications; recenttechnological developments; challenges and outlook. Topics including Smart Devices andServices, Smart Mobiles, Cards and Device Networks, Human Computer Interaction inPervasive Systems, Tagging, Sensing and Controlling, Context-Aware Systems, UbiquitousCommunication, Management of Smart Devices are explored from technology as well asbusiness aspects.

IS 752 Information Security Management (3-0)3

This course is intended to introduce students to Enterprise Information Security from a management perspective and will mainly focus on planning, policy development, project and program management aspects of information security. It aims to provide a thorough description of the most important issues and questions that have to be addressed in security management of information systems rather than the security technology and implementation issues. Students will be introduced to the complexity of real security issues facing today's networked organizations. Through the assignments and case studies on information security management, this course will present best practices and standards, and will enable students to assess and plan for security risks and also develop and maintain security policies and programs that can be used in any enterprise organization.

IS 768 Applications of Audio Information Systems (3-0)3

Audio is an integral part of multimedia informatics and has several applications including smart devices, security, surveillance, human-computer interaction, robotics, forensics, ubiquitous systems and assistive technologies. This course is intended to introduce to students how to extract information exploiting the audio modality and utilize this information in present and future multimedia information systems. Students will learn about the systems requirements, algorithm design, implementation and development of audio information systems. Objective performance metrics within the context of their applications, relevant policies and standards will be discussed.

IS 771 Security Engineering (3-0)

Security engineering involves software and systems engineering, mathematics, economics, psychology and social engineering. This course aims to introduce the students to the hardware and software

systems that require protection; the security mechanisms currently in place to protect them and the attacks that jeopardize availability, integrity or confidentiality of information and services. Specific applications of security engineering for military systems, financial sector, and management of health records will be discussed.

IS 777 Technology Entrepreneurship and the Lean Startup (3-0)
This course provides an overview of technology entrepreneurship and the lean startup approach,by presenting the fundamentals regarding technology venture formation and highlighting the lean startup which utilizes agile development for startup formation. The lean startup approach incorporates iterative product releases with short development cycles, while measuring progress by using valuable customer feedback. The course content covers topics including types of markets and ventures, opportunity identification, vision, competitive strategy, venture financing,risk and return, the lean startup approach, business model generation and customer development.

IS 782 Principles of Geospatial Information Technologies
Nature of geospatial data, Geographic Information Systems (GIS), Elements and types of GIS, database managements systems for geospatial data, uncertainty management for geo spatial data, spatial analysis methods, spatial decision support systems, introductory spatial statistics, analysis of point and area data.

IS 783 Social Media Analytics (3-0)3

The phenomenal growth of social media has created new market opportunities. Companies can easily reach masses and can respond to their customers' needs promptly. It is therefore important to have an understanding of customer needs and plan ahead, which can be only achieved with social media analytics tools. This subject has also gained significant attention from many disciplines. For example, social media is also used in emergency management, environment monitoring and disaster management.

This course will examine several aspects of social media particularly analysis of user profiles, behaviours, influences, networks and information diffusion. It will show how existing tools, AI, natural language processing and data mining methods can be used to study these topics. The course will focus on the extraction, processing and interpreting the relevant information from social media particularly from business point of view.

IS 785 Social Network Analysis (3-0)3
Social network analysis is a core methodology utilizing graph theory, algebra, statistics, sociometry and psychometry for a diverse field of applications. This course is intended to introduce to students how to extract information contained in a network to measure and characterize them, different types of networks, creating models of networks and predicting their behavior. Most commonly used GUI-based software tools for measuring and displaying network data will also be introduced. The course will also focus on specific applications of the network analysis in epidemiology, surveillance, marketing, healthcare, collective intelligence, spread of new ideas and social computing.

IS	**589**	**Term Project**	**NC**
IS	**590**	**Graduate Seminar**	**NC**
IS	**599**	**Master's Thesis**	**NC**
IS	**699**	**PhD Thesis**	**NC**
IS	**8XX**	**Special Studies**	**NC**
IS	**9XX**	**Advanced Studies**	

M.S. and Ph.D. PROGRAMS IN COGNITIVE SCIENCE

PROFESSORS

BOZŞAHİN, H. Cem ***(Program Director)***: B.S., M.S., METU; Ph.D., Arizona State University.
ZEYREK, Deniz ***(Associate Director of the Graduate School of Informatics) :*** B.A., Hacettepe University; M.A., University of Kansas; Ph. D. Hacettepe University

ASSISTANT PROFESSORS

ACARTÜRK, C.: B.S., M.S., METU; Ph.D., University of Hamburg
ÇAKIR, M.P.; B.S., METU; M.S., University of Pennsylvania; Ph.D., Drexel University
HOHENBERGER, Annette: B.S., M.A., Ph.D, University of Frankfurt.

INSTRUCTOR

TEMÜRCÜ, Ceyhan: B.S., M.S., METU; Ph.D., University of Antwerp.

AFFILIATED FACULTY

ASSISTANT PROFESSOR

GÖKÇAY, Didem: B.S., M.S., METU; Ph.D., University of Florida.

OBJECTIVES: Cognitive science is the interdisciplinary study of human and other minds. The objective of the department is to offer students with different backgrounds a breadth of knowledge in a wide range of areas in cognitive science, including artificial intelligence, computer science, linguistics, psychology, neuroscience and philosophy. The graduate programs provide extensive training designed to equip students with research skills needed for an empirical investigation of various aspects of the mind through interdisciplinary research.

CAREER OPPORTUNITIES: Multimedia applications, translator systems, language technology, innovative uses of computers, man-machine interfaces, academic track on cognitive science or related disciplines, such as computer science, linguistics, psychology, philosophy and neuroscience.

PROGRAM STRUCTURE: Courses are grouped into four tracks, listed in Master Course List on the web. These are Computer Science, Linguistics, Psychology, Philosophy. The advisor of each student will be responsible for guiding the student in taking the necessary courses, by considering the courses that the student has taken in the past.

DEGREE REQUIREMENTS

M.S. Degree Requirements:

- 2 must courses (3 credits each)
- 1 must course (1 credit)
- 4 COGS courses (one from each track; 3 credits each)
- 3 electives (either from elective list or COGS list, 3 credits each)
- 1 seminar course (non-credit)
- Master's Thesis (non-credit)

Ph.D. Degree Requirements:

- 3 must courses (if not taken in the M.S., or not exempted)
- 1 seminar course (no credit)
- At least 24 credits of elective courses, according to the multiple constraints below:
- At least one philosophy course

- At least four courses should have the COGS course code
- At least five courses should be selected from the master course list
- At most two courses may be taken from another department (those courses can be taken from any department at METU or from another university, upon approval of the advisor)
- Undergraduate courses with 3XX course codes cannot be used for fulfilling the course requirements in PhD
- PhD Qualifier Exam
- PhD thesis (non-credit)

GRADUATE CURRICULUM

M.S. PROGRAM

Must Courses

COGS	501	Linguistics and Formal Languages	(3-0)3
COGS	502	Logic and Programming	(3-0)3
COGS	503	Introduction to Cognitive Science	(2-0)1

Students with a Computer Science degree may be exempted from COGS 502. Students with a degree in a related field may also be exempted from COGS 502 with the consent of the instructor. An extra elective course must be taken to replace the exempted must course.

Courses of The Program

The list is regularly updated by the program. Please visit the department web page for Master Course List.

Ph.D. PROGRAM

Must Courses

If they or their equivalent have been taken before, students do not have to take other courses to replace the exempted course(s).

COGS	501	Linguistics and Formal Languages	(3-0)3
COGS	502	Logic and Programming	(3-0)3
COGS	503	Introduction to Cognitive Science	(2-0)1

Courses of The Program

The list is regularly updated by the program. Please visit the department web page for Master Course List.

Must Courses

COGS	501	Linguistics and Formal Languages	(3-0)3
COGS	502	Logic and Programming	(3-0)3
COGS	503	Introduction to Cognitive Science	(2-0)1

Track A: Computing

COGS	511	Computational Models of Mind	(3-0)3
COGS	515	Artificial Intelligence for Cognitive Science	(3-0)3
COGS	523	Using Corpora for Language Research	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	563	Computational Linguistics	(3-0)3
CENG	564	Pattern Recognition	(3-0)3

CENG	565	Theory of Computation	(3-0)3
CENG	566	Image Processing	(3-0)3
CENG	567	Design and Analysis of Algorithms	(3-0)3
CENG	568	Knowledge Engineering	(3-0)3
CENG	569	Neurocomputing	(3-0)3
CENG	580	Distrubuted Artificial Intelligence	(3-0)3
CENG	581	Automated Reasoning	(3-0)3
CENG	582	Advanced Neural Modeling	(3-0)3
CENG	583	Computational Vision	(3-0)3
CENG	584	Cognitive Aspects of Natural Language Processing	(3-0)3
CENG	585	Fundamentals of Autonomous Robotics	(3-0)3
CENG	701	Virtual Reality	(3-0)3
CENG	729	Syntax, Semantic &Computation: Combinatory Categorical Grammar	(3-0)3
CENG	784	Statistical Methods in Natural Language Processing	(3-0)3
EE	543	Neurocomputers	(3-0)3
EE	586	Artificial Intelligence	(3-0)3
ES	509	Partial Differential Equations in Computer Vision/Image Processing	(3-0)3
GATE	722	Audio for Games and Virtual Environments	(3-0)3
IS	566	Image Peocessing Algoritms	(3-0)3
IS	573	Human Computer Interaction	(3-0)3
MIN	705	Neuroimaging: Anatomy, Physiology and Function of the Human Brain	(3-0)3

Track B: Linguistics

COGS	522	Lexical Semantics	(3-0)3
COGS	523	Using Corpora for Language Research	(3-0)3
COGS	524	Cognitive and Linguistic Aspects of Sign Language	(3-0)3
COGS	526	Meaning and Logic	(3-0)3
COGS	530	Modern Theories of Grammar	(3-0)3
COGS	531	Language and Cognition	(3-0)3
COGS	532	Theoretical Linguistics	(3-0)3
COGS	541	Language Acquisition	(3-0)3
CENG	729	Syntax, Semantics and Computation Combinatory Categorical Grammar	(3-0)3
ELT	506	Second Language Acquisition	(3-0)3
ELT	520	English-Turkish Contrastive Analysis	(3-0)3
ELT	608	Pragmatics and Discourse Analysis	(3-0)3
ELT	611	Psycholinguistics	(3-0)3

Track C: Psychology

COGS	519	The Grounding of Language and Cognition in Perception	(3-0)3
COGS	524	Cognitive and Linguistic Aspects of Sign Language	(3-0)3
COGS	533	Functional Neuroanatomy	(3-0)3
COGS	534	Cognition, Perception and Action	(3-0)3
COGS	535	Cognitive Development	(3-0)3
COGS	536	Research Methods and Statistics for Cognitive Science	(3-0)3
COGS	537	Dynamical Approaches to Cognitive Science	(3-0)3
COGS	551	Human Memory	(3-0)3
COGS	552	Thought and Language Processes	(3-0)3
COGS	553	Psychology of Reading	(3-0)3
COGS	554	Auditory Cognition	(3-0)3
COGS	555	Connectionism and Human Behavior	(3-0)3
COGS	556	Visual Cognition	(3-0)3
COGS	557	Situated and Distributed Cognition	(3-0)3
COGS	757	Neurogenetics of Learning and Memory	(3-0)3
COGS	758	Time and Cognition	(3-0)3
PSY	385	Introduction to Cognitive Science	(3-0)3

Track D: Philosophy

COGS	526	Meaning and Logic	(3-0)3
COGS	517	Philosophy of Cognitive Science	(3-0)3
COGS	519	The Grounding of Language and Cognition in Perception	(3-0)3
PHIL	405	Philosophy of Language	(3-0)3
PHIL	507	Philosophical Logic I	(3-0)3
PHIL	508	Philosophical Logic II	(3-0)3
PHIL	510	Topics in Epistemology	(3-0)3
PHIL	523	Studies in Philosophy of Science I	(3-0)3
PHIL	524	Studies in Philosophy of Science II	(3-0)3
PHIL	527	Philosophy in Science	(3-0)3
PHIL	529	Philosophy of Biology	(3-0)3
PHIL	621	Philosophy of Mind I	(3-0)3
PHIL	622	Philosophy of Mind II	(3-0)3
PHIL	632	Dynamics of Scientific Theories	(3-0)3
PHIL	633	Foundations of Logic I	(3-0)3
PHIL	634	Foundations of Logic II	(3-0)3
PHIL	644	Current Problems in	

		Philosophy	(3-0)3
PHIL	653	Theories of Scientific Method	(3-0)3

Track Free Courses:

COGS	595	Affective Neuroscience	
		and Computing	(3-0)3
ARCH	463	Introduction to the Theory of Shape Grammars	(3-0)3
BIO	409	Introduction to Neurobiology	(3-0)3
BIO	704	Advances in Neuroscience	(3-0)3

DESCRIPTION OF COURSES

COGS 501 Linguistics and Formal Languages (3-0)3

Natural language and linguistic knowledge. Language and grammar. Morphology. Syntax and grammatical structure. Semantics: Word meaning and grammatical meaning. Regular expressions and regular grammars. Push-down automata. An introduction to Parsing and derivation.

COGS 502 Programming and Logic (3-0)3

Sets, relations and functions. Propositional and predicate logic. Truth, validity, and models. Deduction and inference methods. Logic programming. Specification and construction of PROLOG programs. Various data structures and predicates of PROLOG.

COGS 503 Introduction to Cognitive Science (0-0)1

This course introduces the various empirical domains and research methodologies of Cognitive Science to new-coming students. Students will first be introduced to the history of Cognitive Science and to major debates in the field (rationalism vs. empiricism, modularity, meaning of data). Subsequently the major empirical research domains of Cognitive Science will be covered on a weekly basis (language, vision, attention, learning and memory, theory of mind, action, evolution, brain, emotional and social aspects of cognition). General academic skills such as academic reading, writing, and discussion will be fostered through homework assignments and active in-class participation of students. Specific academic skills will be conveyed through three alternating blocks of teaching and practical hands-on training (conducting and analyzing experiments, collecting and presenting own data). The course aims at providing an overview over the inter-disciplinary field of Cognitive Science and to motivating students to further explore the various tracks offered by the program in their subsequent studies (computation, linguistics, neuroscience, philosophy, and psychology).

COGS 511 Computational Models of Mind (3-0)3

An introduction to computational modeling in cognitive science, including computer simulation models of complex cognition, models within artificial intelligence, models based on neural mechanisms and networks and formal and mathematical models in areas such as psychology, linguistics, and philosophy. Mathematical and computational modeling of the evolution of cognition. Models of cognition that extend beyond the boundaries of the person to include the environment, artifacts, social interactions, and culture.

COGS 514 Cognition and Machine Learning (3-0)3

Machine learning and its applications as a research methodology at the intersection between natural cognitive systems and artificial cognitive systems. Supervised learning, Bayesian decision theory, decision trees, multilayer perceptrons. Applications in subdomains of cognitive science, including natural language processing, vision and models of human learning.

COGS 515 Artificial Intelligence for Cognitive Science (3-0)3

Fundamental Techniques of Artificial Intelligence and Their Applications in Cognitive Science: Search, Planning, Game Playing, Knowledge Representation and Inference, Uncertainty and Probabilistic Reasoning. Decision Making. Learning. Philosophical Implications of Artificial Intelligence and its relation to Cognitive Science.

COGS 517 Philosophy of Cognitive Science (3-0)3

Mind-body problem. Materialist theories of mind and cognition. Arguments against materialism. Consciousness. Intentionality. Free will. Mental causation. Perception. Modularity and Creativity in cognition. Computationalism. Language of Thought

Hypothesis. Computational Theories of Mind. What is Cognitive Science About?

COGS 519 The Grounding of Language and Cognition in Perception (3-0)3
This interdisciplinary course will study two main questions: How do language and thought relate to perception? How are symbols grounded in perception? To address the questions, we will present and analyze case studies in cognitive and language development, symbol grounding, and computational linguistics from the standpoint of cognitive psychology, philosophy, and computational linguistics. The philosophical content will be provided through a discussion of the semantics and epistemology of perceptual demonstratives, perceptual predicates, and mental files. We will investigate infants' ability to individuate objects through perceptual and conceptual systems (cognitive development), the role of perception in word learning, word segmentation, the development of grammar (language development), and the role of perception in the conception of colors and events (symbol grounding).

COGS 522 Lexical Semantics (3-0)3
Lexical relations, approaches to meaning components (binary features, logical decomposition, semantic primitives), lexical organization (categorization, prototypes, metaphor, metonymy, semantic maps), lexical meaning and compositionality, verb semantics (event classification, event structure, argument structure, linking problem), lexicon in computational theories of grammar, close up on Pustejovsky's 'generative lexicon'.

COGS 523 Using Corpora for Language Research (3-0)3
The study of language via corpora. Definition and varieties of corpora. Building a corpus: sampling, representativeness, encoding and annotation. Characteristics of major available corpora. Using corpora: corpora in psycholinguistics, corpora and semantics, corpora and discourse, statistical natural language processing. Using tools and programming for corpus-based studies.

COGS 524 Cognitive and linguistic aspects of Sign Language (3-0)3
History of Sign Language and Sign Language research. Sign Language phonology and phonological theories (hand tier model, prosodic model, Optimality Theory). Sign Language morphology: morphological typology (simultaneous and sequential affixes), inflectional morphology and word formation processes, classifiers. Sign Language syntax: word order, sentence types (figure-ground, topic, focus, questions). Psycholinguistics of Sign Language: perception, production, acquisition, emergence of Sign Language, working memory, use of space in Sign Language. Neurolinguistics of Sign Language, neurophysiological bases of Sign Language, Sign Language aphasia. Effects of modality and modularity, universality of Sign Language. Sign Language and gestures. Methods of Sign Language Research, notation systems.

COGS 526 Meaning and Logic (3-0)3
The course aims to introduce students to the connections between philosophy and linguistics, with a focus on problems of meaning in both disciplines. After two introductory sessions on meaning in natural language and meaning in logic, the course proceeds with thematic units relevant to the interaction between natural language and logic: the language of logic, formal semantics, logical vs. pragmatic meaning, ordinary language philosophy, intentionality, and meaning in modern linguistics. The final portion of the course focuses on discussions on what different approaches to linguistic and logical meaning may imply in the study of cognitive phenomena.

COGS 530 Modern Theories of Grammar (3-0)3
The course introduces to the theory of principles and parameters which is representative for the contemporary discussion in linguistic research. Empirical adequacy of a theory of grammar as a system of mental representations.

COGS 531 Language and Cognition (3-0)3
Models for acquisition, processing and application of human knowledge as the object of cognitive sciences. Cognitive Linguistics as the investigation of the acquisition, processing, and application of language knowledge. Grammar as a model of human language knowledge. Relations of artificial intelligence.

COGS 532 Theoretical Linguistics (3-0)3
A survey of the history of linguistics, sound-meaning-structure relations in language, grammatical categories and functions, key concepts and methods of analysis in phonetics, phonology, morphology and syntax.

COGS 533 Functional Neuroanatomy (3-0)3
Central nervous system, gross neuroanatomy, histology and neurophysiology for students to develop a general understanding of the organization of the human brain. Localization of cognitive functions: language, memory, learning, attention,

decision making, executive function. Limbic system and emotions. Disorders that present with pathology, lesion or social/learning deficits.

COGS 534 Cognition, Perception and Action (3-0)3

Students will learn about the history of the topic, starting with James´ Ideo-motor principle; the importance of the interaction between cognition, perception, and action and its implications for contemporary theories in cognitive science will be pointed out; modern theories accommodating this interaction will be discussed in depth: the Common-Coding model and the Theory of Event Coding (TOC) which both assume a common representational code for perception and action; students will be presented with important methods to study cognition, perception, and action, e.g., the Simon-task; support of joint action-perception representations by the discovery of a human mirror neuron system; we will address ´embodied´ and ´embedded cognition´ which stress the role of the body and the environment for cognition; how joint actions are coordinated by joint minds between two or more subjects; how infants and children learn to control their actions through the anticipation of their intended action goals. Team-work: Students will engage in planning, conducting, analyzing, and reporting experiments on relevant topics, in small groups.

COGS 535 Cognitive Development (3-0)3

Development of infants (first 2 years of life) and pre-schoolers (2-6 years). Theories of development (nativist, empiricist, genetic epistemology, dynamic systems theory (DST)). Basic concepts of development: knowledge representation, learning, maturation, modularity, domain-general vs. domain-specific development, emergence. Research methodology and experimental paradigms. Basic milestones in the development of perception (language, face, objects, action) and production (language, imitation of others´ and planning of own actions), categorization, understanding the physical world, understanding human action, Theory of Mind (ToM), Reasoning/Logic, Causaliy, Number, Attention and Memory (WM and LTM). Developmental cognitive neuroscience, brain development.

COGS 536 Research Methods And Statistics For Cognitive Science (3-0)3

Research methods: The students will be introduced to basic concepts of empirical research and experimental design: independent/dependent variable(s), variance. Methods and methodology of psychological research: experiment, observation, ex-post-facto design, cross-sectional studies, longitudinal studies. Statistics: The students will be introduced to Descriptive Statistics: building statistical models, the reason between population-sample, distributions, various mean values, variance, SD, SE, confidential intervals, test statistics, as well as to Inferential Statistics: General Linear Model (GLM), various forms of Analysis of Variance (ANOVA, ANCOVA, MANOVA, repeated measures ANOVA, mixed design ANOVA). Correlation. Regression. Non-paramatic tests. Factor analysis. Statistical analyses will be conducted using SPSS. Designing and reporting experiments.

COGS 537 Dynamical Approaches to Cognitive Science (3-0)3

Introduction to various dynamical approaches to Cognitive Science (e.g., non-linear dynamical systems theory, synergetics, chaos theory) – Basic mathematics of non-linear dynamical systems – Dynamical concepts (e.g., chaos, fractals, attractors, bifurcation, self-organization, symmetry-breaking) – Dynamical approaches in relation to computational and connectionist approaches to Cognitive Science – Theory, methodology and empirical applications of dynamical systems to major areas in Cognitive Science (neuronal self-organization, visual perception, coordinated action, learning and memory, cognitive development, language/ language acquisition, attention/ consciousness, and social psychology) – The philosophy of emergence – Hands-on practical training with HTML-based educational material on the mathematics and science of fractals and chaos.

COGS 541 Language Acquisition (3-0)3

The course aims to examine the theories and research methods in first and second language acquisition including bilingual processing.

COGS 551 Human Memory (3-0)3

History of human memory research, memory taxonomies and memory systems, methods of memory research. The development and structure of Baddeley's Multiple Component Working Memory Model (phonological loop, visuo-spatial sketchpad, executive control, episodic buffer). The neurophysiology and neuroanatomy of memory, memory disorders. Dynamical memory. Episodic memory. Development of memory. Memory and language (processing and production). Implicit and explicit memory. False Memory. Memory and sleep.

COGS 552 Thought and Language Processes (3-0)3

This course will examine language, knowledge representation, and thinking from the standpoint of

behavioral research. Basic mental processes related to phonological, orthographic, syntactic, and semantic processing will be examined. Rule-based and alternative approaches to human reasoning will be considered. The course will include discussions of specific topics such as logical reasoning, statistical reasoning, decision making, hypothesis testing, and problem solving. More general issues such as training in reasoning and expertise will also be discussed.

COGS 553 Psychology of Reading (3-0)3
The course will review research on psychological processes related to reading starting from the more perceptual and proceeding towards conceptual and global issues. The early part of the course will deal with the control of eye movements and registration of visual information during reading. Then issues related to word identification such as alternative models of visual word recognition and possible role of phonological coding in visual word identification will be discussed. Other topics will include constructing mental representations from text, learning, reading, developmental and acquired reading disabilities.

COGS 554 Auditory Cognition (3-0)3
This course will concentrate on the perceptual and cognitive analysis of auditory stimuli at simple and complex levels. The early part of the course will be devoted to an introduction to the physical properties of sound and structure and functioning of auditory sense organs and the auditory nervous system. This will be followed by discussion of perception of simple qualities of sound as pitch, loudness, and timbic. The final part of the course will concentrate on more complex auditory phenomena such as auditory scene analysis, memory of auditory stimuli, perception of speech and perception of musical pitch.

COGS 555 Connectionism and Human Behavior (3-0)3
History and development of connectionism. The dispute between nativism and empiricism; symbols and rules vs. patterns and associations; connectionism and the cognitive sciences; connectionism and dynamical systems; perspectives and limitations of connectionism. Basic concepts of connectionist networks. Learning to work and doing exercises with a simple connectionist network ("T-learn"). Applications of connectionist modelling: human cognitive development, language acquisition (the English past tense debate), language production and processing, person perception, human consciousness, music.

COGS 556 Visual Cognition (3-0)3
The course covers sensory, perceptual, and cognitive processes related to vision from a mainly psychological viewpoint supported by neuroscientific and computational information where appropriate. Content includes discussion of theoretical approaches to vision and a survey of empirical research on main problems related to vision. Information on classic research will be supplemented by examination of contemporary research on central issues.

COGS 557 Situated and Distributed Cognition (3-0)3
This course will introduce topics that are gaining increasing interest in cognitive science, such as embodiment, cognitive artifacts, affordances, extended cognition, distributed/group cognition and intersubjectivity. The course involves several readings that offer a re-examination of various domains of cognitive science such as thinking, reasoning, planning, learning, perception, representation and communication from a situated cognition perspective. Interaction Analysis will be introduced as a research methodology to study various aspects of cognition from a situated cognition perspective. Excerpts from online chat logs and face to face interactions will be analyzed from both conventional and situated perspectives to discuss existing theoretical and empirical positions regarding various cognitive processes such as reasoning, perception and social interaction.

COGS 590 Graduate Seminar NC

COGS 595 Affective Neuroscience and Computing (3-0)3
Definition of systems in the brain involved in the processing of affect. Fundamental physiological constructs underlying the sensation, representation and expression of affect. Emotional frameworks and models at our times, consisting of agents, neural networks and logic propositions. Expression of affect in computing such as in face, prosody, gesture or text processing. Emotions in human computer interfaces, game technology. Practical hands-on experience with skin conductance and startle eyeblink measures.

COGS 599 Master's Thesis NC

COGS 690 Graduate Seminar NC

COGS 699 Ph.D. Thesis NC

COGS 757 Neurogenetics of Learning and Memory (3-0)3
This course is a survey of research on the genes that affect learning and memory when mutated. The

course involves an introduction to research methods that are used to identify genes and study their function; a survey of behavioral tests that are used to screen for learning and memory mutants; and readings on the neural mechanisms of learning and memory.

COGS 758 Time and Cognition (3-0)3
This course is a survey of the properties of temporally controlled behavior in animals and humans, and the models that have been proposed to explain the neural mechanisms of timing and time perception. The course starts with readings the orderliness of behavior under experimental procedures where the duration of the signals controls behavior, with special emphasis on Weber's law in interval timing (aka the scalar property). Following a survey of the mathematical models that attempt to explain the scalar property, the course proceeds with readings on the neural mechanisms of timing and time perception. It is recommended to cognitive science, psychology, and biology students.

M.S. PROGRAM IN MODELLING AND SIMULATION

PROFESSOR

ÇETİN YARDIMCI, Yasemin: B.S., M.S., Boğaziçi University; Ph.D., Vanderbilt University.

ASSISTANT PROFESSOR

HACIHABİBOĞLU, Hüseyin *(Program Director)*: B.S.,METU; M.S., , University of Bristol; Ph.D., Queen's University Belfast

AFFILIATED FACULTY

PROFESSORS

BOZYİĞİT, Müslim: B.S., M.S., METU; Ph.D., University of Sussex. (Department of Computer Engineering)
KAYALIGİL, Sinan: B.S., M.S., METU; Ph.D., Lousiana Technology University.
(Department of Industrial Engineering)
KIRCA, Ömer: B.S., M.S., METU; Ph.D., Georgia Institute of Technology.
(Department of Industrial Engineering)
LEBLEBİCİOĞLU, Kemal: B.S., M.S., Ph.D., METU.
ÖZDEMİREL, N. Evin: B.S., M.S., METU; Ph.D. Arizona State University .
(Department of Industrial Engineering)
TOROSLU, İ.Hakkı: B.S., METU; M.S., Bilkent University; Ph.D., Northwestern University.

ASSOCIATE PROFESSOR

İŞLER, Veysi : B.S., METU; M.S., Ph.D., Bilkent University.

ASSISTANT PROFESSOR

OĞUZTÜZÜN, Halit Oğuztüzün: B.S., M.S., METU; Ph.D., University of Iowa.
(Department of Computer Engineering)

OBJECTIVES: Master of Science in Modelling and Simulation (M.S. in MODSIM) is an interdisciplinary program focusing on operations research modelling, virtual environments, and computer simulation. MODSIM program aims at educating students having sufficient background in various disciplines, and is intended mainly for those who will work as professionals as they pursue academic work. MODSIM curriculum is designed to develop and integrate modeling and simulation skills with special emphasis on application of these skills in virtual environments. The objectives of the program are:

- to educate graduates from different disciplines in the theoretical and practical aspects of modelling, virtual environments, and computer simulation,
- to foster and support interdisciplinary research in the field of modelling and simulation,
- to meet modelling and simulation needs of defense industry, and public and private sectors in general.

CAREER OPPORTUNITIES: Graduates of the program can work in any field related with modelling and simulation.

PROGRAM STRUCTURE: MODSIM is a non-thesis program and mainly intended for working professionals. It has no deficiency program and has two tracks: Decision Models and Virtual Environments. Each track has background requirements, core courses, and elective courses as defined in the curricula. Students are expected to complete the program in 5 semesters.

Students enrolled in MODSIM program pay tuition fee based on the number of credit hours they register every semester. The amount of tuition fee per credit hour is determined at the beginning of every academic year.

DEGREE REQUIREMENTS

- 6 core courses (MS 531 4 credits, remaining 5 courses 3 credits each)
- 3 elective courses (3 credits each)
- 1 seminar course (non-credit)
- Research Methods in Modelling and Simulation (1 semester, 3 credits)
- Term Project (non-credit)

A total of 40 credits are required.

GRADUATE CURRICULUM

Core Courses

Common Core Courses:

MS	501	Deterministic Decision Models	(3-0)3
MS	515	System Simulation	(3-0)3
MS	521	Object-Oriented Programming	(3-0)3
MS	531	Distributed Simulation	(3-2)4
MS	590	Graduate Seminar	(1-0)0
MS	591	Research Methods in MODSIM	(6-0)4
MS	592	Term Project	(6-0)5

Decision Models Track Core Courses:

MS	502	Stochastic Decision Models	(3-0)3
MS	503	Mathematical Modelling and Applications	(3-0)3

Virtual Environments Track Core Courses:

MS	522	Computer Graphics	(3-0)3
MS	529	Software Engineering	(3-0)3

If a student has already taken some of the courses listed above (or their equivalents), he/she will take elective courses to replace them.

Elective Courses

MS	502	Stochastic Decision Models	(3-0)3
MS	503	Mathematical Modelling and Applications	(3-0)3
MS	504	Mathematical Models in Defense Analysis	(3-0)3
MS	506	Combinatorial Analysis	(3-0)3
MS	507	Network Analysis and Project Management	(3-0)3
MS	508	Inventory Theory	(3-0)3
MS	510	Scheduling Models	(3-0)3
MS	513	Decision Analysis	(3-0)3
MS	514	Decision Support System: Design and Implementation	(3-0)3
MS	516	Simulation Output Analysis	(3-0)3
MS	517	Statistical Data Analysis	(3-0)3
MS	522	Computer Graphics	(3-0)3
MS	523	Virtual Reality	(3-0)3
MS	525	Computer Communication and Networking	(3-0)3
MS	527	Artificial Intelligence	(3-0)3
MS	529	Software Engineering	(3-0)3
MS	541	Human Computer Interfacing	(3-0)3
MS	551	Fundamentals of GIS	(2-2)3
MS	561	Physics-Based Modelling	(3-0)3

DESCRIPTION OF COURSES

MS 501 Deterministic Decision Models (3-0)3

Introduction to the methodology of deterministic decision models. Kuhn-Tucker conditions of optimality. Linear programming using the simplex method. Duality theory. The dual simplex method and post optimality analysis. Parametric linear programming. The transportation algorithm. Transshipment and assignment problems. Integer programming models and an introduction to enumerative algorithms. Dynamic programming.

MS 502 Stochastic Decision Models (3-0)3

Review of probability theory and random variables. Sequence and functions of random variables, convergence concepts. Stochastic processes. Queuing problems based on birth and death models. Introduction to renewal theory. Applications in reliability and replacement models. Poisson processes, shot noise; Markov processes; statistical inference, least mean square error estimation.

MS 503 Mathematical Modeling and Applications (3-0)3
The aim of this course is to develop better skills in building and understanding mathematical modelling. Deterministic models in the areas of transportation, distribution, location, production and economic planning are analyzed.

MS 504 Mathematical Models in Defense Analysis (3-0)3
Basic LP models. Lanchester models. Deterministic combat models. Probabilistic combat models. Homogenous combat models. Heterogenous combat models. Mathematical models of combat. War games. Estimation of attrition rates. Weapon effectiveness indices.

MS 506 Combinational Analysis (3-0)3
What is combinatorics? Basic counting rules. Recurrence relations. Divide and conquer algorithms. Deterministic Decision Models Methods: Linear programming, integer programming, nonlinear programming, enumeration, dynamic programming. Analysis of algorithms: worst case, average. Applications: knapsack, travelling salesman, chinese postman, spanning tree, steiner tree, graph partitioning, cell formation, assembly line balancing. Meta heuristics: greedy, divide and conquer, local search: interchange, look-ahead, simulated annealing, genetic algorithms, neural networks.

MS 507 Network Analysis and Project Management (3-0)3
Basic network flow problems such as shortest path, minimal spanning tree and maximal flow problems. Principles of project management. Network representation and terminology. Network planning with respect to costs and durations. Resource constrained network planning. Financial planning and cost control. Project scheduling with probabilistic networks.

MS 508 Inventory Theory (3-0)3
Deterministic inventory problems. Deterministic inventory problems with constraints. Unconstrained, infinite horizon., stochastic demand continuous review problems. Single period, stochastic demand problems. (s,S)policies for periodic review, infinite horizon problems. Structure of production-inventory systems. Deterministic and stochastic ordering decision models in continuous and periodic review systems. Coordinated replenishment of multiple items. Supply-chain management.

MS 510 Scheduling Models (3-0)3
Scheduling and sequencing problems. Basic formulation. Single processor, multi processor scheduling procedures and heuristics. Scheduling approaches. Priority rules and job shop scheduling.

MS 513 Decision Analysis (3-0)3
Decision making under uncertainty. Maximizing expected monetary value. Maximizing expected utility. Judgmental probabilities. Value of information. Normal form of analysis. Risk sharing.

MS 514 Decision Support Systems: Design and Implementation (3-0)3
Individual and organizational decision making. Normative and behavioral models of decision making. Utility functions. Basic concepts of DSS. Data collection, database management, modelling support user interface design issues. EIS, ES, intelligent DSS. Integration of MSS. Basics of modelling, model building blocks. Implementation issues.

MS 515 System Simulation (3-0)3
Simulation methodology and model building. Modelling with a simulation language. Random variate generation. Basic issues in the design, verification and validation of simulation models. Advanced simulation modelling concepts in process interaction orientation. Examples will be based on modelling of defense systems. Station submodels. Continuous and mixed simulation. Introductory output analysis for a single system and comparison alternatives.

MS 516 Simulation Output Analysis (3-0)3
Simulation methodology and its comparison with other techniques, discrete change simulation concepts. Selecting input distributions, random variate generation, statistical analysis of output. Selected applications of simulation.

MS 517 Statistical Data Analysis (3-0)3
Computer aided exploration, analysis and classification of data and empirical model building in engineering through the use of descriptive statistics, random sampling, probability distribution fitting, analysis of variance, regression analysis, discrimination and classification and clustering.

MS 521 Object-Oriented Programming (3-0)3
Review of data structures using C++. Introduction to Object Oriented Programming Languages. Abstraction, approaches to modular program design, principles of abstract data types, basic concepts of objects: local variables and methods. Classes and instances, single and multiple inheritance and object hierarchies. Principles of object-oriented software

development. Overview of and experience with the object-oriented programming environments such as C++, Java, through programming assignments and possibly a term project.

MS 522 Computer Graphics (3-0)3
Introduction to computer graphics. The rendering pipeline. Rasterization algorithms. Two-dimensional and three-dimensional transformations. Quaternions. Hierarchical modelling. Animation. Viewing transformations. Rendering basics. Illumination and color models. Geometrical Modelling. Hidden surface elimination problem. Shading, deformation, ray tracing, texture mapping, fractal representation and various other advanced techniques are discussed.

MS 523 Virtual Reality (3-0)3
Display technologies and computational models: Stereoscopic display, head-mounted displays, holographic displays, force display, tracking technologies. Building and displaying virtual worlds. Applications of virtual reality.

MS 525 Computer Communication and Networking (3-0)3
Basics of data communication, and computer networks, ISO/OSI basic reference model. Physical, data-link, network, and transport layers. Routing, flow control, congestion control. Internetworking. TCP/IP suite of protocols. Higher layer protocols. Contemporary network architectures.

MS 527 Artificial Intelligence (3-0)3
This course examines the ideas and techniques underlying the design of intelligent computer systems. Topics include heuristic search, problem-solving, game-playing, knowledge representation, logical inference, planning, reasoning under uncertainty, decision theory, expert systems, learning, perception and natural language understanding.

MS 529 Software Engineering (3-0)3
Software development process is explained within its engineering perspective, through a variety of traditional methods. With an emphasis on modelling techniques for the problem definition and design, traditional approaches are compared to contemporary concepts. New methods and current research in defining future technology are introduced.

MS 531 Distributed Simulation (3-2)4
Fundamentals of distributed discrete event simulation. Distributed interactive simulation and networked virtual environments. High Level Architecture. Federation development and execution process. Conceptual models of mission space. Verification and validation. Synthetic environments.

MS 541 Human Computer Interfacing (3-0)3
Human Factors of Interactive Software. Managing the design processes. Assessment of user interfaces. Building software tools. Direct manipulation systems. Interaction mediums and devices. Presentation issues. Multiple-window strategies. Information search and visualization. Hypermedia and WWW.

MS 551 Fundamentals of GIS (2-2)3
Fundamentals of Geographic Information Systems (GIS), GIS components, coordinate systems and map projections, data input and output, spatial data models, data management, integrated data analysis, spatial data modelling.

MS 561 Physics Based Modelling (3-0)3
Review of continuous and discrete time signals and systems. Space-time domain representation of signals. Modelling and simulation of active and passive sensor systems. Sampling and noise in physical systems. Applications in infrared and color imaging and radar or acoustic signal processing.

MS 590 Graduate Seminar NC
This course is designed to expose MODSIM students to various research areas in modeling and simulation. Speakers from the industry and academia are invited to give talks in their field of interest. Second year MODSIM students with significant modeling and simulation experience may also be asked to present their projects.

MS 591 Research Methods in MODSIM (4-0)4

MS 592 Term Project (5-0)5

M.S. PROGRAM IN INFORMATICS-ONLINE

PROFESSORS

BAYKAL, Nazife ***(Director of the Graduate School of Informatics)***: B.S., M.S., Ph.D., METU.
ÇETİN YARDIMCI, Yasemin: ***(Department Chair)*** B.S., M.S., Boğaziçi University; Ph.D., Vanderbilt University.
DEMİRÖRS, Onur: B.S., METU; M.S., Ph.D., Southern Methodist University.

ASSOCIATE PROFESSORS

KOÇYİĞİT, Altan: B.S., M.S., Ph.D., METU.
YILDIRIM ÖZKAN, Sevgi : B.A., M.A., Cambridge University; M.Sc, .London University; Ph.D., METU.
BETİN CAN, Aysu: B.S., METU, Ph.D., University of California Santa Barbara.
GÜNEL, Banu: B.S., METU; M.S., University of Bristol; Ph.D., Queen's University

ASSISTANT PROFESSORS

EREN, P. Erhan ***(Program Director)***: B.S., Bilkent University; M.S., Ph.D., University of Rochester. Belfast.
TEMİZEL TAŞKAYA, Tuğba: B.S., Dokuz Eylül University; Ph.D., University of Surrey.

INSTRUCTOR

ARİFOĞLU, Ali ***(Associate Director of the Graduate School of Informatics)***: B.S., Hacettepe University; M.S., Ph.D., METU

AFFILIATED FACULTY

ASSISTANT PROFESSOR

GÖKÇAY, Didem: B.S., M.S., METU, Ph.D., University of Florida.

OBJECTIVES: Informatics-Online aims at providing expertise on the rapidly developing subjects of information technology and systems. It is intended for working professionals who need continuing education at anytime and anywhere without the need to come to the METU campus for lectures.

CAREER OPPORTUNITIES: Graduates of the program can work in any field related with information technology and systems.

PROGRAM STRUCTURE: Informatics-Online is a non-thesis program in which course participation will be exclusively through the Internet. Courses cover fundamental and current concepts of information technology and systems in depth. Personal appearance of students on the campus is required twice in every semester (at the beginning and at the end of the semester). Students are required to complete an applied project and present it in a seminar on the campus. Performance of students is evaluated based on in-class final exams and self-tests administered on the web, as well as homework assignments, projects, and contribution to chats, seminars and forums.

Students enrolled in Informatics-Online pay tuition fee based on the number of credit hours they register every semester. The amount of tuition fee per credit hour is determined at the beginning of every semester.

DEGREE REQUIREMENTS

- 5 core courses (3 credits each)
- 5 elective courses (3 credits each)
- 1 seminar course (non-credit)
- Term Project (1 credit)

A total of 31 credits are required.

GRADUATE CURRICULUM

Core Courses

ION	501	Introduction to Information Systems	(3-0)3	ION	504	Computer Networking for Information Systems	(3-0)3
ION	502	Introduction to Software Engineering	(3-0)3	ION	505	Information Systems On-Line Group Project	(1-4)3
ION	503	Database Concepts and Applications	(3-0)3	ION	590	Graduate Seminar	NC
				ION	589	Term Project	(1-0)1

Students who have already taken some of the core courses listed above (or their equivalents) should take elective courses to replace them.

Elective Courses

ION	510	Object Oriented Programming with Java	(3-0)3	ION	541	Computer Networking Applications	(3-0)3
ION	512	IT Governance	(3-0)3	ION	542	Information Technology and Business Processes	(3-0)3
ION	514	Multimedia Information Systems	(3-0)3	ION	545	Software Quality Management	(3-0)3
ION	516	Computer Architecture	(3-0)3	ION	551	Computer Security and Cryptography	(3-0)3
ION	523	Data Mining	(3-0)3	ION	552	Regulatory and Legal Aspects of Information Systems	(3-0)3
ION	525	Artificial Intelligence	(3-0)3	ION	561	Fundamentals of Simulation	(3-0)3
ION	526	Introduction to Neural Networks	(3-0)3	ION	562	Optimization	(3-0)3
ION	528	Image Processing Algorithms	(3-0)3	ION	574	Medical Imaging Technology	(3-0)3
ION	533	Decision Support Systems	(3-0)3	ION	557	Security Engineering	(3-0)3
ION	535	Introduction to Medical Informatics	(3-0)3	ION	720	Systems Engineering	(3-0)3

DESCRIPTION OF COURSES

ION 501 Introduction to Information Systems (3-0)3

The course introduces the students to the fundamental concepts of information systems. These include: systems theory; management information; conceptual models of information in organizations; MIS; decision support systems; enterprise resource planning systems; information systems planning; organizing for information system projects; IS project lifecycle models; IS development and maintenance principles; organization, management and control of IS; IS outsourcing.

ION 502 Introduction to Software Engineering (3-0)3

The course introduces the fundamentals of software management and software system models with an emphasis on software development process models, project management techniques and contemporary modeling notations.

ION 503 Database Concepts and Applications (3-0)3

Introduction to database concepts: data abstraction/independence, data models (entity-relationship model, object oriented model, relational/network/hierarchical model), database languages (ddl, dml), database administrator/user. Storage and file structures. Indexing and hashing. Relational model: formal query languages (relational algebra, relational calculus), commercial query languages (sql). Relational database design: integrity constraints, data dependencies, normal forms. Transaction processing and concurrency control.

ION 504 Computer Networking for Information Systems (3-0)3

Introduction to networking, Layered network architectures and standard layer functions. ALOHA, Ethernet and Token Ring networks. Framing and error control. Routing and switching. Internetworking. TCP/IP. The Internet.Application support protocols. Network security.

ION 505 Information Systems On-Line Group Project (1-4)3

This course aims to integrate fundamental awareness and expertise obtained in earlier information systems and software engineering courses into a meaningful whole through an applied group project. Students are organized in teams and each team is responsible from a stage in a complete IS development project. Teams communicate via formal documentation prepared and reviewed over the Internet. Course material, in parallel with project stages, presents an overview of fundamental IS project planning and management techniques and approaches. The course aims to achieve a professional level of quality in all stages of work, through formal peer reviews, standards of documentation and quality assurance.

ION 510 Object Oriented Programming with Java (3-0)3
The first aim of the course is to explain the concept of Object Oriented Programming. Secondly, Java programming language will be shown in parallel and how the basic principles of OOP are implemented in Java. Java structures and language constructs will be explained in addition to advanced Java concepts, Graphical User Interface design and thread mechanism. At the end of the semester students are expected to be able to program in Java efficiently and implement medium-hard GUI functionality.

ION 512 IT Governance (3-0)3
Contemporary issues about IT Governance as a whole; but major concentration upon IT Organization, Management, Processes, Project Management, Control Standards & Security, Risk Management & Audit issues will be thoroughly discussed and practiced in this course. By focusing on Business Requirements and Business-Technology Alignment; well-applied Global Best Practices, Assessment Methodologies, Process Maturity and IT Risks will examined.

ION 514 Multimedia Information Systems (3-0)3
Architectures for multimedia systems, digital audio, video technology and image compression, computer graphics, multimedia information systems, multimedia communication systems.

ION 516 Computer Architecture (3-0)3
The course provides the basics of computer organization and advanced architectures used in the design of modern computers. Together with fundamentals of computer organization, instruction level parallelism, memory hierarchies, storage systems and multiprocessor systems are given.

ION 523 Data Mining (3-0)3
The course introduces principles and techniques of data mining. It emphasizes the advantages and disadvantages of using these methods in real world systems, and provides hands-on experience. Topics include: Data Mining using Decision-Tree based classifiers, Association-Rules, Clustering methods, Neural Networks, Statistical methods (Probability, Maximum Likelihood, EM algorithm, Bayesian methods, Markov and Hidden Markov methods, Cross-Validation, Regression), Visual methods, Text Mining, Web Mining.

ION 525 Artificial Intelligence (3-0)3
Problem solving and search strategies. Game playing. Knowledge Representation. Expert systems and rule chaining. Vision. Natural language processing. Machine translation. Machine learning. Neural networks.

ION 526 Introduction to Neural Networks (3-0)3
This course aims to give basics of Artificial Neural Networks in an algorithmic approach. The following topics are to be covered in the course: Biological and Artificial Neurons, Perceptron Training Algorithm, Multilayer Perceptron and Back Propagation Training Algorithm, Hopfield Network as Autoassociative Memory, Bidirectional Associative Memory, Function Interpolation and Radial Basis Function Networks, Kohonen Self Organizing Feature Maps, Hopfield Network for Optimization Problems, Simulated Annealing and Boltzman Machine.

ION 528 Image Processing Algorithms (3-0)3
Introduction, Transform Techniques, Enhancement, Edge Detection, Morphological Image Processing, Color Image Processing, Segmentation, Image Representation and Compression. The course will be offered through Internet.

ION 533 Decision Support Systems (3-0)3
Individual and organizational decision making. Normative and behavioral models of decision making. Utility functions. Basic concepts of DSS. Simulation for decision support. Data collection, database management, data mining, Business Intelligence, EIS, ES, Intelligent DSS. Integration of MSS. Basics of modeling, model building blocks. Implementation issues.

ION 535 Introduction to Medical Informatics (3-0)3
Medical informatics is the application of computers, communications and information technology and systems to all fields of medicine - medical care,

medical education and medical research. This Course presents an overview of medical informatics and its main applications. Primary topics include : Medical informatics as a discipline, Associations and Institutes, Medical data and records, coding classification, database and reference models, Interfaces, data acquisition, processing and exchange standards, Medical Knowledge, decision and diagnostic support, Medical information systems, Administrative, Clinical and Ancillary Information systems, Implementations and evaluations, Telemedicine and Internet applications.

ION 541 Computer Networking Applications (3-0)3

TCP/IP overview. Integrated services. Differentiated services. Multiprotocol Label Switching. Ethernet overview and gigabit Ethernet. Wireless Networks. Optical Networks.

ION 542 Information Technology and Business Processes (3-0)3

This course covers the business process concepts and the impact of ICT as the enabling technology. Process organization and process innovation are the main emphasis. Methodologies such as integrated process engineering and extended integrated process engineering will also be in introduced.

ION 545 Software Quality Management (3-0)3

Software quality. Quality assurance. Quality metrics. Construction of software quality. Quality management and control. Software Quality Assurance planning. Quality standards. Software testing techniques. Black box and white box testing.

ION 551 Computer Security and Cryptography (3-0)3

The course introduces fundamental principles and concepts in computer security and teaches cryptography as a leveraging tool for building secure computer systems. Topics on cryptography include simple ciphers, both symmetric and asymmetric encryption, hash functions, message authentication codes and digital signatures. Other main computer security issues such as authentication, access control, operating system security and secure programming are also given. Security standards are briefly presented.

ION 552 Regulatory and Legal Aspects of Information Systems (3-0)3

This module aims to introduce the student to the basis of the legal systems that govern the supply and use of computer and communications technology. The sources of law regulating electronic transactions arising related to these technologies will be emphasized. Developing an understanding of the regulatory framework relating to electronic business transactions, starting with the simple formation of a binding electronic contract, and moving to complex issues of data protection, intellectual property rights, electronic liabilities, e-payments and financial transactions, and dispute resolution are the main concerns of this course.

ION 557 Security Engineering (3-0)3

Security engineering involves software and systems engineering, mathematics, economics, psychology and social engineering. This course aims to introduce the students to the hardware and software systems that require protection; the security mechanisms currently in place to protect them and the attacks that jeopardize availability, integrity or confidentiality of information and services.Specific applications of security engineering for military systems, financial sector, and managementof health records will be discussed.

ION 561 Fundamentals of Simulation (3-0)3

This course covers simulation modeling in dynamic and stochastic systems, relevant fundamentals of statistical analysis, computer simulation and other application specifics. Discrete event simulation is the main emphasis, however, continuous and combined models will also be introduced. Input data analysis, model verification and validation, experimentation and output analysis will be introduced. Computer simulation will be taught in SIMAN programming environment.

ION 562 Optimization (3-0)3

Introduction to optimization problems, problem formulation, mathematical preliminaries, convex analysis, unconstrained minimization, one dimensional search techniques, methods of steepest descent, Newton and quasi-Newton and conjugate directions, constrained minimization and Kuhn-Tucker conditions, linear programming, penalty function method, feasible direction techniques, evolutionary optimization, genetic algorithms.

ION 574 Medical Imaging Technology (3-0)3

The course provides a basic overview of the fundamental medical imaging technologies at an introductory level for graduate students of any background. Physical principles, data acquisition techniques and mathematical formulation of imaging problems are briefly introduced. Digital medical image processing/analysis techniques, as well as telemedicine/teleradiology concepts (including digital image communication in medicine-DICOM) are also covered.

ION 720 Systems Engineering (3-0)3
Introduction to Systems Engineering Management, Systems Engineering Management in Acquisition, Systems Engineering Process Overview, Requirements Analysis, Functional Analysis and Allocation, Design Synthesis, Verification, Systems Engineering Process Outputs, Work Breakdown Structure, Configuration Management, Technical Reviews and Audits, Trade Studies, Modeling and Simulation, Metrics, Risk Management

ION 589 Term Project (1-0)1

ION 590 Graduate Seminar NC

M.S. PROGRAM IN SOFTWARE MANAGEMENT

PROFESSOR

DEMİRÖRS, Onur ***(Program Coordinator):*** B.S., METU; M.S., Ph.D., Southern Methodist University

ASSOCIATE PROFESSORS

BETİN CAN, Aysu: B.S., METU; Ph.D., University of California Santa Barbara.
GÜNEL, Banu: B.S., METU; M.S., University of Bristol; Ph.D., Queen's University Belfast
KOÇYİĞİT, Altan: B.S., M.S., Ph.D., METU.

AFFILIATED FACULTY

PROFESSOR

BİLGEN, Semih: B.S., METU; M.S. Rensselaer Polytechnic Institute; Ph.D., University of Manitoba.

ASSOCIATE PROFESSOR

KÜÇÜKKAYA, Engin: B.S., METU; MBA, METU; Ph.D., University of South Florida.

ASSISTANT PROFESSOR

EŞMELİOĞLU, Sadık: B.S., M.S., Ph.D., METU.

INSTRUCTORS

KARAGÖZ, Alpay: B.S., M.S., Ph.D., METU.
CEBECİ, Hüseyin Onur: B.S., M.S., Ph.D., METU.
GÜCEĞLİOĞLU, Selçuk: B.S., M.S., Ph.D., METU.

OBJECTIVES: The M.S. program in Software Management is the first program established in Turkey to target specialized software domain knowledge. The objectives of this program are to lead the advancement of software practice in Turkey, to disseminate the domain knowledge on principles, processes, methods and techniques required to manage the development and evolution of software systems, and to bring forth experts and scientists in this field.

The program targets professionals in the field. The students in the program will gain the ability to systematically define and use the knowledge on software development processes, methodologies, techniques and metrics. The program offers courses on software project management, software quality management, software acquisition management, requirements analysis, software architectures and design, software testing, human computer interaction, and software operations and maintenance. For students to gain necessary experience, design and implementation are seen as an integral part of all courses. Students are also involved in a realistic team project to integrate the knowledge and experience built up in specialized courses.

CAREER OPPORTUNITIES: The program prepares graduates for professional careers in organizations which acquire, develop, evolve and maintain software systems.

PROGRAM STRUCTURE: Software Management is a non-thesis program. The students enrolled in the program are required to take four core courses and seven electives. The elective courses are divided into two categories as *Software* category and *Software Domains* category. *Software* category includes courses related to software management and software product engineering. Students need to take at least four courses

in this category. *Software Domains* category includes courses on computing foundations and software application areas. Students can take up to three courses from this category. In addition, the students can also take courses from other programs such as M.S. in Modeling and Simulation (MODSIM) and M.S. in Informatics Online (ION) as S*oftware Domains* electives.

No prerequisite courses are specifically required to enter the program. However, the students are expected to have background knowledge on discrete mathematics and numerical methods, programming and algorithms, and management. Additional information can be obtained from the web page http://www.ii.metu.edu.tr/software-management-ms-program

Students enrolled in Software management program pay tuition fee based on the number of credit hours they register every semester. The amount of tuition fee per credit hour is determined at the beginning of every semester.

DEGREE REQUIREMENTS

- 4 core courses (SM 504 4 credits, remaining 3 courses 3 credits each)
- 7 elective courses (3 credits each)
- Graduate Seminar course (non-credit)
- Term Project (non-credit)
- Special Studies (non-credit)

A total of 34 credits are required for graduation.

GRADUATE CURRICULUM

Core Courses

SM	501	Personal Software Process	(3-0)3
SM	502	Software Management	(3-0)3
SM	503	Object Oriented Software Development	(3-0)3
SM	504	Team Software Project	(2-4)4
SM	589	Term Project	NC
SM	590	Graduate Seminar	NC
SM	892	Special Studies	NC

Students who have already taken some of the core courses listed above (or their equivalents) should take elective courses to replace them.

Software Elective Courses

SM	511	Software Process Improvement	(3-0)3
SM	514	Introduction to Software Testing	(3-0)3
SM	515	Software Verification and Validation	(3-0)3
SM	516	Component Based Software Production	(3-0)3
SM	517	Software Metrics	(3-0)3
SM	518	Real-time Software Development	(3-0)3
SM	519	Software Acquisition	(3-0)3
SM	521	Software Requirements Engineering	(3-0)3
SM	523	Software Design Patterns	(3-0)3
SM	525	Software Product Line Management	(3-0)3
SM	561	Introduction to Software Engineering	(3-0)3
SM	702	Behavioral Aspects of Software Development: Peopleware	(3-0)3

Software Domains Elective Courses

SM	512	Object Oriented Programming and Data Structures	(3-0)3
SM	528	Software Architecture	(3-0)3

SM	530	Social Network Analysis	(3-0)3
SM	541	Instructional Software Construction	(3-0)3
SM	542	Multimedia and Web Engineering	(3-0)3
SM	546	Contemporary Database Management Systems	(3-0)3
SM	547	Enterprise Resource Planning Systems	(3-0)3
SM	548	Computer System for Programmers	(3-0)3
SM	549	IT Governance	(3-0)3
SM	701	Contemporary Issues in Business	(3-0)3

DESCRIPTION OF COURSES

SM 501 Personal Software Process (3-0)3

The course introduces the basic principles of the personal software process and help individual engineers to improve their performance by bringing discipline to the way they develop software. Students start with the PSP0 process, where they use their current programming practices. The PSP process is enhanced through seven process versions, with students writing one or two programs with each PSP version. For each program, they use the process methods just introduced, as well as all of the methods introduced with the previous process versions.

SM 502 Software Management (3-0)3

This course introduces the fundamentals and methods used in managing software development. Topics will include software project planning and control, subcontract management, configuration management, risk management and organizing and managing software teams and commitment management.

SM 503 Object-Oriented Software Development (3-0)3

The course introduces the fundamentals of object-oriented information system development with a focus on analysis and design phases. Data modeling and design principles such as data abstraction, information hiding, modularity, and coupling are viewed in the context of object-oriented paradigm. For object-oriented modeling Unified Modeling Language (UML) is introduced and used extensively throughout the course. Unified process is taken as the basis for development efforts. Issues relating to making the transition from other software development methodologies are examined and risks involved in object-oriented process are discussed.

SM 504 Team Software Project (2-4)4

The course is designed for students to gain an understanding of issues of a real-world software project and enable them to apply their newly learned skills in a practical context. Students will be grouped into teams to undertake a software project with the tools, techniques and skills acquired during their previous course work. Each team will work as a software development group and assume the role of a quality assurance team for another group. The team will be assigned to a client and will interact with that client to engineer requirements, agree upon a design and achieve a successful acceptance test of a software system. Teams will meet on predetermined milestones with their faculty and quality assurance groups to discuss review results and progress.

SM 511 Software Process Improvement (3-0)3

Introduce students the concept of software process and software process improvement through the use of software process capability models. Emphasis will be placed on the application of process concepts to industrial situations. Other topics will include software process assessment techniques, software process improvement models and process capability models in related areas.

SM 512 Object Oriented Programming and Data Structures (3-0)3

The basic Object Oriented Principles will be discussed using a modern programming language i.e. Java. The theory will be used in practice to implement Data Structures which is very important in algorithm development. The core of the class will depend on using object oriented principles to implement algorithms in Data Structures using Java. Although some reading is required, practice is more important in learning any programming language

SM 514 Introduction To Software Testing (3-0)3

The Relationship Of Software Testing To Quality Is Examined With An Emphasis On Testing Techniques. Topics Include Module And Unit Testing, Integration And Acceptance Testing, Statistical Testing Methods, Defining Test Plans And Strategies That Map To System Requirements. Testing Principles, Formal Models Of Testing And Software Testing Standards Are Also Examined.

SM 515 Software Verification and Validation (3-0)3
The course introduces software verification and validation techniques and tools. The course focuses on audit, review, inspection and walkthrough techniques and tools used for implementation. It also introduces independent verification and validation process. Issues related to the installation of these processes within an organization and to the impact on software quality are also investigated. Students complete a term project to apply the techniques and tools studied.

SM 516 Component Based Software Production (3-0)3
Effective software processes for component based software production. Domain engineering vs. application engineering. Component project management. Quality assurance. Product line development. The use of commercial off-the-shelf components. Product data management. Maturity of the component process. Running the component-based engineering business.

SM 517 Software Metrics (3-0)3
Techniques of measurement within the context of software quality engineering and software project management are addressed. Metrics and quality are presented in relationship to the software process and software process maturity models. Selection of quality and project metrics is addressed in terms of the goal/question/metric paradigm as well as various quality models. Methods of storing data for historical purposes, analyzing and presenting data to others are also discussed included.

SM 518 Real-time Software Development (3-0)3
Real-time systems. Real-time operating system concepts: Scheduling, Synchronization, Communication. Real-time software development methods. Real-time software development tools.

SM 519 Software Acquisition (3-0)3
Issues relating to software procurement, contract law, specification and control of product processes are examined. Topics include software and system acquisition standards, factors that affect cost, cost estimation, cost/benefit analysis, risk analysis and legal implications with respect to ownership and use.

SM 521 Software Requirements Engineering (3-0)3
Requirements engineering within software life-cycle. Requirements elicitation and modeling: issues and techniques. Documentation and management of requirements. Standards and CASE tools. Cognitive and socio-organizational issues.

SM 523 Software Design Patterns (3-0)3
This course focuses on design patterns, patterns for concurrent software systems, antipatterns and recognizing design problems, refactoring bad design to patterns. Hands-on experience on reuse of design patterns will be established by a class project. The course includes reviews of UML, object-oriented design and aspect oriented design. Students will be able to efficiently communicate program structures using patterns and to develop software of high quality.

SM 525 Software Product Line Management (3-0)3
Fundamental concepts of software product lines are introduced. These include commonality and variability; domain and application management; variability modeling and management; reference architectures. Approaches to SPL development, SPL organisation and SPL adoption are discussed. The concept of SPL maturity is also introduced and the Family Evaluation Framework is studied, together with case studies of hypothetical and real life organisations.

SM 528 Software Architecture (3-0)3
Fundamental concepts of software architecture. The role of architecture in software engineering. Designing applications from an architecture-centric perspective. Architecture design techniques and approaches. Architectural styles and patterns. Implementation and deployment. Software architecture modeling and architecture documentation.

SM 530 Social Network Analysis (3-0)3
Social network analysis is a core methodology utilizing graph theory, algebra, statistics, sociometry and psychometry for a diverse field of applications. This course is intended to introduce to students how to extract information contained in a network to measure and characterize them, different types of networks, creating models of networks and predicting their behavior. Most commonly used GUI-based software tools for measuring and displaying network data will also be introduced. The course will also focus on specific applications of the network analysis in management, strategy development, spread of new ideas, innovations, epidemiology and social computing.

SM 541 Instructional Software Construction (3-0)3
Overview of Computer Aided Instruction (CAI): Types, strengths and weaknesses, effective CAI.

Implications of the learning theories for courseware design and authoring. Features, advantages and limitations of different CAI modes. Planning and managing CAI projects. Designing and producing CAI.

SM 542 Multimedia and Web Engineering (3-0)3

This course introduces methodologies, techniques and tools used to analyze, design and implement multimedia and web-based applications. The focus of the course will be hands-on development of commercial web-based applications. Students will study a variety of software technologies relevant to web design and implementation including programming languages, scripting languages, network programming and security. Each student will develop an application by going through all phases of web engineering life cycle: specification, design, implementation, and evaluation.

SM 546 Contemporary Database Management Systems (3-0)3

This course will introduce students to the state of the art commercial relational database systems and enable them to gain practical knowledge and experience in using them. The fundamental concepts including relational data base systems and SQL, the normal forms, data base design, and the entity-relationship approach will be reviewed. The concepts of modern relational database systems such as stored procedures, triggers, cursors, database security and concurrency as well as performance and tuning of the relational database system will be covered.

SM 547 Enterprise Resource Planning Systems (3-0)3

This course studies Enterprise Resource Planning (ERP) systems, its scope, implementation issues and the organization's motivation for implementation such systems. The topics include; the ERP framework and architecture, leading enterprise systems and market trends, implementation methodologies, evaluation of ERP Systems, and implementation success factors. The students will comprehend the implementation process and will be able to develop an ERP implementation. The course will involve a combination of lectures, in-class discussions and presentations, online materials, a project, and homework assignments. The course will involve a combination of lectures, in-class discussions and presentations, online materials, a project, and homework assignments.

SM 548 Computer Systems for Programmers (3-0)3

This course summarizes computer systems from a programmers perspective and it is for students with no backgrounds in logic design, computer organization and computer architecture. Starting with a program in a high level language, all stages from compilation, assembly and execution of instructions in hardware level are covered. More advanced topics such as pipelining and cache memories are also discussed. The students who finish the course can write better programs since they will be able to understand better how the computer programs are executed.

SM 549 IT Governance (3-0)3

Contemporary issues about IT Governance as a whole; but major concentration upon IT Organization, IT Management, IT Processes,
IT Project Management, IT Control Standards & Security, IT Risk Management & Audit issues.. By focusing on Business Requirements and Business-Technology Alignment; well-applied Global Best Practices, Assessment Methodologies, Process Maturity and IT Risks will examined. Besides experiencing the technology impact and its leverage on business world, the protection & control of information & information assets will be the common perspective of this lecture. In addition to a medium weight of reading materials; membership to and follow-up of some major professional e-groups and discussion lists, research over the Internet, control risk assessment & audit project assignments, in-class case studies, simulations and presentations will be the lecture's in & out of class study/practice material.

SM 561 Introduction to Software Engineering (3-0)3

The course introduces the fundamentals of software engineering with an emphasis on software processes, software development process models, software requirements, requirements analysis, software design, contemporary modeling notations, verification and validation, software testing and software project management.

SM 701 Contemporary Issues in Business (3-0)3

A mixture of practical and theoretical topics will be examined. Among the topics to be discussed and for which case studies will be analyzed are competing in the global economy, practicing ethical behavior and social responsibility, handling employee-management relations, business challenges, small and medium sized enterprises, and developing marketing strategies. In each of these topics, the general principles will be examined before

discussing the topics in more detail. For example, prior to developing marketing strategies, it is essential to understand what the main principles of marketing are and to assess it within the general framework of "integrated marketing" including - advertising, promotion and public relations.

SM 702 Behavioral Aspects of Software Development: Peopleware (3-0)3

The course covers the human behavioral issues affecting software development processes. Topics are investigated at three layers: individual, team, and organizational. The role of individual behavior and productivity, the concept of effective teams and the role of organizational culture in software development are discussed. Results of various research studies are presented in the context of managing human capital in software projects.

SM 590 Graduate Seminar NC

SM 589 Term Project NC

SM 892 Special Studies NC

M.S. AND Ph.D. PROGRAMS IN MEDICAL INFORMATICS

PROFESSOR

MUMCUOĞLU, Ünal Erkan : B.Sc., METU; M.S., Bilkent University; Ph.D., University of Southern California.

ASSOCIATE PROFESSOR

ÖZKURT, Tolga ***(Program Coordinator)***: B.Sc., M.S., İstanbul Technical University; Ph.D., University of Pittsburg

ASSISTANT PROFESSORS

ACAR, Aybar Can **:** B.Sc. METU, Ph.D. George Mason University
AYDIN SON, Yeşim ***(Head of Health Informatics Department)***: M.D., Hacettepe University; Ph.D., University of Tennessee, Knoxville.
GÖKÇAY, Didem : B.Sc., M.S., METU; Ph.D., University of Florida.

OBJECTIVES: Health sciences and medicine are prominent application areas of information and technology. Measurement and imaging methods, testing, analysis and patient monitoring instruments are being developed and increasing at a very fast pace. As a result, not only patient data is increasing at a very fast rate but also health information is getting richer. The contribution of information technologies in putting the research results to practice is indispensable, considering the expanding pace of research conducted in medicine.

The main motivation in Health Informatics lies in the forming, shaping and sharing of this information effectively and providing new methodologies in the diagnosis and treatment of patients. This is why; the biggest step that Turkey should take in Health Informatics is to start training specialists.

In recent years, biomedical informatics has come into use as a name encompassing the converging fields of medical informatics and bioinformatics. Bioinformatics is an interdisciplinary field spanning different areas of science, engineering, and mathematics. In particular, Bioinformatics lies at the interface of the traditional disciplines of Biology, Computer Science and Engineering, Mathematics, Statistics, Chemistry, and Physics. Recent advances in life sciences, such as the completion of the Human Genome Project, led to the generation of massive data sets that require the development of sophisticated computational analysis tools. With the help of the analysis tools and new mathematical models, the genetic code of living organisms is being deciphered and the integrated functions of thousands of genes are being discovered. Our understanding of the natural world is dramatically changing with the ultimate goal of improving the quality of human life.

In addition, the analysis and synthesis of advancements in all areas of science, especially neuroscience, have always been on the agenda of Health Informatics. In an interdisciplinary area such as neuroscience, combining the knowledge and information in several fields such as neurology, neuroradiology, neurophysiology, neuropharmacology, biophysics, neuroimaging, neuropsychology and neurobiology is crucial. It is also necessary to establish shared and reusable processes, and to carry these processes into inter-institutional dimension with the help of information technologies.

The department develops basic methods that are applicable to medical information systems in the areas of healthcare and information science, establishes infrastructures for the information environment where medical information is utilized effectively, and applies knowledge and techniques acquired through these efforts to basic medical sciences and healthcare. The main keywords of the target domain are medical and clinical information systems, next-generation electronic health record systems, virtual health care environment, computer representations and standardization of medical concepts, ontology, medical knowledge engineering, hospital epidemiology, quality assessment of healthcare, clinical and bioinformatics engineering, privacy protection and encryption, analysis of hospital management, safety management in healthcare, medical and biological image and signal analysis, neuroscience and neuroimaging.

The objectives of the Medical Informatics graduate program are as follows:
- To provide the specialists/researchers working in all health sectors with the necessary knowledge and experience to carry out their work effectively.
- To train academicians/researchers.
- To conduct inter-disciplinary scientific research.
- To bring together researchers from other disciplines to the field of Medical Informatics.

CAREER OPPORTUNITIES: Health and Medical Informatics offer very broad and diverse employment opportunities. Public and private sectors, and academic institutions are in immediate need of graduates of this program. Some examples are information technology companies developing/supporting software, the IT-management and quality management departments of all hospitals and health providers, clinical managers, health insurance firms, nursing services management, city health offices and many other health organizations. In addition, various projects supported by international financial firms need specialists from this field. Government based Social Security institutions are also potential employers of such specialists.

PROGRAM STRUCTURE: Medical Informatics Program has five tracks: "Health Information Systems and Clinical Informatics", "Medical Image/Signal Analysis", "Medical Decision Support", "Neuroscience" and "Bioinformatics". The M.S. program has thesis and non-thesis options, and after completion of the deficiency courses, total of 21 credits and 30 credits should be completed, respectively. The course requirement for the Ph.D. program is total to 30 credit hours.

In all of the programs 3 core courses have to be completed and the rest of the credits can be completed with specialization and elective courses according to the students track. It is crucial for the success of the program that the faculty advisors guide the students closely and help them choose elective courses suitable for their specific objectives and backgrounds.

DEGREE REQUIREMENTS

M.S. Degree Requirements- (Thesis)
- (3-credit) core course - 9 credits total
- 4 (3-credit) elective course - 12 credits total
- 1 (non-credit) seminar course
- Master's Thesis (non-credit)

M.S. Degree Requirements- (Without Thesis)
- 3 (3-credit) core course - 9 credits total
- 7 (3-credit) elective course - 21 credits total
- 1 (non-credit) seminar course
- Term Project (non-credit)

Ph.D. Degree Requirements
- 3 (3-credit) core course - 9 credits total
- 7 (3-credit) elective course - 21 credits total
- 1 (non-credit) seminar course
- PhD Thesis (non-credit)

GRADUATE CURRICULUM

M.S. PROGRAM (THESIS / WITHOUT THESIS OPTIONS)

Deficiency Courses
Accepted students must complete their scientific background requirements before starting the program.

CENG	230	Introductions to C Programming
ES	443	Human Physiology for Engineers
STAT	221	Fundamentals of Statistics
OR		
BIN	502	Statistics for Informatics
OR		
BIS	605	Biyoistatistik

Core Courses

MIN	502	Introduction to Medical Informatics	(3-0)3
MIN	528	Fundamentals of Mathematics for Information Systems	(3-0)3
MIN	545	Object Oriented Programming and Data Structures	(3-0)3
MIN	590	Graduate Seminar	(NC)
MIN	589 *	Term Project	(NC)
MIN	599 &	Master's Thesis	(NC)
MIN	8XX	Special Studies	(NC)

Students pursuing M.S. with non-thesis option must register for the course marked with an asterisk (Term Project), and students pursuing M.S. with thesis option must register for the course marked with an ampersand (Master's Thesis).

Courses of the Program
Students pursuing MS with a thesis option should choose one of the 4 specialization areas below:

1. Health Information Systems and Clinical Informatics
2. Medical Image/ Signal Analysis
3. Medical Decision Support
4. Neuroscience

Students have to take at least two specialization courses (listed below) in the track of their choice and fulfill the rest of the required credits with 'elective' courses. The specialization courses help students acquire the necessary skills needed for the specialization area, whereas the elective courses help students acquire the necessary knowledge to become experts in the chosen area. Upon consent of the academic advisor, students can also take courses from other departments and/or Hacettepe University Sağlık Bilimleri Enstitüsü'. Courses offered by Hacettepe University are in Turkish, and are indicated herein by course codes starting with 'TEB', 'BIS', 'HAS'.

Ph.D. PROGRAM

Deficiency Courses
Accepted students must complete their scientific background requirements before starting the program.

CENG	230	Introductions to C Programming
ES	443	Human Physiology for Engineers
STAT	462	Biostatistics
OR		
COGS	536	Research Methods and Statistics for Cognitive Science
OR		
BIS	735	Biyoistatistik

Core Courses

MIN	502	Introduction to Medical Informatics	(3-0)3
MIN	528	Fundamentals of Mathematics for Information Systems	(3-0)3
MIN	545	Object Oriented Programming and Data Structures	(3-0)3
MIN	590	Graduate Seminar	(NC)
MIN	699	Ph.D. Thesis	(NC)
MIN	9XX	Advanced Studies	(NC)

Courses of the Program

Students pursuing Ph.D. should choose one of the 5 specialization areas below:

1. Health Information Systems and Clinical Informatics
2. Medical Image/ Signal Analysis
3. Medical Decision Support
4. Neuroscience
5. Bioinformatics

For each specialization field, at least two specialization courses and up-to five elective courses should be completed. The specialization courses help students acquire the necessary skills needed for their area, whereas the elective courses help students acquire the necessary knowledge to become experts in the chosen area. In order to fulfill the number of courses to be completed for the degree, students must take adequate number of courses from the 'elective' course list. Upon consent of the academic advisor, students can also take courses from other departments and/or Hacettepe University 'Sağlık Bilimleri Enstitüsü.' Courses offered by Hacettepe University are in Turkish, and are indicated herein by course codes starting with 'TEB', 'BIS', 'HAS'.

Specialization Area:
Health Information Systems and Clinical Informatics

Area Courses:

IS	501	Int. to Information Systems	(3-0)3
MIN	503	EHR: Representation, Standards and Coding	(3-0)3
MIN	701	Networking for Health Information Systems and Telehealth	(3-0)3
MIN	702	Evaluation Methods in Health Informatics	(3-0)3
MIN	710	Database Applications for Medical Informatics	(3-0)3

Elective Courses:

BİS	736	Sağlık Bilimlerinde Araştırma Yöntemleri	(3-0)3
CENG	538	Advanced Graphics and User Interfaces	(3-0)3
CENG	555	Object-Oriented Database Systems	(3-0)3
CENG	559	Data Security and Protection	(3-0)3
HAS	640	Epidemiyolojinin Temel İlke ve Yöntemleri	(3-0)3
HAS	645	Epidemiyolojide Araştırma Programlama ve Uygulama	(3-0)3
IAM	501	Introduction to Cryptography	(3-0)3
IS	503	Database Concepts and Applications	(3-0)3
IS	504	Computer Networking for Information Systems	(3-0)3
IS	507	Int. Software Engineering	(3-0)3
IS	551	Computer Security and Cryptography	(3-0)3
IS	580	Knowledge Discovery and Mining	(3-0)3
IS	740	Information Tech. Acceptance	(3-0)3
IS	785	Social Network Analysis	(3-0)3
MIN	704	Reasoning Under Uncertainty	(3-0)3
MIN	715	Future Studies in Healthcare	(3-0)3
MIN	717	Mobile Health	(3-0)3

Specialization Area:
Medical Decision Support

Area Courses:

IS	580	Knowledge Discovery and Mining	3-0)3
MIN	537	Neural Networks for Biomedical Applications	(3-0)3
MIN	539	Bio-Inspired And Classical Optimization	(3-0)3
MIN	702	Evaluation Methods in Health Informatics	(3-0)3

MIN	704	Reasoning Under Uncertainty	(3-0)3
MIN	720	Pattern Classification for Bio Medical Applications	(3-0)3

Elective Courses:

BİS	656	İstatistiksel Hesaplama	(3-0)3
BİS	736	Saglik Bilimlerinde Arastirma Yontemleri	(3-0)3
BİS	610	Karar Verme Sürecinde İstatistiksel Yöntemler	(3-0)3
CENG	555	Object-oriented Database Systems	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	564	Pattern Recognition	(3-0)3
CENG	568	Knowledge Representation	(3-0)3
CENG	569	Neurocomputing	(3-0)3
CENG	571	Numerical Analysis I	(3-0)3
CENG	574	Statistical Data Analysis	(3-0)3
CENG	576	Numerical methods in Optimization	(3-0)3
CENG	580	Distributed Artificial Intelligence	(3-0)3
CENG	581	Automated Reasoning	(3-0)3
CENG	770	Advanced Data Mining	(3-0)3
EE	543	Neurocomputers	(3-0)3
EE	553	Optimization	(3-0)3
ES	501	Analytical Methods in Engineering	(3-0)3
IAM	530	Elements of Probability and Statistics	(3-0)3
IAM	564	Basic Algorithms and Programming	(3-0)3
MIN	503	EHR: Representation, Standards and Coding	(3-0)3
MIN	710	Database Applications for Medical Informatics	(3-0)3

Specialization Area:
Neuroscience

Area Courses:

MIN	505	Neuroimaging: Anatomy, Physiology and Function of the Human Brain	(3-0)3
MIN	506	Advanced Neuroimaging with Magnetic Resonance Imaging	(3-0)3
MIN	533	Brain Dynamics and Oscillations	(3-0)3
MIN	550	Systems Neuroscience	(3-0)3
MIN	555	Principles of Cognitive Neuroscience	(3-0)3

Elective Courses:

BIO	406	Behavioral Neuroscience	(3-0)3
BIO	409	Introduction to Neurobiology	(3-0)3
BIO	417	Neurochemistry	(3-0)3
BIO	461-2	Biophysics I-II	(3-0)3
BIO	507	Neurobiology	(3-0)3
BIO	562	Spectroscopy of Biological Molecules and Membranes	(3-0)3
BIO	704	Advances in Neuroscience	(3-0)3
BIO	705	Protein Structure Function and Stability	(3-0)3
BIO	716	Molecular and Cellular Biology	(3-0)3
BİS	656	İstatistiksel Hesaplama	(3-0)3
CENG	555	Object-Oriented Database Systems	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	564	Pattern Recognition	(3-0)3
CENG	569	Neurocomputing	(3-0)3
CENG	571	Numerical Analysis I	(3-0)3
CENG	574	Statistical Data Analysis	(3-0)3
CENG	576	Numerical Methods in Optimization	(3-0)3
COGS	533	Functional Neuroanatomy	(3-0)3
EE	543	Neurocomputers	(3-0)3
EE	553	Optimization	(3-0)3
IS	566	Image Processing Algorithms	(3-0)3
IS	781	Knowledge Representation and Data Mining	(3-0)3
MIN	704	Reasoning under Uncertainty	(3-0)3
MIN	710	Database Applications for Medical Informatics	(3-0) 3
MIN	720	Pattern Classification for Bio-Medical Applications	(3-0)3

Specialization Area:
Medical Image/Signal Analysis

Area Courses:

MIN 524 **Fundamentals of Medical Imaging: Acquisition and Reconstruction** (3-0)3

MIN	530	Medical Image Analysis	(3-0)3
MIN	535	Biological Signal Analysis	(3-0)3
MIN	711	Advance Topics in Medical Image Analysis	(3-0)3

Elective Courses:

BİS	656	İstatistiksel Hesaplama	(3-0)3
BİS	736	Sağlik Bilimlerinde Arastirma Yöntemleri	(3-0)3
CENG	538	Advanced Graphics and User Interfaces	(3-0)3
CENG	555	Object-oriented Database Systems	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	564	Pattern Recognition	(3-0)3
CENG	569	Neurocomputing	(3-0)3
CENG	571	Numerical Analysis I	(3-0)3

CENG	574	Statistical Data Analysis	(3-0)3
CENG	576	Numerical methods in Optimization	(3-0)3
CENG	581	Automated Reasoning	(3-0)3
CENG	583	Computer Vision	(3-0)3
EE	430	Digital Signal Processing	(3-0)3
EE	543	Neurocomputers	(3-0)3
EE	553	Optimization	(3-0)3
EE	583	Pattern Recognition	(3-0)3
EE	642	Introduction to Mathematical Bases of Computer Graphics	(3-0)3
EE	701	Robot Vision	(3-0)3
ES	503	Finite Element Method	(3-0)3
IAM	530	Elements of Probability and Statistics	(3-0)3
IAM	564	Basic Algorithms and Programming	(3-0)3
IS	507	Int. to Software Engineering	(3-0)3
IS	566	Image Processing Algorithms	(3-0)3
IS	580	Knowledge Discovery and Mining	(3-0)3
MIN	533	Brain Dynamics and Oscillations	(3-0)3
MIN	537	Neural Networks for Biomedical Applications	(3-0)3
MIN	539	Bio-Inspired And Classical Optimization	(3-0)3
MIN	704	Reasoning Under Uncertainty	(3-0)3
MIN	710	Database Applications for Medical Informatics	(3-0)3
MIN	720	Pattern Classification for Bio Medical Applications	(3-0)3

Specialization Area:
Bioinformatics

Area Courses:

BIN	501	Introduction to Bioinformatics	(3-0)3
BIN	504	Probabilistic and Statistical Modeling for Bioinformatics	(3-0)3
BIN	505	Foundations of Systems Biology	
BIN	506	Protein and DNA Sequence Analysis	(3-0)3
BIN	714	Microarray Data Analysis and Informatics	(3-0)3

Free Electives:

BIN	503	Biological Databases and Data Analysis Tools	(3-0)3
BIN	711	Applications of Bioinformatics in Molecular Biology	(3-0)3
BIN	712	Computational Methods In Bioinformatics	(3-0)3
BIO	705	Protein Structure Function and Stability	(3-0)3
BIO	715	Genomics and Proteomics	(3-0)3
BİS	656	Istatistiksel Hesaplama	(3-0)3
BTCH	705	Current Techniques in Protein Interactions	(3-0)3
CENG	553	Database Man. Systems	(3-0)3
CENG	538	Advanced Graphics and User Interfaces	(3-0)3
CENG	556	Distributed Database Management Systems	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	564	Pattern Recognition	(3-0)3
CENG	567	Design and Analysis of Algorithms	(3-0)3
CENG	571-2	Numerical Analysis I-II	(3-0)3
CENG	574	Statistical Data Analysis	(3-0)3
CENG	577	Parallel Computing	(3-0)3
CENG	580	Distrubuted Artificial Intelligence	(3-0)3
CENG	714	Data Mining	(3-0)3
CENG	734	Advanced Topics in Bioinformatics	(3-0)3
FDE	403	Food Biotechnology	(3-0)3
IAM	530	Statistics and Probability	(3-0)3
IAM	557	Statistical Learning and Simulation	(3-0)3
IAM	565	Introduction to Algorithms and Complexity	(3-0)3
IAM	566	Numerical Optimization	(3-0)3
IAM	567	Mathematical Modeling	(3-0)3
IAM	664	Inverse Problems	(3-0)3
IE	455	An Introduction To Combinatorial Analysis	(3-0)3
IS	503	Database Concepts and Applications	(3-0)3
IS	504	Computer Networking for Information Systems	(3-0)3
IS	507	Introduction to Software Engineering	(3-0)3
IS	545	Object Oriented Programming and Data Structures	(3-0)3
IS	580	Knowledge Discovery and Mining	(3-0)3
MIN	704	Reasoning Under Uncertainty	(3-0)3
MIN	710	Database Applications for Medical Informatics	(3-0)3
MIN	720	Pattern Classification for Bio-Medical Applications	(3-0)3
STAT	519	Biostatistics	(3-0)3
STAT	515	Computational Statistics and Data Analysis	(3-0)3

MIN 502 Introduction to Medical Informatics (3-0)3

This course presents an overview of medical informatics and its main applications. Primary topics include: Reasons for necessity of systematically processing data, information and knowledge in medicine and health care, benefits and current constraints of using information and communication technology in medicine and health care, medical informatics as a discipline, medical data and records, coding classification, database and reference models, interfaces, data acquisition, processing and exchange standards, medical knowledge, decision and diagnostic support, medical information systems, administrative, clinical and ancillary information systems, implementations and evaluations, telemedicine and internet applications, efficient and responsible use of information processing tools to support health care professionals practice and their decision making.

MIN 503 Electronic Health Record: Representation, Standards and Coding (3-0)3

This course gives an overview of contemporary health records and then introduces computer based patient records/electric health records. Topics include data entry, minimum data sets, general applications of electronic health records (EHR), standards in health and medical informatics, importance of coding and standardization, clinical uses of CPR. Current applications in all areas of medicine; like use of CPR in primary care to specialized clinical/departmental information systems and HIS applications shall be given. Reasons for necessity of medical coding and classification will be described. Primary topics include history of classification, important classification systems like ICD, SNOMED, MESH, ICPC, CPT, and practical application and uses of these coding systems.

MIN 505 Neuroimaging: Anatomy, Physiology and Function of the Human Brain (3-0)3

The course introduces all three aspects - anatomy, physiology and function- of neuroimaging, which is enlisted as a sub-field of neuroinformatics. Theoretical knowledge on neuroanatomy and function of the brain will be complemented by hands-on applications with the existing online data analysis packages. The anatomy of the brain will be studied over MR images using volumetric and shape based techniques. The physiology of the brain will be studied over cytoarchitecture. The function of the brain will be studied over pet-spect, meg, eeg, and fMRI, with more emphasis on fMRI.

MIN 506 Advanced Neuroimaging with Magnetic Resonance Imaging (3-0)3

New techniques in structural and functional brain imaging will be studied. Structural neuroimaging methods such as voxel based morphometry, diffusion tensor imaging, probabilistic cytoarchitectonic maps are covered in detail. Functional neuroimaging methods such as independent component analysis, dynamic causal modeling, resting state networks and arterial spin labeling are studied. Hands on exercises will be conducted using publicly available neuroimaging toolkits.

MIN 524 Fundamentals of Medical Imaging: Acquisition and Reconstruction (3-03)

This course covers fundamental medical imaging modalities like X-ray, CT, MRI, SPECT, PET, Ultrasound. Physics and mathematical models of data acquisition and image reconstruction concepts are studied both theoretically and by implementation based homeworks on MATLAB. Medical imaging system properties like detector noise, resolution, point spread function, modulation transfer function, sampling, contrast and lesion detectability are also discussed.

MIN 528 Fundamentals of Mathematics for Information Systems (3-0)3

The aim of the course is to acquaint the non-technical background graduate students with the fundamental theory and techniques of engineering mathematics. This will be achieved by teaching fundamental theory as well as application based homework assignments on MATLAB. The course covers subjects like Basic Calculus (Functions, Continuity, Integrals, Derivatives), Differential equations, Linear Algebra and Quadratic optimization.

MIN 530 Medical Image Analysis (3-0)3

The aim of the course is to acquaint the graduate students with the fundamental theory and techniques of medical image analysis, like image enhancement, automatic and semi-automatic image segmentation, image quantification (shape and texture analysis, feature extraction), computer-aided diagnosis, image alignment (registration) and fusion.

MIN 533 Brain Dynamics and Oscillations (3-0)3

This course introduces the tools of EEG and MEG data analysis to capture brain dynamics with fast temporal resolution. It will provide the relation between neuronal activity and electromagnetic mapping, necessary physics of measured sensor data, brain source localization and identification. Various preprocessing tools, time-frequency analysis, brain source reconstruction methods will also be covered. Theory will be complemented by hands-on sessions in which students will be tutored through the complete analysis of EEG and MEG datasets with popular free online data analysis packages. The functional image of the brain will be studied with simulated and real EEG and MEG data projected on MR images.

MIN 535 Biological Signal Analysis (3-0)3

This course provides main tools to interpret the biomedical signals ranging from neural and cardiac rhythms to muscular activity. It takes a probabilistic signal processing approach and introduces traditional methods of time-frequency analysis as well as more recent issues of fractals, self-similarity, cross-frequency coupling and independent component analysis. Theory of methods shall be complemented with biomedical data applications emphasizing and motivating their use in practice.

MIN 537 Neural Networks for Biomedical Applications (3-0)3

The course introduces “neural networks” mainly to train features from biological signals in order to classify patterns, construct models, predict outcomes and make decisions. Fundamental supervised and unsupervised neural network algorithms will be introduced and they will be applied on biological signals such as fMRI, EEG, MEG, EOG, EMG and ECG. Recent advances in the common space of artificial neural networks and biomedical signal processing will be covered during the course.

MIN 539 Bio-inspired and Classical Optimization (3-0)3

Proper optimization is critical for various problems involving decision making. This course introduces ideas and methods to solve unconstrained and constrained optimization problems. The methods involve both traditional and biologically inspired approaches. While the former includes mainly gradient based methods and linear & convex programming, the latter covers diverse approaches from evolutionary computation to neural networks and swarm intelligence. Theoretical formulations of all methods will be presented indicating use, advantages and disadvantages of them. Complementarily, many computer exercises will be supplied to demonstrate their applicability for commonly observed problems.

MIN 545 Object Oriented Programming and Data Structures (3-0)3

Basic Object Oriented Principles will be discussed using a modern programming language i.e. Java. Theoretical approaches will be developed to implement Data Structures which is very important in algorithm development. The core of the class will depend on using Java. Although some reading is required, practice is more important in learning any programming language.

MIN 550 Systems Neuroscience (3-0)3

Electrical and chemical neural signaling is introduced. Subcomponents of the central nervous system are studied thoroughly with morphological and functional aspects. Sensory processing along the visual, auditory, olfactory, somatosensory pathways is discussed and laboratory experiments are performed for each tract. The motor circuits and autonomous nervous system are studied and clinical evidences are covered.

MIN 555 Principles of Cognitive Neuroscience (3-0)3

This course introduces the building blocks of cognitive neuroscience both methodologically and conceptually. Basic methods such as functional magnetic resonance imaging, electroencephalography, and eye tracking are studied in detail and the underlying physiological foundations in these measurements are discussed. Measurement of brain function using these tools are illustrated through hands-on exercises. Foundations of the brain such as language, memory, attention, executive function and their neuroscientific infrastucture are investigated conceptually. Clinical examples in psychiatry and neurology (eg. Schizophrenia, depression, Parkinson’s Disease) and active research areas (aging, development, resting state) are introduced.

MIN 701 Networking for Health Information Systems and Telehealth (3-0)3

The course summarizes the fundamentals of computer networking from a health informatics perspective and introduces the students to the underlying concepts of telehealth. Topics on computer networking include hardware and

software components, protocol layers, application layer protocols, socket programming, Internet protocol, multimedia networking and local area networks. The subjects on telehealth are discussed starting by describing history, definitions and current applications. Then, the advantages and barriers for successful telehealth projects are emphasized, types of telehealth projects are discussed, and security and legal issues are given. More advanced topics such as virtual reality are also presented.

MIN 702 Evaluation Methods in Health Informatics (3-0)3

Medical Informatics is a multifaceted interdisciplinary field. In this area clearly there is a need for clinical information system, good research design, carry out, measurement technique, analysis of studies, evaluation and interpretation of wide range quantitative and qualitative techniques. This course will be useful for all medical informatics professionals.

MIN 703 Medical Imaging Applications (3-0)3

This course provides a basic overview of the applications of medical imaging and Radiology Information Systems (RIS). Practical applications of X-ray radiography, computed tomography, magnetic resonance imaging, ultrasound and ultrasonography, Doppler ultrasound and Doppler ultrasonography, computed radiology, digital radiology, radiology information systems and other medical imaging techniques are briefly introduced. Various image processing applications on medical images are introduced in both clinical and technical perspectives.

MIN 704 Reasoning Under Uncertainty (3-0)3

Uncertainty models and information representations: types of uncertainty (predictive, retrodictive, diagnostic, prescriptive) and uncertainty measures (incompleteness, imprecision, vagueness, inconsistency, dissonance, confusion, etc.). Entropy and set-theoretic reprentation of information (crisp sets, fuzzy measures like Belief functions and fuzzy sets). Minimization of uncertainty. Decision making under uncertainty. Applications to medical informatics.

MIN 710 Database Applications for Medical Informatics (3-0) 3

Database management system theory on relational database management systems: E-R diagrams, Normal Forms, Transaction processing. SQL data query language. Homeworks and class assignments on each of these topics, centered on examples from the health information systems. Object oriented databases, and their use in medical informatics. Archetypes, and use of semantic systems in HIS. Standards in medical informatics on interoperability and meta-data.

MIN 711 Advance Topics in Medical Image Analysis (3-0)3

This course is aimed for graduate students who want to do their thesis in the field of medical image analysis. Various advanced topics in medical image analysis are introduced: non-linear image enhancement, organ segmentation, lesion detection, Wavelet transform, feature extraction, computer-aided diagnosis, active shape model, multi-modal fusion, content-based image retrieval and augmented reality for surgical navigation.

MIN 715 Future Studies in Healthcare

This course covers basic assumptions and theories; and reviews some the of the most important trends and issues shaping the future and how we provide healthcare. Throughout the course four fundamental foresight skills: creating the future (innovating products and services); discovering the future (models, trend identification and analysis); planning the future (developing shared goals and processes); and benefiting in the future (achieving measurable positive environmental, social, or economic results) will be examined. The big picture of future studies will be explored through the history of accelerating changes from universal, historical and technological perspectives, and considering global trends that are affecting individuals, society, healthcare sector and other businesses and governments. Emerging approaches and future trends in healthcare and how biology, psychology, community and culture help and hinder personal thinking about the future will be discussed. How organizations can form calculated bets on the future will be examined, which will give student a chance to explore career prospects in a variety of fields.

MIN 7171 Mobile Health (3-0)3

Integration of mobile technologies and healthcare informatics sets the stage for innovative emerging research discipline titled as ‘mhealth’ or ‘mobile health’. This course will include the basic ideas, tools, case studies and contributions of mobile in healthcare sector. The subjects to be covered will involve: mobile and wireless concepts; medical information for mobile health and management; patient monitoring in diverse environment and in hospital; medical body sensor networks; context aware systems;

mobile health performance. The course will include class discussions of theoretical concepts and case studies, quizzes, critical reading assignments, a midterm exam and a term projects.

MIN 720 Pattern Classification for Bio-Medical Applications (3-0) 3

Introduction to Pattern Classification as a tool for decision making. Statistical Approaches. Bayes Classification. Parameter Estimation. Nearest Neighbor Rule. Linear Discriminant Functions. Neural Networks. Support Vector machines. Tree Classification. Multiclassifiers. Clustering. Various applications in biology and medicine.

MIN	**589**	**Term Project**	**NC**
MIN	**590**	**Graduate Seminar**	**NC**
MIN	**599**	**Master's Thesis**	**NC**
MIN	**699**	**PhD Thesis**	**NC**
MIN	**8XX**	**Special Studies**	**NC**
MIN	**9XX**	**Advanced Studies**	

M.S. PROGRAM IN WORK BASED LEARNING STUDIES

INSTRUCTOR

TEMİZEL, Alptekin ***(Program Director)***: B.S., METU; Ph.D., University of Surrey.

OBJECTIVES: Work Based Learning Studies focuses on learning you have gained from your past work as well as experiences and the development of new learning in the form of work based project(s) focused on your current work role. By taking the program, your previous experience will be officially recognized and accredited. The aim of the program is to recognize, create and apply knowledge through and for work as well as at work.

PROGRAM STRUCTURE: Work Based Learning Studies is a non-thesis program in which course participation is mostly through the Internet. Courses cover information technology, systems and e-business concepts in depth. Students are required to complete a work-based applied project. Performance of students is evaluated based on their portfolio, in-class final exams, as well as homework assignments and projects. Further information can be found at the web address http://ii.metu.edu.tr/work-based-learning-department

GRADUATE CURRICULUM

M.S. PROGRAM

Core Courses

WBLS	501	Recognition and Accreditation of Learning	(3-0)3
WBLS	502	Recognition and Accreditation of Learning	(3-0)3
WBLS	503	Recognition and Accreditation of Learning	(3-0)3
WBLS	504	Program Planning	(2-0)2
WBLS	505	Research Methods	(4-0)4
WBLS	589	System Design I	(3-0)3
WBLS	590	System Design II	(3-0)3
WBLS	591	Project	NC

Elective Courses

WBLS	521	Systems Engineering	(3-0)3
WBLS	542	e-Business Environment and Architecture	(3-0)3
WBLS	547	High-tech Entrepreneurship	(3-0)3
WBLS	550	Web Services	(3-0)3
WBLS	552	Business Communication and Internet Law	(3-0)3
WBLS	554	Information Technology Management and Governance	(3-0)3
WBLS	586	Project Management	(3-0)3
WBLS	512	Hands on Cyber Defence and Security	(6-6)9
ION	501	Introduction to Information Systems	(3-0)3
ION	502	Introduction to Software Engineering	(3-0)3
ION	503	Database Concepts and Applications	(3-0)3
ION	504	Computer Networking for Information Systems	(3-0)3
ION	510	Object Oriented Programming with Java	(3-0)3
ION	512	IT Governance	(3-0)3
ION	514	Multimedia Information Systems	(3-0)3
ION	523	Data Mining	(3-0)3
ION	525	Artificial Intelligence	(3-0)3
ION	528	Image Processing Algorithms	(3-0)3
ION	541	Computer Networking Applications	(3-0)3
ION	542	Information Technology and Business Processes	(3-0)3
ION	545	Software Quality Management	(3-0)3
ION	551	Computer Security and Cryptography	(3-0)3
ION	574	Medical Imaging Technology	(3-0)3
SM	502	Software Management	(3-0)3

SM	515	Software Verification and Validation	(3-0)3
SM	521	Software Requirements Engineering	(3-0)3
EM	501	Finance and Management Accounting	(3-0)3
EM	502	Operations Management	(3-0)3
EM	503	Systems and Organizations	(3-0)3
EM	504	Technology Management	(3-0)3
EM	505	Decision Models	(3-0)3
EM	506	Project Management	(3-0)3
EM	507	Total Quality Management	(3-0)3
EM	508	Strategic Planning	(3-0)3
EM	510	Reengineering	(3-0)3
EM	516	Logistics	(3-0)3
EM	520	MI and Decision Support System	(3-0)3
EM	521	Applied Statistics	(3-0)3
EM	531	Eng. Econ. and Investment Management	(3-0)3
EM	532	Finance for EM	(3-0)3
EM	533	Quality Engineering	(3-0)3
EM	534	Supply Chain Management	(3-0)3

DESCRIPTION OF COURSES

WBLS 501 Recognition and Accreditation of Learning (3-0)3

On completion of this course, student will be able to analyse their work and other activities to-date to identify patterns and areas of learning, develop a vocabulary which express different ways of learning, evaluate how to describe learning in a way that matches the University's assessment criteria, produce a portfolio claiming a number and level of credits which accurately reflect their educational qualifications to-date, analyse, synthesise and evaluate their learning experience in compiling the portfolio in order to write a reflective essay.

WBLS 504 Program Planning (2-0)2

In this course, student plans her/his program of study, taking account of career aims, the needs of employer and the University criteria for an approved program of study. In this course, student must develop a program proposal. This takes the form of a Learning Agreement. In this agreement, student explains the components of his/her proposed program and justifies its coherence. Proposed program must be agreed to by student, the University and a third party such as student's employer.

WBLS 505 Research Methods (4-0)4

This course is designed to equip student to undertake one or more work based projects of a research and development nature. The course focuses on project planning, design and the identification and use of an appropriate research approach and specific research techniques suitable for student's proposed project. A major outcome of the course will be that student have assembled his/her own Research Portfolio. This will equip the student in a very practical way to carry out the project component of the program and help the student become more effective at work through the development of research related skills and as the result of being aware of practical research and development issues.

WBLS 589 System Design I (3-0)3

System Design and Project work, is part of the research and development associated with the work environment of the student. The project work must add value and a significant challenge to the student's work environment. In this regard, the research and development projects should deploy practical methods that are applicable to student's work.

WBLS 502 Recognition and Accreditation of Learning (3-0)3

This course aims to give students the possibility to consider their sophisticated work and other activities to-date to identify patterns and areas of learning, build up an advanced vocabulary which express different ways of learning, figure out how to describe learning in a way that matches the University's assessment criteria, produce a progressive portfolio claiming a number and level of credits which accurately reflect their educational qualifications to-date, determine, integrate and value their advanced learning experience in compiling the portfolio in order to write a reflective essay.

WBLS 503 Recognition and Accreditation of Learning (3-0)3

The course covers the analysis of student's work and other leading activities to-date to identify patterns and areas of learning, produce a high-level vocabulary which express different ways of learning, decide how to describe learning in a way that matches the University's assessment criteria, produce a high-level portfolio claiming a number and level of credits which accurately reflect their remarkable educational qualifications to-date, interpret, structure and classify their high-level learning experience in compiling the high profile portfolio in order to write an imposing reflective essay.

WBLS 512 Hands on Cyber Defence and Security (6-6)9

The course covers the analysis of student's work and other leading activities to-date to identify patterns and areas of learning, produce a high-level vocabulary which express different ways of learning, decide how to describe learning in a way that matches the University's assessment criteria, produce a high-level portfolio claiming a number and level of credits which accurately reflect their remarkable educational qualifications to-date, interpret, structure and classify their high-level learning experience in compiling the high profile portfolio in order to write an imposing reflective essay.

WBLS 521 Systems Engineering (3-0)3

Introduction, Conceptual Design, Preliminary Design, Detailed Design and Development, Construction and/or Production, Operational Use and Systems Support, Phase Out and Disposal, Systems, Engineering Management, Systems Engineering Management Tools, Systems Engineering Process Tools, Related Disciplines.

WBLS 547 High-Tech entrepreneurship (3-0)3

Technical professionals are rapidly becoming business drivers in their organizations. This course intends to equip technical professionals with tools to effectively manage innovation. The students will learn about basic concepts of entrepreneurship and intrapreneurship, (new business development within a company). The students will become familiar with business models and strategies, developing business plans, and product life cycle management.

WBLS 542 e-Business Environment and Architecture (3-0)3

This module aims at teaching students how to evaluate technologies in a business context, to increase the awareness, effectiveness and skills in analyzing, managing and understanding of issues related to technology and organizations. This is done through the introduction of a methodological approach to e-business design and development. The module also introduces the concepts that relates to various internet technologies (e.g. HTML, Scripting, XML, ASP, Java, search engines, electronic payment systems) and critically explores business issues related to information technologies and particularly the Internet through a critical examination of specific e-business cases. It is also aimed that students are taught to carry out a critical evaluation of e-business security.

WBLS 550 Web Services (3-0)3

This course introduces basic concepts in Web services, the use of Web services for e-business and e-commerce, latest standards, Grid services, service oriented architecture, semantic Web and mobile web services.

WBLS 552 Business Communication and Internet Law (3-0)3

This module aims to introduce the student to the basis of the legal systems that govern the supply and use of computer and communications technology. The sources of law regulating electronic transactions arising related to these technologies will be emphasized. Developing an understanding of the regulatory framework relating to electronic business transactions, starting with the simple formation of a binding electronic contract, and moving to complex issues of data protection, intellectual property rights, electronic liabilities, e-payments and financial transactions, and dispute resolution are the main concerns of this course.

WBLS 589 System Design I (3-0)3

System Design and Project work, is part of the research and development associated with the work environment of the student. The project work must add value and a significant challenge to the student's work environment. In this regard, the research and development projects should deploy practical methods that are applicable to student's work.

WBLS 590 System Design II (3-0)3

System Design and Project work, is part of the research and development associated with the work environment of the student. The project work must add value and a significant challenge to the student's work environment. In this regard, the research and development projects should deploy practical methods that are applicable to student's work.

M.S. PROGRAM IN GAME TECHNOLOGIES

ASSISTANT PROFESSOR

HACIHABİBOĞLU, Hüseyin *(Program Director)*: B.S.,METU; M.S., , University of Bristol; Ph.D., Queen's University Belfast

PART TIME FACULTY

UNDEGER, Çağatay: B.S., Kocaeli University; Ph.D., METU.
YILMAZ, Erdal: B.S., M.S.,Ph.D.: METU
TEM, Kadir Tolga: B.M., M.M., D.M.A., Bilkent University

AFFILIATED FACULTY

ISLER, Veysi : B.S., METU; Ph.D., Bilkent University.
CAGILTAY, Kursat: B.S., METU; Ph.D., Indiana University.
CAN, Tolga: B.S., METU; Ph.D., University of California at Santa Barbara.
HALICI, Uğur: B.S., Ph.D., METU.
SENER-PEDGLEY, Bahar: BID: METU, MA: Hacettepe University, Ph.D: Loughborough University
TEMİZEL, Alptekin: B.S.: METU, Ph.D.: University of Surrey
UYSAL, Ahmet: B.S.: METU, M.S.: METU, Ph.D. University of Houston

OBJECTIVES: Computer games are ubiquitous. Computer game technology is one of the fastest growing ones in the ICT domain. Substantial research work has been carried out into computer graphics and animation, interactive audio, user experience research, interface design, application of gaming in formal learning environments and the psychological and sociological aspects of gaming. These are also active areas of research in the domain.

Game Technologies M.S. program is the first graduate program in Turkey tailored for teaching aspects of computer game technology and equipping students with necessary skills to conduct research in the area. The program has a strong research component and the students are expected to carry out cutting-edge research in the game technology domain.

CAREER OPPORTUNITIES: Graduates of the program can work in computer game development industry.

PROGRAM STRUCTURE: Program is interdisciplinary in nature with relation to the following scientific disciplines: Physics, Mathematics, Computer Science, Electronic Engineering, Industrial Design, Computer Education and Instructional Technologies.

The Department encourages students from all disciplines to apply but acknowledges the need for a common foundation in computer programming, data structures and algorithms, linear algebra, operating systems and computer architecture. A deficiency program consisting of related courses is available for new students to complete their preparation before taking graduate level courses.

DEGREE REQUIREMENTS

M.S. Degree Requirements - Thesis:

- 1 core courses
- 6 elective courses
- 1 seminar course (non-credit)
- Master's Thesis (non-credit)

GRADUATE CURRICULUM

M.S. PROGRAM (THESIS)

Deficiency Courses
MATH 260: Introduction to Linear Algebra
CENG 200/210/220/230 or equivalent: Introduction to Computers and Programming
CENG 301/EE 441 or equivalent: Algorithms and Data Structures
CENG 334/331: Introduction to Operating Systems/Computer Organization
CENG 443: Introduction to Object Oriented Programming Languages and Systems

Core Courses

GATE 505 Game Development Pipeline	(3-0)3
GATE 590 Graduate Seminar	NC
GATE 599 Master Thesis	NC

Elective Courses
All students should take at six elective courses in total. At least four of these courses have to be from their assigned track.

GATE 501 Foundations of Simulations and Games	(3-0)3
GATE 508 Game Metrics	(3-0)3
GATE 532 Computer Animation	(3-0)3
GATE 538 Computer Graphics	(3-0)3
GATE541 Physics for Computer Games	(3-0)3
GATE 540 3D Geometric Modeling and Processing	(3-0)3
GATE 561 Artificial Intelligence in Computer Games	(3-0)3
GATE 552 Multi-Player Game Design	(3-0)3
GATE 511 Game Aesthetics	(3-0)3
GATE 522 Procedural Sound Design	(3-0)3
GATE 710 Modelling Outdoor Virtual Environments for Simulation and Games	(3-0)3
GATE 713 Applied Parallel Programming on GPU	(3-0)3
GATE 722 Audio for Games Virtual Environments	(3-0)3
GATE 724 Music and Sound Production for Games: Aesthetics and Practice	(3-0)3
GATE 715 Psychology in Game Design	(3-0)3

DESCRIPTION OF COURSES

GATE 501 Foundations of Simulations and Games (3-0)3
This course will provide students with a sound introduction to the theories of gaming/simulations and examine cognitive/social factors and the design of computer games/simulations. So, the course will have a more psychological and social focus rather than a technical one. It will be organized around a collection of readings and real-world exercises. The format of this course is problem-centered. The lectures, presentations and other resources will be used to support the problems that students are working on throughout the semester.

GATE 508 Game Metrics (3-0)3
Measurement of usability and user experience in games during and after game development is a process that enhances greatly the overall quality of games. It is known that even very small changes can make a big positive (or negative) impact on user experience. It then becomes very important to develop efficient and solid strategies to determine whether a game provides a good user experience or not. This course aims to teach the fundamentals of user experience evaluation for games.

GATE 511 Game Aesthetics (3-0)3
This course aims to provide the students familiar with aspects related to game aesthetics. This course aims at presenting fundamentals of visual design. Content areas include: history, basic visual design, visual design in an interactive content, world design, motion graphics and game art. Special emphasis is placed on how visual aesthetics play a role in the game experience.

GATE 522 Procedural Sound Design (3-0)3
Games are interactive applications and game worlds change with interaction. Audio content in games

and virtual reality are typically canned recordings that are impossible to modify during runtime, preventing interactivity, causing repetition and increasing the memory footprint. Procedural audio generation by using interactive synthesis algorithms is a solution to circumvent these problems. This course aims to introduce the students to the concepts and underpinnings of procedural audio as well as give them the practical knowhow on procedural sound design for games.

GATE 541 Physics for Computer Games (3-0)3
The course provides the basics of classical mechanics and numerical methods to solve typical physics problems of game programming. After a gentle introduction to game physics by presenting basic concepts, kinematics, force and kinetics, collision are given together with mathematical tools that are frequently used for physics based game programming. Programming studio sessions will provide an opportunity to share programming practices among participants.

GATE 552 Multi-player Game Design (3-0)3
This course aims to provide the students familiar with aspects related to Multi-Player Game Design. This course aims at presenting the techniques and concepts required to develop a multi-player game. Content areas include: introduction, multiplayer games, massively multiplayer online games, game play and scenario issues in multi-player games, software architectures, server design for non-playable characters, testing and performance evaluation.

GATE 561 Artificial Intelligence in Computer Games (3-0)3
The course presents the theoretical basics of artificial intelligence (AI) and their application to behavior modeling in game development. The first part will introduce common AI architectures, which can be used in game design, and the second part will cover basic AI techniques towards entity behavior modeling. In the course, students will be given term papers to be read, which will be summarized and presented in the class. Additionally, the students will form groups, and each group will develop a term project involving behavior modeling in computer games.

GATE 532 Computer Animation (3-0)3
Main techniques covered in this course include keyframing, kinematics, physically based dynamics modeling, motion capture, story-boarding, scene composition, lighting, and sound track generation. Advanced topics such as dynamic simulation of flexible and rigid objects, facial animation, and behavioral/AI based animation are also studied.

GATE 538 Introduction to Computer Graphics (3-0)3
Introduction to computer graphics. The rendering pipeline. Rasterization algorithms. Two-dimensional and three-dimensional transformations. Quaternions. Hierarchical modelling. Animation. Viewing transformations. Rendering basics. Illumination and color models. Geometrical Modelling. Hidden surface elimination problem. Shading, deformation, ray tracing, radiosity, texture mapping, fractal representation and various other advanced techniques are discussed. Concepts of motion are introduced for the generation of digital animation.

GATE 540 3D Geometric Modeling and Processing (3-0)3
3D sensor outputs, 3D data structures, 3D data visualization, modelling of 3D data, 3D surface models (mesh and spline models), preprocessing of 3D data, 3D registration, 3D feature extraction, 3D feature descriptors, 3D object detection and recognition.

GATE 710 Modelling Outdoor Virtual Environments for Simulation and Games (3-0)3
This course aims to present the fundamentals of outdoor virtual environments in computer games and simulation applications. Outdoor virtual environments cover; terrain, geography, vegetation, sky, sun, moon, rain, snow, seasons etc. Besides these natural phenomena, life layer entities will also be mentioned during the course. Good knowledge of these components helps game developers to design and create better titles throughout their professional life. A practical knowledge of programming language (C++, C# or Java) is a prerequisite for this course.

GATE 713 Applied Parallel Programming on GPU (3-0)3
The course has been designed to give hands-on knowledge and development experience on general purpose GPU programming. The students will learn about the GPU as part of the PC architecture. Then they will learn about development of GPU software using CUDA C and OpenCL. Various optimization issues, particularly effective use of memory and floating point calculations will be discussed. The concepts and the effects of optimization will be demonstrated with case studies. Similarities and differences of CUDA and OpenCL will also be discussed around these case studies.
The students will be expected to propose a compute-expensive problem to implement on the GPU and

then, develop and optimize it on the GPU and compare the performance results with the CPU implementation. They are also expected to compare various optimization strategies.

GATE 715 Psychology in Games (3-0)3

Applications of psychological theories to game design, flow, immersion, motivational aspects, basic psychological needs, rewards and punishments, regulation of multiple goals, psychological biases, automaticity and priming, escapism, aggression

GATE 722, Audio for Games and Virtual Environments

Spatial and synthetic audio are key elements of computer games and virtual reality applications where a high level of realism and immersiveness is desired within computational limitations of available hardware. The entire chain of processes from the production of sound to its perception all play part in the success of game audio systems. This course aims to introduce the fundamental concepts of spatial and synthetic audio for computer games and virtual reality with a clear focus on development of algorithms for such applications. Students will learn about fundamentals of digital audio, psychoacoustics, spatial hearing mechanism, room acoustics modelling and auralization, 3D audio reproduction, and sound synthesis methods

GATE 724 Music and Sound Production for Games: Aesthetics and Practice

This is an applied method course designed to familiarize students with the language of computer music and sound production. Prerequisite knowledge of music is not necessary. This course aims at presenting fundamentals of music composition and sound production based on applied method and theory.

GATE 590 Graduate Seminar NC

GATE 599 Master's Thesis NC

GATE 8XX Special Studies NC

M.S. PROGRAM IN BIOINFORMATICS

PROFESSOR

MUMCUOĞLU, Ünal Erkan : B.Sc., METU; M.S., Bilkent University; Ph.D., University of Southern California.

ASSOCIATE PROFESSOR

ÖZKURT, Tolga : B.Sc., M.S., İstanbul Technical University; Ph.D., University of Pittsburg

ASSISTANT PROFESSORS

ACAR, Aybar Can ***(Program Coordinator)***: **:** B.Sc. METU, Ph.D. George Mason University
AYDIN SON, Yeşim ***(Head of Health Informatics Department)***: M.D., Hacettepe University; Ph.D., University of Tennessee, Knoxville.
GÖKÇAY, Didem : B.Sc., M.S., METU; Ph.D., University of Florida.

OBJECTIVES: The aim of the Bioinformatics program is to design and implement novel methods that can be generalized to a defined class of problems—to focus on the acquisition, representation, retrieval, and analysis of biological data and knowledge.

The Masters Program in Bioinformatics focuses on computational techniques and tools for data analysis, theoretical modeling of biological processes, and also the design and development of biological tools and databases. Generally speaking, the program aims at researchers from both science and engineering fields who are interested in biotechnology, pharmacology, life sciences, or related industries, and who wish to broaden or upgrade their skills to follow recent breakthroughs and lead research in the area of bioinformatics.

The objectives of the METU Bioinformatics Graduate Programs are:

- to educate graduates from different disciplines in the theoretical and practical aspects of bioinformatics
- to meet the interdisciplinary graduate needs of t academia, and industry, and in the public and private sectors,
- to foster and support interdisciplinary research in the field.

CAREER OPPORTUNITIES: Graduates of the M.S. Program in Bioinformatics will be supporting diverse applications of bioinformatics in academic and private institutions, hospitals and industry focusing on biotechnology, biomedical and pharmaceutical sciences both on national and international platforms. Besides bioinformatics research career opportunities for bioinformatics professionals range from development of instrumentation and computer software for biological data collection, retrieval, analysis and interpretation, biological database design and management, computational analysis of biological data, and the implementation of newly emerging bioinformatics tools in bio-industries.

PROGRAM STRUCTURE: Students are required to complete 21 credits of course work during their studies in the M.S. Program in Bioinformatics. These credits should include three core courses, two area and two elective courses and a seminar course. Students also submit a master's thesis supervised by an advisor who is affiliated with bioinformatics program before graduation.

Deficiency courses will be determined based on the undergraduate background of the student and the courses completed successfully by the student before starting the program.

DEGREE REQUIREMENTS

M.S. Degree Requirements

- 3 core courses (9 credits total)
- At least 2 area courses (6 credits total)
- Maximum of 2 elective courses (6 credits total)
- 1 seminar course (non-credit)
- Master's Thesis (non-credit)

GRADUATE CURRICULUMM.S. PROGRAM

Deficiency Courses

STAT	221	Fundamentals of Statistics	(3-0)3
CENG	230	Introductions to C Programming	(3-0)3
BIO	317	Molecular Biology	(3-0)3
BIO	420	Biochemistry *OR*	(3-0)3
CHEM	413	Biochemistry	(3-0)3

Core Courses

BIN	501	Introduction to Bioinformatics*	(3-0)3
BIN	502	Statistical Methods for Informatics	(3-0)3
BIN	503	Biological Databases and Data Analysis Tools	(3-0)3
BIN	504	Probabilistic and Statistical Modeling for Bioinformatics	(3-0)3
BIN	505	Foundations of Systems Biology	(3-0)3

*****_CENG 465 Introduction to Bioinformatics is equivalent of BIN 501._

Area Courses

BIN	506	Protein and DNA Sequence Analysis	(3-0)3
BIN	711	Applications of Bioinformatics in Molecular Biology	(3-0)3
BIN	712	Computational Methods in Bioinformatics	(3-0)3
BIN	714	Microarray Data Analysis and Informatics	(3-0)3
BIO	505	Advanced Molecular Genetics	(3-0)3
BIO	715	Genomics and Proteomics	(3-0)3
BTCH	705	Current Techniques in Protein Interactions	(3-0)3
CENG	734	Advanced Topics in Bioinformatics	(3-0)3
GENE	433	Molecular Modeling And Protein Structure	(3-0)3

Elective Courses

BIO	444	Introduction to Enzyme Kinetics	(3-0)3
BIO	461-2	Biophysics I-II	(3-0)3
BIO	503	Enzyme Kinetics	(3-0)3
BIO	511	Experimental Techniques in Biochemistry	(3-0)3
BIO	513	Biology Of Cancer	(3-0)3
BIO	537	Genetic Engineering	(3-0)3
BIO	578	Evolutionary Genetics and Environmental Stress	(3-0)3
BIO	703	Special Topics in Evolutionary Biology	(3-0)3
BIO	705	Protein Structure, Function And Stability	(3-0)3
BIO	710	Pharmaceutical Biotechnology	(3-0)3
BCH	503	Intermediary Metabolism	(3-0)3
CENG	546	Object-Oriented Programming Languages and Systems	(3-0)3
CENG	553	Database Man. Systems	(3-0)3
CENG	538	Advanced Graphics and User Interfaces	(3-0)3
CENG	555	Object-Oriented Database Systems	(3-0)3
CENG	556	Distributed Database Management Systems	(3-0)3
CENG	561	Artificial Intelligence	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	564	Pattern Recognition	(3-0)3
CENG	567	Design and Analysis of Algorithms	(3-0)3
CENG	571-2	Numerical Analysis I-II	(3-0)3
CENG	574	Statistical Data Analysis	(3-0)3
CENG	577	Parallel Computing	(3-0)3
CENG	580	Distributed Artificial Intelligence	(3-0)3
CENG	714	Data Mining	(3-0)3
CHEM	555-6	Molecular Spectroscopy I-II	(3-0)3
FDE	403	Food Biotechnology	(3-0)3
IAM	530	Statistics and Probability	(3-0)3
IAM	557	Statistical Learning and Simulation	(3-0)3
IAM	565	Introduction to Algorithms and Complexity	(3-0)3
IAM	566	Numerical Optimization	(3-0)3
IAM	567	Mathematical Modeling	(3-0)3
IAM	664	Inverse Problems	(3-0)3
IE	455	An Introduction To Combinatorial Analysis	(3-0)3

IS	503	Database Concepts andApplications (3-0)3	IS	781	Knowledge Discovery and Mining (3-0)3
IS	504	Computer Networking for Information Systems (3-0)3	MIN	545	Object Oriented Programming and Data Structures (3-0)3
IS	507	Introduction to Software Engineering (3-0)3	STAT	519	Biostatistics (3-0)3
IS	545	Object Oriented Programming and Data Structures (3-0)3	STAT	515	Computational Statistics and Data Analysis (3-0)3
IS	738	Software Design Patterns (3-0)3	**Seminar Course**		
			BIN	590	Graduate Seminar in Bioinformatic

DESCRIPTION OF COURSES

BIN 501/CENG465 Introduction to Bioinformatics (3-0)3
This course will provide an introduction to bioinformatics. The computational techniques for mining the large amount of information produced by biological experiments such as genome sequencing, microarray technology, and other high-throughput experimental methods will be introduced. The main emphasis of the course is to provide an overview of the area and describe solutions to fundamental problems of bioinformatics such as DNA and protein sequence alignment, protein structural alignment, protein/RNA structure prediction, phylogenetic tree construction, microarray data analysis, and analysis of gene/protein networks.

BIN 502 Statistical Methods for Informatics (3-0)3
This course serves as a deficiency course for non-statisticians who are studying informatics at graduate level. Fundamentals of statistical methods and probability theory will be covered with specific examples and applications from cases in informatics and bioinformatics research. The topics offered in this course are; Counting, permutations and combinations, axioms of probability, conditional probability and independence, random variables, basic distributions of discrete and continuous random variables, functions of random variables, expectation, variance, covariance and correlation, sampling distributions, the central limit theorem, estimation and confidence intervals, bias, sufficiency, efficiency and consistency of estimators, hypothesis testing, common tests, error types. Non-parametric tests. Linear regression and ANOVA

BIN 503 Biological Databases and Data Analysis Tools (3-0)3
This course provides an in-depth review of the publicly available software tools and biological databases. Different types of biological data will be introduced and techniques for organization of biological data will be discussed. Also, the course will cover extensive use of web-based bioinformatics environments for investigation and analysis of biological data.

BIN 504 Probabilistic and Statistical Modeling for Bioinformatics (3-0)3
This course will introduce statistical modeling and inference techniques applied to biological problems. The course will cover standard statistical methods, such as multiple regression and principle component analysis, and more recent statistical techniques, such as maximum likelihood methods. Among the techniques covered will be Monte-Carlo-Markov chains using the Metropolis-Hastings algorithm and Gibbs sampling. In addition, the course will cover the use of statistical techniques such as Hidden Markov Models to model family of sequence and structures. Kernel methods and Support Vector Machines for computational biology will also be covered.

BIN 505 Foundations of Systems Biology (3-0)3
Systems biology aims to study biological phenomena through the modeling of interactions and general system behavior rather than reducing to the individual parts. This course will cover the basic ideas, tools and contributions of the systems biology and biological network analysis. The subjects to be covered include: dynamics of biological networks; common motifs; network analysis, modeling and visualization methods; applications in transcription, protein interaction, metabolic and co-expression networks. The coursework involves in-class discussion of several case studies, a term project, homework assignments and exams.

BIN 506 Protein and DNA Sequence Analysis (3-0)3
This course will cover the methods of DNA and protein sequence analysis in depth including analysis of homology, identification of motifs and domains, pair-wise and multiple alignments, and statistical significance of sequence alignments. The course will also cover sequence and motif databases such as GeneBank, SwissProt, Prosite, and Pfam.

BIN 590 Graduate Seminar in Bioinformatics (3-0)3
The graduate seminar will provide the students an opportunity to present advanced papers in bioinformatics. The students will read and present papers from frontier bioinformatics conferences, such as RECOMB, ISMB, PSB, and CSB, and from top journals such as Bioinformatics, PNAS, Science, Nature, Genome Research, and Proteins. This course will be a medium for discussing recent breakthroughs and brainstorming new research ideas. Enrolment in this course for at least two semesters will be mandatory for each graduate student enrolled in the Bioinformatics Graduate Program.

BIN 711 Applications of Bioinformatics in Molecular Biology (3-0)3
This course aims to introduce frequently used bioinformatics tools to non-bioinformaticians and will discuss the basic concepts of bioinformatics. Recent developments in biological sciences have produced a wealth of experimental data of sequences and three-dimensional structures of biological macromolecules. With the advances of computer and information sciences, these data and tools to analyze the data available from a variety of public sources. The main focus of the course will be to teach how to access, handle and interpret this rapidly expanding amount of biological information at an introductory level. Practical section of the course will emphasize on how to use the computer and bioinformatics applications to aid in biological research.

BIN 712 Computational Methods In Bioinformatics (3-0)3

Recent advances on technology, molecular biology and large-scale biological experiments result in data accumulation at a large scale. These data have been provided in different platforms and come from different laboratories. Therefore, there is a need for compilation and comprehensive analysis. The main focus of the course will be to understand the principal concepts of algorithms, mining methods and database management systems used in analyzing, clustering and storing these data from the computer science perspective for bioinformatics students. Programming assignments and presentations of major bioinformatics algorithms will emphasize the understanding and implementation of bioinformatics applications to aid in biological research. Furthermore, understanding the basic computational concepts used in data analysis will gain experience for later work in cooperation with computer scientists.

BIN 714 Microarray Data Analysis and Informatics (3-0)3
Microarrays are now an established technology in molecular biology with increasing number of applications in genomics and proteomics research. The main objective of this course is to introduce the participants to advanced bioinformatics, statistical methodologies and software tools for analyzing and managing various microarray data, such as transcriptomics, proteomics and genotyping. This course is aimed at advanced MS and PhD level students and post-doctoral researchers who are applying or planning to apply microarray analysis and bioinformatics methods in their research. The course will be presented under three major topics 1) Fundamentals of Microarray Technology 2) Analytics of Microarray Process 3) Microarray Informatics. The latest software packages will be introduced within appropriate lectures.

BIN	**590**	**Graduate Seminar**	**NC**
BIN	**599**	**Master's Thesis**	**NC**
BIN	**8XX**	**Special Studies**	**NC**

GRADUATE SCHOOL OF APPLIED MATHEMATICS

Director: KARASÖZEN, Bülent; B.S., M.S., Ph.D. Technical University Berlin.
Associate Director: SELÇUK-KESTEL, A. Sevtap; Assoc. Prof. Dr., B.S., M.S., Ph.D. METU.
Associate Director: MANGUOĞLU, Murat; B.S. METU, M.S. University of Utah, Ph.D. Purdue University.
Assistant to the Director: WEBER, Gerhard Wilhelm; B.S., M.S., Ph.D. Aachen Technical University.

GENERAL INFORMATION: The Institute of Applied Mathematics (IAM) is an interdisciplinary centre fostering various researches and teaching activities in mathematical sciences. A major aim of IAM is to coordinate mathematics-based research at METU and to initiate/undertake collaborative research with industry. The objectives of the Institute of Applied Mathematics are:

- Coordinate mathematics-based research at METU in fostering interdisciplinary collaboration between the department of Mathematics and the other departments within METU.
- Train university graduates from different disciplines in theoretical and practical aspects of mathematical sciences in order to address the interdisciplinary needs of both public and private sectors.
- Conduct short courses to industrial partners.
- Organize and conduct international workshops and summer schools in chosen research areas.

The Institute plans to offer programs leading to Doctor of Philosophy (Ph.D.) and Master of Science (M.S.) degrees in various areas of mathematical sciences. It is anticipated that the institute will develop innovative new mathematics-based interdisciplinary programs in the years to come.

Admission: Admission to these programs will be conducted per the "Academic Rules and Regulations Concerning Graduate Studies of METU". However, some programs may carry additional requirements. University graduates interested in acquiring skills and expertise in mathematical sciences are considered to be the "natural" candidates for these programs. In addition, these programs are also open to the graduates employed in the industry. In general applicants will be evaluated based on their performance in the subject area they have graduated in, their ALES (Academic Graduate Education Examination) scores, English Proficiency, and an optional examination/interview administered by the Institute.

Structure of the Programs: Each program has its own list of core and elective courses. All students enrolled are required to take core and elective courses described in their selected programs. Students lacking the necessary background for the program will be required to take the suggested deficiency courses. Throughout the program, students will be guided by their advisors in making specific course choices to meet their needs.

GRADUATE PROGRAMS: The institute offers M.S. and Ph.D. degrees in Cryptography, Financial Mathematics, Scientific Computing and M.S. degree in Actuarial Science.

M.S. PROGRAMS IN ACTUARIAL SCIENCES

ASSOCIATE PROFESSOR

KESTEL (SELÇUK), Sevtap ***(Department Chair & Associate Director of the Graduate School of Applied Mathematics)***: B.S., M.S. METU; M.BA. St. John's University; Ph.D. METU.

AFFILIATED FACULTY

PROFESSORS

DİMİTRİYADİS, İrini: B.S., M.S., Ph.D. Boğaziçi University.
GEBİZLİOĞLU, Ömer: B.S. METU; M.S. Union College and University; Ph.D. Wisconsin University.

ASSOCIATE PROFESSORS

BATMAZ, İnci: B.S. METU; M.S., Ph.D. Ege University.
İLK, Özlem: B.S. METU, M.S., Ph.D. Iowa State University.
TANK, Fatih: B.S., M.S., Ph.D. Ankara University.

ASSISTANT PROFESSORS

ERKAN BAŞBUĞ, B. Burçak: B.S. METU; M.S. University of Warwick; Ph.D. London School of Economics.
YOZGATLIGİL-TALU, Ceylan: B.S., M.S. METU, Ph.D. Temple University.

INSTRUCTORS

KÜTÜK, Fikret: B.S. METU, M.B.A. St. John's University, Actuary.
KORKMAZ, Selda: B.S. METU, M.S. Boston University, Actuary.
YAZICI, Selamet: B.S. Marmara University, M.B.A. St. John's University, Actuary.

OBJECTIVES

- To provide students with the knowledge and skills necessary for comprehending and applying actuarial techniques,
- To produce theoretically sound and practical research, which contributes to the advancement of actuarial science and practice,
- To conduct research in practical applications of actuarial, insurance, risk management and risk analysis.

DEGREE REQUIREMENTS: This program has both thesis and non-thesis options:

M.S. Degree Requirements (Thesis)

- 9 core courses
- 1 seminar (non-credit)
- Master's Thesis (non-credit)
- Summer internship (one month)

Total: 24 credits

M.S. Degree Requirements (Non-Thesis)

- 9 core courses
- 3 elective courses
- 1 seminar course (non-credit)
- Term Project (non-credit)
- Summer internship (one month)

Total: 36 credits

GRADUATE CURRICULUM

M.S. Program (Thesis):

Core Courses

IAM	500	Master's Thesis	NC
IAM	521	Financial Management	(3-0)3
IAM	530	Elements of Probability and Statistics*	(3-0)3
IAM	541	Probability Theory	(3-0)3
IAM	546	Actuarial Risk Theory	(3-0)3
IAM	548	Stochastic Processes for Insurance and Finance	(3-0)3
or IAM	522	Stochastic Calculus for Finance	(3-0)3
IAM	549	Fundamentals of Insurance	(3-0)
IAM	582	Life Insurance Mathematics	(3-0)3
IAM	583	Pension Fund Modeling	(3-0)3
IAM	584	Advanced Actuarial Mathematics	(3-0)3
IAM	590	Graduate Seminar	(0-2)NC

M.S. Program (Non-Thesis):

Core Courses

IAM	521	Financial Management	(3-0)3
IAM	530	Elements of Probability and Statistics*	(3-0)3
IAM	541	Probability Theory	(3-0)3
IAM	IAM	546 Actuarial Risk Theory	(3-0)3
IAM	548	Stochastic Processes for Insurance and Finance	(3-0)3
or IAM	522	Stochastic Calculus for Finance	(3-0)3
IAM	549	Fundamentals of Insurance	(3-0)3
IAM	582	Life Insurance Mathematics	(3-0)3
IAM	583	Pension Fund Modeling	(3-0)3
IAM	584	Advanced Actuarial Mathematics	(3-0)3
IAM	589	Term Project	(0-2)NC
IAM	590	Graduate Seminar	(0-2)NC

Elective Courses

All students in Non-Thesis Option should take at least 3 elective courses

Suggested Elective Courses

IAM	520	Financial Derivatives	(3-0)3
IAM	524	Financial Economics	(3-0)3
IAM	526	Time Series Applied to Finance	(3-0)3
IAM	543	Regulation and Supervision of Financial Risks	(3-0)3
IAM	547	Risk Management and Insurance	(3-0)3
IAM	552	Credibility Theory	(3-0)3
IAM	554	Interest Rate Models	(3-0)3
IAM	555	Statistical Decision Theory	(3-0)3
IAM	556	Simulation	(3-0)3
IAM	557	Statistical Learning and Simulation	(3-0)3
IAM	558	Reinsurance Theory	(3-0)3
IAM	585	Decision-Making under Uncertainty	(3-0)3
BA	5514	Risk Management	(3-0)3
BA	5814	Investment Management	(3-0)3
BA	5818	Analysis of Financial Statements	(3-0)3
ECON	507	Econometric Methods I	(3-0)3
ECON	508	Econometric Methods II	(3-0)3
ECON	510	Turkish Economy	(3-0)3

*Students not having sufficient background in Statistics will have to take "IAM 530 Elements of Probability and Statistics"; otherwise, they are required to take "IAM 556 Simulation".

M.S. and Ph.D. PROGRAMS IN CRYPTOGRAPHY

AFFILIATED FACULTY

PROFESSORS

AKYILDIZ, Ersan: B.S. METU; Ph.D. University of British Columbia.
BİLHAN, Mehpare: B.S. METU; Ph.D. University Paris VI (Pierre-e-Marie Curie).
GÜLER, İ. Yurdahan: B.S., M.S., Ph.D. METU.
ÖZBUDAK, Ferruh ***(Department Chair)***: B.S., M.S., Ph.D. Bilkent University.
YILMAZ, Abdürrahim: B.S. METU; MS., Ph.D Hacettepe University.

ASSOCIATE PROFESSORS

DOĞANAKSOY, Ali: B.S. İstanbul Technical University; M.S., Ph.D. METU.
YÜCEL, Melek: B.S., M.S., Ph.D. METU.

ASSISTANT PROFESSORS

AKLEYLEK, Sedat: B.S. Ege University; M.S., Ph.D. METU.
SAYGI, Zülfükar: B.S., M.S., Ph.D. METU.

INSTRUCTORS

CENK, Murat: B.S. METU; M.S. Çankaya University; Ph.D. METU.
UĞUZ, Muhiddin: B.S. METU; M.S. Michigan State University; Ph.D. METU.
YALÇIN, Tolga: B.S., M.S. METU; Ph.D. EPFL.
YAYLA, Oğuz: B.S.,M.S.,Ph.D. METU.

OBJECTIVES: The Cryptography Group (CG) of IAM investigates design and analysis of cryptographical software and hardware used for information security. CG's research areas can be categorized as follows: Symmetric cryptosystems (Design and analysis of block ciphers, stream ciphers and pseudorandom sequences), Asymmetric cryptosystems (Elliptic, Hyperelliptic and algebraic curves in cryptography), Computational number theory and Coding theory, and Cryptographical hardwares and their analysis.

In view of the research interest of CG, the objectives of the Cryptography Graduate Program can be summarized as follows:

- To conduct a graduate program leading to M.S. and Ph.D. degrees in Cryptography
- To provide a mathematical treatment to the practical aspects of conventional and public-key cryptography.
- To introduce mathematical tools for serious practitioner in need of the latest cryptographical techniques and algorithms.
- To evolve into an internationally recognized center for research in cryptography and related areas of information security

DEGREE REQUIREMENTS: This program has both thesis and non-thesis options
M.S. Degree Requirements - Thesis Option:

- 6 core courses
- 1 elective course
- 1 seminar course (non-credit)
- Master's Thesis (non-credit)

Total 21 credits

M.S. Degree Requirements- Non-Thesis Option:

- 6 core courses
- 4 elective courses
- 1 seminar course (non-credit)
- Term Project (non-credit)

Total 30 credits

Ph.D. Degree Requirements

If admitted by M.S. degree

- 7 core/elective courses
- Ph.D. Thesis (non-credit)

Total 21 credit

If admitted by B.S. degree

- 6 core courses
- 8 elective courses
- 1 seminar course (non-credit)
- Ph.D. Thesis (non-credit)

Total 42 credits

GRADUATE CURRICULUM

Deficiency Program

IAM	517	Basic Mathematics for Cryptography I	(3-0)3
IAM	518	Basic Mathematics for Cryptography II	(3-0)3

M.S. Programs

M.S. Program (Thesis)

Core Courses

IAM	500	M.S. Thesis	NC
IAM	501	Introduction to Cryptography	(3-0)3
IAM	502	Stream Ciphers	(3-0)3
IAM	503	Applications of Finite Fields	(3-0)3
IAM	504	Public Key Cryptography	(3-0)3
IAM	511	Algorithms and Complexity	(3-0)3
IAM	512	Block Ciphers	(3-0)3
IAM	590	Graduate Seminar	(0-2)NC

Ph.D. Programs

If admitted by M.S. degree

Core Courses

IAM	600	Ph.D. Thesis	NC

Elective Courses

All students should take at least seven core/elective courses.

If admitted by B.S. degree

Core Courses

IAM	501	Introduction to Cryptography	(3-0)3
IAM	502	Stream Ciphers	(3-0)3
IAM	503	Applications of Finite Fields	(3-0)3
IAM	504	Public Key Cryptography	(3-0)3
IAM	511	Algorithms and Complexity	(3-0)3
IAM	512	Block Ciphers	(3-0)3
IAM	590	Graduate Seminar	(0-2)NC
IAM	600	Ph.D. Thesis	NC

Elective Courses

All students should take at least eight elective courses.

Suggested Elective Courses

IAM	505	Elliptic Curves in Cryptography	(3-0)3
IAM	506	Combinatorics	(3-0)3 or
MATH	405	Combinatorics	(3-0)3

Elective Courses

All students should take at least one elective courses.

M.S. Program (Without-Thesis)

Core Courses

IAM	501	Introduction to Cryptography	(3-0)3
IAM	502	Stream Ciphers	(3-0)3
IAM	503	Applications of Finite Fields	(3-0)3
IAM	504	Public Key Cryptography	(3-0)3
IAM	511	Algorithms and Complexity	(3-0)3
IAM	512	Block Ciphers	(3-0)3
IAM	589	Term Project	(0-2)NC
IAM	590	Graduate Seminar	(0-2)NC

Elective Courses

All students should take at least four elective courses.

IAM	507	Algorithmic Graph Theory	(3-0)3
IAM	508	Computer Algebra	(3-0)3
IAM	509	Algebraic Aspects of Cryptography	(3-0)3
IAM	510	Quantum Cryptography	(3-0)3
IAM	530	Elements of Probability and Statistics	(3-0)3
IAM	564	Basic Algorithms and Programming	(0-4)NC
IAM	601	Elliptic Curves	(3-0)3
IAM	602	Algebraic Geometric Codes	(3-0)3
IAM	603	Computational Number Theory	(3-0)3
MATH	473	Ideals, Varieties and Algorithms	(3-0)3
MATH	515	Commutative Algebra	(3-0)3
MATH	521	Finite Fields and Applications	(3-0)3
MATH	522	Coding Theory	(3-0)3
or EE	534	Coding Theory	(3-0)3
MATH	523	Algebraic Number Theory	(3-0)3
MATH	524	Theory of Function Fields	(3-0)3
EE	435	Telecommunications I	(3-0)3
EE	436	Telecommunications II	(3-0)3
EE	533	Information Theory	(3-0)3
EE	542	Computer Networks	(3-0)3
EE	647	Microprocessor Systems Engineering	(3-0)3
CENG	530	Computer Networks and Communications	(3-0)3
CENG	559	Data Security and Protection	(3-0)3
CENG	562	Machine Learning	(3-0)3
CENG	565	Introduction to Theory of Computation	(2-2)3
CENG	567	Design and Analysis of Algorithms	(3-0)3
CENG	573	Symbolic Algebraic Computation	(3-0)3
CENG	575	Simulation Modeling and Analysis	(3-0)3
CENG	577	Parallel Computing	(3-0)3

M.S. and Ph.D. PROGRAMS IN FINANCIAL MATHEMATICS

PROFESSOR

WEBER, Gerhard Wilhelm ***(Assistant to the Director of the Graduate School of Applied Mathematics)***: B.S., M.S., Ph.D. Aachen Technical University.

ASSOCIATE PROFESSORS

SELÇUK-KESTEL, A. Sevtap ***(Department Chair & Associate Director of the Graduate School of Applied Mathematics)***: B.S., M.S. METU; M.BA. St. John's University; Ph.D. METU.
SEZER, Devin: B.S., METU; Ph.D. Brown University.
UĞUR, Ömür: B.S., M.S., Ph.D. METU.

ASSISTANT PROFESSOR

YOLCU OKUR, Yeliz: B.S., M.S. METU; Ph.D. University of Oslo.

AFFILIATED FACULTY

PROFESSORS

BATMAZ, İnci: B.S. METU; M.S., Ph.D. Ege University.
GÜNER, Nuray: B.S., M.S. University of North Carolina; Ph.D. UNC Kenan-Flagler Business School.
KORN, Ralf: Technical University Kaiserslautern.

ASSOCIATE PROFESSORS

İLK DAĞ, Özlem: B.S. METU, M.S., Ph.D. Iowa State University.
HAYFAVİ, Azize: B.S. Ankara University; M.S., Ph.D. METU.
KÜÇÜKÖZMEN, Coşkun: B.A. Dokuz Eylül Unversity; M.S. Loughborough University of Tech.; Ph.D. Exeter University.
PURUTÇUOĞLU-GAZİ, Vilda: B.S., M.S. METU; Ph.D. Lancaster University.
YILDIRAK, Kasırga: B.S. Ankara University; M.S. North Carolina State University; Ph.D. METU.

ASSISTANT PROFESSORS

AYAYDIN, Hande: B.S. METU; M.S., Ph.D.; The University of Manchester
DANIŞOĞLU, Seza: B.S. METU; M.S., Ph.D. Texas Tech. University.
GAYGISIZ, Esma: B.S., M.S. METU; Ph.D. Manchester University.
VARDAR, Ceren: B.S., M.S., METU; Ph.D. Bowling Green University.
YOZGATLIGİL TALU, Ceylan: B.S., M.S. METU; Ph.D. Temple University.

INSTRUCTOR

KALAYCI, Erkan: B.S. M.S.University of Basel; Ph.D. METU.

OBJECTIVES:

- To provide students with the knowledge and skills necessary for comprehending and applying existing techniques of Financial Mathematics.
- To analyse and manage financial markets.
- To conduct research in risk modeling and management, interest rate models, pricing and hedging portfolio optimization.

DEGREE REQUIREMENTS: This program has the both thesis and non-thesis options.
M.S. Degree Requirements (Thesis)

- 7 core courses

- 1 elective courses
- 1 seminar (non-credit)
- Master's Thesis (non-credit)

Total: 24 credits

M.S. Degree Requirements (Non-Thesis)

- 7 core courses
- 3 elective courses
- 1 seminar course (non-credit)
- Term Project (non-credit)

Total: 30 credits

Ph.D. Degree Requirements

If admitted by M.S. degree

- 3 core courses
- 4 elective courses
- IAM 600 Ph.D. Thesis (non-credit)

Total: 21 credits

If admitted by B.S. degree

- 10 core courses
- 4 elective courses
- 1 seminar course (non-credit)
- IAM 600 Ph.D. Thesis (non-credit)

Total: 42 credits

GRADUATE CURRICULUM

M.S. Programs

Deficiency Program

IAM 527 Advanced Calculus and Integration (4-2)5

M.S. Program (Thesis)

Core Courses

IAM	500	Master's Thesis	NC
IAM	520	Financial Derivatives	(3-0)3
IAM	521	Financial Management	(3-0)3
IAM	522	Stochastic Calculus for Finance	(3-0)3
IAM	524	Financial Economics	(3-0)3
IAM	526	Time Series Applied to Finance	(3-0)3
IAM	530	Elements of Probability and Statistics*	(3-0)3
IAM	541	Probability Theory	(3-0)3
IAM	590	Graduate Seminar	(0-2) NC

Elective Courses

All students should take at least one elective course.

M.S. Program (Non-Thesis)

Core Courses

IAM	520	Financial Derivatives	(3-0)3
IAM	521	Financial Management	(3-0)3
IAM	522	Stochastic Calculus for Finance	(3-0)3
IAM	524	Financial Economics	(3-0)3
IAM	526	Time Series Applied to Finance	(3-0)3
IAM	530	Elements of Probability and Statistics*	(3-0)3
IAM	541	Probability Theory	(3-0)3
IAM	589	Term Project	(0-2) NC
IAM	590	Graduate Seminar	(0-2) NC

Elective Courses

All students should take at least three elective courses.

Ph.D. Programs

IAM 614 Methods of Computational Finance (3-0)3
IAM 615 Advanced Stochastic Calculus for Finance (3-0)3
BA 6801-Theory of Finance (3-0)3

Deficiency Program

IAM 520 Financial Derivatives (3-0)3
IAM 521 Financial Management (3-0)3
IAM 522 Stochastic Calculus for Finance (3-0)3
IAM 524 Financial Economics (3-0)3
IAM 541 Probability Theory (3-0)3

If admitted by M.S. degree

IAM 600 Ph.D. Thesis NC
IAM 614 Methods of Computational Finance (3-0)3
IAM 615 Advanced Stochastic Calculus for Finance (3-0)3
BA 6801-Theory of Finance (3-0)3

All students should take at least four elective courses.

If admitted by B.S. degree

Core Courses

IAM 520 Financial Derivatives (3-0)3
IAM 521 Financial Management (3-0)3
IAM 522 Stochastic Calculus for Finance (3-0)3
IAM 524 Financial Economics (3-0)3
IAM 526 Time Series Applied to Finance (3-0)3
IAM 530 Elements of Probability and Statistics* (3-0)3
IAM 541 Probability Theory (3-0)3
IAM 590 Graduate Seminar (0-2)NC
IAM 600 Ph.D. Thesis NC
IAM 614 Methods of Computational Finance (3-0)3
IAM 615 Advanced Stochastic Calculus for Finance (3-0)3
BA 6801-Theory of Finance (3-0)3

Summer Internship

*Students not having a sufficient background in Statistics will have to take "IAM 530 Elements of Probability and Statistics"; otherwise they will have to take "IAM 556 Simulation"

ELECTIVE COURSES

All students should take at least four elective courses.

Suggested Elective Courses

IAM 525 Game Theory (3-0)3
IAM 528 Markov Decisions Processes (3-0)3
IAM 529 Nonlinear Dynamics in Economics (3-0)3
IAM 542 Stochastic Processes (3-0)3
IAM 543 Regulation and Supervision of Financial Risks (3-0)3
IAM 550 Portfolio Optimization (3-0)3
IAM 544 Financial Risk Assessment with Matlab (3-0)3
IAM 554 Interest Rate Models (3-0)3
IAM 556 Simulation (3-0)3
IAM 557 Statistical Learning and Simulation (3-0)3
IAM 560 Stochastic Aspects of Dynamics (3-0)3
IAM 561 Introduction to Scientific Computing I (3-0)3
IAM 562 Introduction to Scientific Computing II (3-0)3
IAM 563 Methods of Applied Mathematics (3-0)3
IAM 564 Basic algorithms and Programming (0-4)NC
IAM 566 Numerical Optimization (3-0)3
IAM 567 Mathematical Modeling (3-0)3
IAM 581 Special Topics in Financial Mathematics (3-0)3
IAM 585 Decision-Making under Uncertainity (3-0)3
IAM 612 Financial Modelling with Jump Processes (3-0)3
MATH 402 Introduction to Optimization (3-0)3
MATH 487 Applied Mathematics I (3-0)3
MATH 488 Applied Mathematics II (3-0)3
MATH 583 Partial Differential Equations I (3-0)3
MATH 581 Numerical Analysis (3-0)3
MATH 593 Numerical Solutions of Partial Differential Equations (3-0)3
ECON 501 Microeconomic Theory I (3-0)3
ECON 502 Macroeconomic Theory I (3-0)3
ECON 503 Microeconomic Theory II (3-0)3
ECON 504 Macroeconomic Theory III (3-0)3
ECON 507 Econometric Methods I (3-0)3
ECON 508 Econometric Methods II (3-0)3
ECON 510 Turkish Economy (3-0)3
ECON 514 Macroeconomics: Theory and Policy (3-0)3
BA 5514 Risk Management (3-0)3
BA 5814 Investment Management (3-0)3
BA 5821 Bank Management (3-0)3
BA 5827 Fixed Income Analysis (3-0)3

M.S. and Ph.D. PROGRAMS IN SCIENTIFIC COMPUTING

PROFESSOR

WEBER, Gerhard Wilhelm ***(Assistant Director of the Graduate School of Applied Mathematics)***: B.S., M.S., Ph.D. Aachen Technical University.

ASSOCIATE PROFESSOR

UĞUR, Ömür: B.S., M.S., Ph.D. METU.

AFFILIATED FACULTY

PROFESSORS

AKSEL, Haluk: B.S., M.S. METU; Ph.D. Lehigh University Bethlehem.
GENÇER, Nevzat Güneri: B.S. Boğaziçi University; M.S., Ph.D. METU.
KARASÖZEN, Bülent: ***(Department Chair & Director of the Graduate School of Applied Mathematics)***
B.S., M.S., Ph.D. Technical University Berlin.
KÖKSAL, Gülser: B.S., M.S. METU; Ph.D. North Carolina State University.
TEZER, Münevver: B.S., M.S. METU; M.S. University of Saskatchewan; Ph.D. University of Calgary.

ASSOCIATE PROFESSORS

MANGUOĞLU, Murat ***(Associate Director of the Graduate School of Applied Mathematics)***: B.S. METU, M.S. University of Utah, Ph.D. Purdue University.

ASSISTANT PROFESSORS

DOĞRU (SERİNAĞAOĞLU), Yeşim: B.S., M.S. METU; Ph.D. Northeastern University.
İYİGÜN, Cem: B.S. METU; M.S., Ph.D. Putgers University.

OBJECTIVES:

- To train graduates coming from different disciplines at the Master's level with the aim of developing
- their skills in solving real life problems and being able to apply them science, engineering and industry,
- To cultivate collaboration among research groups in mathematics, science and engineering departments at METU,
- To provide a platform for active participation of research groups from METU in the international research community by establishing research networks and participating in international projects,
- To organize international workshops and summer schools in order to introduce researchers and upcoming students to the new, developing areas of Scientific Computing.
- To establish contacts among in the Scientific Computing program and the industrial establishment in Turkey for the purpose of demonstrating modern methods applicable to industrial problems, and organize "Mathematics in Industry" workshops with representatives from the industry.

DEGREE REQUIREMENTS:

M.S. Degree Requirements:

- 4 core courses
- 3 electives courses
- 1 seminar course (non-credit)
- Master's Thesis (non-credit)

Total 21 credits

Ph.D. Degree Requirements

If admitted by M.S. degree

7 elective courses
- Ph.D. thesis (non-credit)

Total 21 credits

If admitted by B.S. degree

- 4 core courses
- 10 elective courses
- 1 seminar course (non-credit)
- IAM 600 Ph.D. Thesis (non-credit)

Total 42 credits

GRADUATE CURRICULUM

M.S. Program

Core Courses
IAM 500 M.S. Thesis
IAM 561 Introduction to Scientific Computing I
IAM 562 Introduction to Scientific Computing II
IAM 566 Numerical Optimization
IAM 572 Finite Element Methods for Partial Differential
Equations: Theory and Applications
IAM 590 Graduate Seminar

Elective Courses
All students should take at least three elective courses.

Ph.D. Programs

If admitted by M.S. degree

IAM 600 Ph.D. Thesis (non-credit) NC

All students should take at least
- four IAM courses and
- three elective courses.

If admitted by B.S. degree

Core Courses
IAM 561 Introduction to Scientific Computing I (3-0)3
IAM 562 Introduction to Scientific Computing II (3-0)3
IAM 566 Numerical Optimization
IAM 572 Finite Element Methods for Partial Differential
Equations: Theory and Applications
IAM 590 Graduate Seminar
IAM 600 Ph.D. Thesis

Elective Courses
All students should take at least ten elective courses.

Suggested Elective Courses

IAM	525	Game Theory	(3-0)3
IAM	529	Applied Nonlinear Dynamics	(3-0)3
IAM	530	Elements of Probability and Statistics	(3-0)3
IAM	557	Statistical Learning and Simulation	(3-0)3
IAM	560	Stochastic Aspects of Dynamics	(3-0)3
IAM	564	Basic algorithms and Programming	(0-4)NC
IAM	567	Mathematical Modeling	(3-0)3
IAM	573	System Parameter Estimation and its Applications	(3-0)3
IAM	664	Inverse Problems	(3-0)3
IAM	665	Advanced Continuous Optimization	(3-0)3
IAM	672	Control and Optimization of Differential Equations	(3-0)3
MATH	593	Numerical Solutions of Partial Differential Equations	(3-0)3
MATH	595	The Boundary Element Method and Applications	(3-0)3
MATH	596	Computational Basis of Fluid Differential Equations	(3-0)3
MATH	677	Numerical Methods in Ordinary Dynamics Equations	(3-0)3
AE	541	Advanced Computational Fluid Flow	(3-0)3
CHE	520	Transport Phenomena	(3-0)3
CHE	521	Advanced Fluid Flow	(3-0)3
CENG	576	Numerical Methods in Optimization	(3-0)3
CENG	577	Parallel Computing	(3-0)3
EE	515	Bioelectricity and Biomagnetism	(3-0)3
EE	519	Medical Imaging	(3-0)3
EE	553	Optimization	(3-0)3
ES	503	Finite Element Method	(3-0)3
ES	504	Numerical Solution of PDEs	(3-0)3
GGIT	537	Statistical Techniques in Geographical Analysis	(3-0)3
GGIT	538	Spatial Data Analysis	(3-0)3

IE	554	Discrete Optimization	(3-0)3	Mechanics	(3-0)3
OR	503	Nonlinear Optimization	(3-0)3		
OR	504	Large Scale Optimization	(3-0)3		
ME	517	Advanced Fluid Mechanics	(3-0)3		
ME	547	Introduction to Continuum			

DESCRIPTION OF COURSES

IAM 500 M.S. Thesis NC
Program of research leading to M.S. degree arranged between the student and a faculty member. Students register to this course in all semesters while the research program or write up of thesis is in progress.

IAM 501 Introduction to Cryptography (3-0)3
Historical development of cryptography, introduction to simple crypto systems, information theoretic security, basics of symmetric ciphers: block ciphers, stream ciphers, basics of asymmetric ciphers, cryptographic protocols and cryptanalysis.

IAM 502 Stream Ciphers (3-0)3
Linear Feedback Shift Registers: Generating Functions, Minimal Polynomial and Families of Recurring Sequences, Characterizations and Properties of Linear Recurring Sequences. Design and Analysis of Stream Ciphers: Stream Ciphers Using LFSRs, Additive Generators, Gifford, Algorithm M, PKZIP. Other Stream Ciphers and Real Random Sequence Generators: RC4, SEAL, WAKE, Feedback with Carry Shift Registers, Stream Ciphers using FCSRs, Non - Linear-Feedback Shift Registers. Cascading Multiple Stream Ciphers, Generating Multiple Streams from a Single Pseudo-Random-Sequence Generator.

IAM 503 Applications of Finite Fields (3-0)3
Structure of Finite Fields, Polynomials over Finite Fields, Factorization of Polynomials, Construction of Irreducible Polynomials, Normal and Optimal Normal Basis.

IAM 504 Public Key Cryptography (3-0)3
The Idea of Public Key Cryptography, Quadratic Residues, The Merkle-Hellman Knapsack System, Attacks on Knapsack Cryptosystems, RSA, Primality and Factoring Algorithms, ElGamal scheme, DSA, Pollard's Rho, the Pohling-Hellman and Index Calculus Algorithms, Introduction to Elliptic Curves and ECDSA .

IAM 505 Elliptic Curves in Cryptography (3-0)3
Elliptic curves over finite fields, group structure, Weil conjectures, Super singular curves, efficient implementation of elliptic curves, determining the group order, Schoof algorithm, the elliptic curve discrete logarithm problem, the Weil pairing, MOV attack.

IAM 506 Combinatorics (3-0)3
Algebraic Enumeration Methods: Bijections, generating functions, free monoids. Lagrange inversion, multisets and partitions. Inclusion-Exclusion, Mobius inversion, symmetric functions. Asymptotic Enumeration: Estimation of sums, formal power series, elementary estimates for convergent generating functions, analytical generating functions, singularities, Darboux's theorem, algorithmic and automated asymptotics. External set systems: Intersecting families, families with prescribed intersection sizes, s-wise t-intersection families, covering number. Computational complexity.

IAM 507 Algorithmic Graph Theory (3-0)3
Basic concepts: Walks, connection, external graphs, search trees, hyper graphs, Hamilton paths. Fundamental Parameters: Connectivity, edge connectivity, stability number, matching number, chromatic number, toughness. Bipartite graphs, line graphs, Thowrason's lemma, Pora's lemma, Woodall's hopping lemma. Lengths of circuits. Packing's and coverings. External graphs. Ramsey theory.

IAM 508 Computer Algebra (3-0)3
Number systems and elementary arithmetic with (arbitrary large) integers, Polynomial arithmetic, Fast Fourier transforms, Resultants and Sub-resultants, Factorization of polynomials, Arithmetic with power series, Gröbner bases. Applications of Gröbner basis algorithms. Coursework and computer lab with MATLAB.

IAM 509 Algebraic Aspects of Cryptography (3-0)3
Cryptography based on Groups, Discrete Logarithm Problem (DLP) in finite fields, The ElGamal Cryptosystem, Diffie-Hellman and Digital Signature Algorithm. Algorithms to attack DLP in finite fields: The Silver-Pohling-Hellman, The Index-Calculus, Basic facts on Elliptic Curves, Group structure, Elliptic Curve cryptosystems, Elliptic

curve primality test, Elliptic curve factorization. Lucas, GH and XTR cryptosystems.

IAM 510 Quantum Cryptography (3-0)3
Basic notions of quantum mechanics: Hilbert spaces, postulates of quantum mechanics, qubits, density operator, entanglement, EPR and Bell inequality. Quantum gates, quantum circuits. Quantum Fourier transform. Quantum algorithms: Deutsch's, Deutsch-Jozsa, Grover's and Shor's algorithms. Quantum cryptography: quantum key distribution, BB84, B92 and EPR protocols.

IAM 511 Algorithms and Complexity(3-0)3
Formal techniques for design and analysis of algorithms, methods for specifying algorithms, proving an algorithm's correctness, basics of algorithmic efficiency, asymptotic notations and basic efficiency classes, computational complexity, complexity classes P, NP, NP-completeness/ hardness, mathematical analysis of algorithms, divide-and-conquer, space and time trade-offs, and number-theoretical algorithms.

IAM 512 Block Ciphers (3-0)3
Block Cipher Systems: Building Blocks and Design Criteria. Modes of Operation: ECB, CBC, CFB, OFB, PCBC. Boolean Functions, Correlations and Walsh Transforms. Cryptographic Criteria: Propagation Characteristics, Nonlinearity, Resiliency and Generalization to S-Boxes. Differential and Linear Cryptanalysis, Algebraic Attacks. Descriptions of DES, SAFER, IDEA and AES Semi-Finalist Algorithms: Rijndael, Mars, Serpent, Twofish and RC6. Statistical Evaluation and Performance Comparison of AES Semi-Finalist Algorithms.

IAM 517 Basic Mathematics for Cryptography I (3-0)3
Basic properties of Integers, Divisibility, Primes, The fundamental theorem of arithmetic, Fermat numbers, Factorization methods, Diophantine equations, Congruences, Theorems of Fermat, Euler, Chinese Remainder and Wilson. Arithmetical functions, Primitive roots, Quadratic congruences.

IAM 518 Basic Mathematics for Cryptography II (3-0)3
Algebraic Preliminaries: Group, Ring, Ideals, Prime and Maximal ideals, Homomorphisms, Isomorphism theorems, Field, Polynomials, Field extensions, Finite fields, Factorization of polynomials, Splitting field. Quadratic residues and quadratic reciprocity.

IAM 520 Financial Derivatives (3-0)3
Introduction to Derivative and Financial Markets. The Structure of Options Markets. Principles of Option Pricing. Option Pricing Models. Basic Option Strategies. Advanced Option Strategies. The Structure of Forward and Futures Markets. Principles of Spot Pricing. Principles of Forward and Futures Pricing. Futures Hedging Strategies. Advanced Futures Strategies. Options on Futures. Foreign Currency Derivatives. Swaps and Other Interest Rate Agreements.

IAM 521 Financial Management (3-0)3
An Overview of Financial Management. Financial Statements, Cash Flow, and Taxes. Analysis of Financial Statements. The Financial Environment: Markets, Institutions, and Interest Rates. Risk and Return. Time Value of Money. Bonds and Their Valuation. Stocks and Their Valuation. The Cost of Capital. The Basics of Capital Budgeting. Cash Flow Estimation and Other Topics in Capital Budgeting. Capital Structure Decisions. Distribution to Shareholders: Dividends and Repurchases. Issuing Securities, Refunding, and Other Topics. Lease Financing. Current Asset Management. Mergers, LBOs, Divestitures, and Holding Companies.

IAM 522 Stochastic Calculus for Finance (3-0)3
Discrete time models, Martingales and arbitrage opportunities, complete markets, European options, option pricing, stopping times, the Snell envelope, American options. Continuous time models: Brownian motion, stochastic integral with respect to the Brownian motion, the Itô Calculus, stochastic differential equations, change of probability, representation of martingales; pricing and hedging in the Black-Scholes model, American options in the Black-Scholes model; option pricing and partial differential equations; interest rate models; asset models with jumps.

IAM 524 Financial Economics (3-0)3
Asset pricing, individual investment decisions under uncertainty, the optimal portfolio theory, in both static and dynamic approach, theory of capital market equilibrium and asset valuation equilibrium models of asset markets such as the Arrow-Debreu model of complete markets, the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). Besides mutual fund separation and aggregation theorems are analyzed. Finally, the financial decisions of firms are considered and the Modigliani-Miller theorems are analyzed.

IAM 525 Game Theory (3-0)3
Strategic games, Nash equilibrium, Bayesian Games, Mixed, Correlated, Evolutionary equilibrium, Extensive games with perfect information, Bargaining games, Repeated games, Extensive games with imperfect information, Sequential equilibrium, Coalition games, Core, Stable sets, Bargaining sets, Shapley value, Market games, Cooperation under uncertainty.

IAM 526 Time Series Applied to Finance (3-0)3
Univariate linear stochastic models: ARMA and ARIMA models building and forecasting using these models. Univariate non-linear stochastic models: Stochastic variance models, ARCH processes and other non-linear univariate models. Topics in the multivariate modeling of financial time series. Applications of these techniques to finance such as time series modeling of equity returns, trading day effects and volatility estimations will be discussed.

IAM 527 Advanced Calculus and Integration (4-2)5
Review of linear algebra: matrices and linear systems, determinants, vector spaces and subspaces, orthogonality, linear transformations, eigenvalues and eigenvectors. Review of multivariate calculus: limits, differentiation, chain rule, Taylor's theorem, inverse and implicit function theorems, directional derivatives, Lagrange multipliers. Sequences of series and functions: uniform convergence, continuity, differentiation and integration. Integration: Riemann-Stieltjes, bounded and monotone convergence theorems, change of variables, Fubini theorem. Measure and Lebesgue integration: sigma-algebra, measurable space, measurable functions, integration on measurable spaces.

IAM 528 Markov Decision Processes (3-0)3
Discrete-time Markov chains: Ordinary and strong Markov properties, classification of states, stationary probabilities, limit theorems. Continuous-time Markov chains (a survey). Discrete-time Markovian Decision Processes: Various policies, policy-iteration algorithm, linear programming formulation, value-iteration algorithm. Semi-Markov Decision Processes. Applications to inventory problems, to portfolio optimization and to communication systems.

IAM 529 Applied Nonlinear Dynamics (3-0)3
Basics of discrete dynamical systems: mappings, time series, orbits, fixed points. The theory of flows, vector fields, equilibrium solutions, invariant manifolds, periodic solutions. Poincare-Bendixson theorem, Poincare maps. Stability, Lyapunov functions. Periodic attractors. Quasiperiodic solutions, bifurcations, center manifold reduction; structural stability, chaos.

IAM 530 Elements of Probability and Statistics (3-0)3
Probability spaces, random variables, probability distributions and probability densities, conditional probability, Bayes formula, mathematical expectation, moments. Sampling distributions, decision theory, estimation (theory and applications), hypothesis testing (theory and applications), regression and correlation, analysis of variance, non-parametric tests.

IAM 541 Probability Theory (3-0)3
Probability spaces. Independence. Conditional probability. Product probability spaces. Random variables and their distributions. Distribution functions. Mathematical expectation (Integration with respect to a probability measure.) Lp-spaces. Moments and generating functions. Conditional expectation. Linear estimation. Gaussian vectors. Various convergence concepts. Central Limit Theorem. Laws of large numbers.

IAM 542 Stochastic Processes (3-0)3
This course is a nonmeasure theoretic introduction to stochastic processes, and as such assumes a knowledge of calculus and elementary probability. Some of the theory of stochastic processes is presented and diverse range of its applications is indicated. Outline of Topics: Poisson process, Renewal Theory, discrete-time Markov chains, continuous-time Markov chains, martingales, random walks, Brownian Motion. Applications to queueing and to ruine problems.

IAM 543 Regulation and Supervision of Financial Risks (3-0)3
Rationale for Regulating/Supervising Financial Risks. International Regulatory& Supervisory Framework. Quantitative Techniques and Application (based on Excel/ VBA/ Cyristall Ball). Financial Scandals. Hedge Funds. Project works.

IAM 544 Financial Risk Assessment With Matlab (3-0)3
Introduction to programming in Matlab. Computations of Probability Distributions in Matlab. Distribution Fit. Mixed distributions. Computation of Unconditional and Conditional Probabilities. OLS, MLE, Properties of the estimators. Autocorrelation-Heteroscedasticity-Nonlinearity in time series. Commands for AR-MA-

ARMA-ARIMA-ARCH-GARCH- Multivariate GARCH modeling. Measuring the risk of foreign exchange, equities, derivatives, bonds. Computation of Zero Coupon Bond-Duration-Convexity-Forward Rate-Yield Curve (Interpolation and Function based approaches i.e. Nelson-Siegel). Computation of Portfolio Value at Risk, Covariance VaR, Delta-Normal VaR, Historical Simulation-Filtered Historical Simulation-Bootstrap, Monte Carlo Simulation of Geometric Brownian Motion, CRR, CIR, Vasicek, HJM models.

IAM 546 Actuarial Risk Theory (3-0) 3
Basic concepts of probability in sense of risk theory, Introduction to risk processes (claim number process, claim amount process, total claim number process, total claim amount process, inter-occurrence process), Convolution and mixed type distributions, Risk models (individual and collective risk models), Numerical methods (simple methods for discrete distributions, Edgeworth approximation, Esscher approximation, normal power approximation), Premium calculation principles, Credibility Theory, Retentions and reinsurance, Ruin theory, Ordering of risks.

IAM 547 Risk Management and Insurance (3-0) 3
Definition of risk, insurance and surety. Risk management techniques and some applications in real life problems. Economic and social significance of insurance. Laws of agency, contract, and negligence and their applications to insurance. Types, scope and organization of insurance companies. Construction of policies including limitations on recovery. Underwriting, marketing, rating and regulation of insurance. Covers the principles of risk management, property-liability insurance and life health insurance. Insurance regulations, laws, and insurance practice in Turkey.

IAM 549 Fundamentals of Insurance (3-0) 3
Basic concepts, Insurance related institutions, their relations with insurance companies, connection to market and investment tools, the role of laws, regulations, terms and conditions, parties and partners in insurance sector, types of insurance, pricing, product development, managerial and financial operations in an insurance company, investment strategies, financial management in insurance companies, field trip to insurance companies.

IAM 550 Portfolio Optimization (3-0)3
Mean-Variance (Markowitz) analysis; continuous-time market model in finance; options and exotic options, pricing (valuation) of options; self-financing, optimal strategies, optimal portfolios (problems); martingale method; stochastic control and portfolio optimization.

IAM 552 Credibility Theory (3-0) 3
Risk rating, Bayes premiums, credibility estimators, large claims and credibility, Buhlman-Straub and other relevant models, hierarchical and multidimensional credibility, linear models, linear trend models, evolutionary models.

IAM 554 Interest Rate Models (3-0)3
Interest Rate Derivatives: Futures, Options on Bonds, and Options on Interest Rates such as Caps and Floors. Models of Arbitrage-Free pricing of Interest-Rate Derivatives: Arbitrage Pricing Theory for Derivative Securities. Basics for The Modeling of Interest-Rate movements. Dynamics of Interest-Rate movements. Short-Rate Models and the Heath-Jarrow-Morton Model of Forward Rates. Change of Numéraire Technique. Derivation of Formulae for the Pricing and Hedging of Certain Derivatives. Numerical Methods for the Actual Implementation of the Valuation of Term Structure Models.

IAM 555 Statistical Decision Theory (3-0) 3
Introduction to decision making, expected loss, decision rules and risk, decision principles, utility and loss, prior information and subjective probability, Bayesian analysis, posterior distribution, Bayesian inference, Bayesian Decision theory, minimax analysis, value of information, sequential decision procedures, multi decision problems.

IAM 556 Simulation (3-0)3
Basic introduction to simulation concepts, generation of random variables from distributions, test for randomness, Monte Carlo Simulation, selecting input distribution, discrete event simulation, variance reduction techniques, statistical analysis of output.

IAM 557 Statistical Learning and Simulation (3-0)3
Introduction to statistical learning, simulation and supervised learning. Linear methods of regression and classification. Model assessment and selection. Model inference and averaging. Additive models, trees and related methods. Prototype methods and nearest neighbors. Cluster algorithms and support vector machines. Unsupervised learning.

IAM 558 Reinsurance Theory (3-0) 3
Fundamentals of reinsurance including historical development, terminology and distribution systems. Treaty forms, facultative reinsurance, underwriting, rating, accounting and contract issues, analysis of

annual statement, testing methods, advanced rating methods in property and casualty excess contracts, analysis accumulations, retention, contract wording and programming.

IAM 560 Stochastic Aspects of Dynamics (3-0)3
This course is about densities. In the history of science, the concept of densities emerged only recently as attempts were made to provide unifying descriptions of phenomena that appeared to be statistical in nature. In view of the formal developments of probability and statistics, we have come to associate the appearance of densities with the description of large systems containing inherent elements of uncertainty. The aim of this course is to introduce the students into the theory of Markov operators, ergodic theory, and their applications to study of chaotic dynamical systems.

IAM 561 Introduction to Scientific Computing I (3-0)3
Introduction, Systems of Linear Equations, Iterative Methods, Linear Least Squares, Eigenvalue Problems, Nonlinear Equations, Optimization Coursework and Programming Projects.

IAM 562 Introduction to Scientific Computing II (3-0)3
Interpolation, Numerical Integration and Differentiation, Initial Value Problems for Ordinary Differential Equations, Boundary Value Problems for Ordinary Differential Equations, Partial Differential Equations, Fast Fourier Transform.

IAM 564 Basic Algorithms and Programming (0-4)NC
Basics of programming, introducing MATLAB, programming with MATLAB, basic algorithms and problem solving in Linear Algebra, Differential Equations, Optimization, and so an. Reporting and presenting problems and their solutions, introducing LATEX and/or Scientific Workplace, Typesetting text and mathematical formulae, graphing, making bibliography and index, packages, and defining your own styles.

IAM 566 Numerical Optimization (3-0)3
Unconstrained optimization: line search methods, steepest descent, Newton and quasi Newton methods, the conjugate gradient method constrained optimization: equality and inequality constraints, linear constraints and duality, linear programming, the simplex method, Lagrange multiplier algorithms, interior point methods, penalty methods, large scale optimization.

IAM 567 Mathematical Modeling (3-0)3
Models and cases studies from biology, engineering and mechanics, in form of ordinary and partial differential equations. Geometric and discrete models. Elements of inverse problems (image and data processing). Stochastic models in finance. Coursework and computer lab with MATLAB

IAM 572 Finite Element Methods for Partial Differential Equations: Theory and Applications (3-0)3
FEM for one dimensional problems. Variational formulation and weak solutions. FEM for elliptic equations. FEM spaces. Error analysis and adaptivity. Diffusion-convection equations. Time dependent problems. Iterative solution techniques and preconditioning.

IAM 573 System Parameter Estimation and its Applications (3-0)3
Estimation theory, various estimation problems, modeling of deterministic systems, modeling of stochastic processes, linear estimators, nonlinear estimation, system identification, maximum likelihood and least squares estimation, denoising, impulse analysis of systems, density estimation.

IAM 582 Life Insurance Mathematics (3-0)3
The theory of compound interest: Effective and nominal interest rates, present values, annuities. Survival distributions and life tables. Life Insurance: Level benefit insurance, endowments, varying level benefit insurance. Life annuities. Benefit premiums. Benefit reserves, multiple decrement models.

IAM 583 Pension Fund Mathematics (3-0)3
Risk theory analysis of pension funds. Valuation of pension plans. Terminal funding. Actuarial cost methods for retired and for active and retired lives pension funding. Defined Benefit; defined contribution plains, Amortization.
Prerequisite: IAM 582.

IAM 584 Advanced Actuarial Mathematics (3-0)3
Insurance models including expenses. Special annuities and insurance. Advanced multiple life theory. Population theory. Interest as a random Variable, Reserves, IBNR, Loss Models, credibility models.
Prerequisite: IAM 546.

IAM 585 Decision-Making under Uncertainty (3-0)3
Basic methods based on probability. Distorted probabilities. Decision and utility theories, state

dependent utilities, risk taking agent types. Techniques for bounding the effects of missing information or the effects of incorrect information. Trading time and space resources with certainty. Fusing uncertain information of different kinds. Real-time inference algorithms.

IAM 589 Term Project (0-2) NC
M.S. students working on a common area choose a research topic to study and present to a group under the guidance of a faculty member.

IAM 590 Graduate Seminar (0-2) NC
This course is designed to provide students with a chance to prepare and present a professional seminar on subjects of their own choice.

IAM 600 Ph.D. Thesis NC
Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write up of thesis is in progress.

IAM 601 Elliptic Curves (3-0)3
The Geometry of Elliptic Curves: Weirstrass equations, The group law, j-invariants, Isogenies, The dual isogeny, The Tate module, The Weil pairing. The Formal Group of an Elliptic Curve: Expansion around 0, Formal groups, Groups associated to formal groups, The invariant differential, The formal logarithm, Formal Groups over discrete valuation rings. Elliptic Curves over Finite Fields: Number of rational points, The Weil conjectures, The Endomorphism rings, Calculating Hasse invariant.

IAM 602 Algebraic Geometric Codes (3-0)3
AG-Codes: Constructions and properties, Duality and spectra, Codes of small genera, Elliptic codes, Other families of AG-Codes, Decoding: Basic algorithm, modified algorithm, Asymptotic results: Basic AG-bounds, Expurgation bound. Constructive bounds, Other bounds.

IAM 603 Computational Number Theory (3-0)3
The aim of computational number theory is the design, implementation and analysis of algorithms for solving problems in number theory. This includes efficient algorithms for computing fundamental invariants in algebraic number fields and algebraic function fields, as well as deterministic and probabilistic algorithms for solving the discrete logarithm problem in any structure. Computational methods in quadratic fields.

IAM 612 Financial Modeling with Jump Processes (3-0)3
Lévy processes. Building Lévy processes. Multidimensional models with jumps. Simulation of Lévy processes. Modeling time series with Lévy processes. Option pricing with jumps: Stochastic calculus for jump processes, measure transformations for Lévy processes, pricing and hedging in incomplete markets, risk-neutral modeling with exponential Lévy processes. Integro-differential equations and numerical methods. Inverse problems and model calibration.

IAM 613 Finance and Stochastics In Insurance (3-0)3
Risk in insurance systems. Short, medium and long term financial structures of insurance funds. Modeling and valuation of insurance plans. Contribution and benefit schemes for insurance and reinsurance. Economic dynamics, financial markets and assets management for insurance systems. Multiple decrements, actuarial balance and fair premiums.

IAM 614 Methods of Computational Finance (3-0)3
Numerical Methods for Discrete Time Models: binomial method for options; discrete time optimal control problems. Reminders on Continuous Models: Ito process and its applications in stock market, Black-Scholes equation and its solution; Hedging, Volatility smile. Monte Carlo Method for Options: generating random numbers, transformation of random variables and generating normal variates; Monte Carlo integration; pricing by Monte Carlo integration; variance reduction techniques, quasi-random numbers and quasi-Monte Carlo method. Finite Difference Methods for Options: explicit and implicit finite difference schemes, Crank-Nicolson method; Free-Boundary Problems for American options. Finite Difference Methods for Control Problems: Markov Chain approximation method, elliptic Hamiltion-Jacobi-Bellman equations, computational methods.

IAM 615 Advanced Stochastic Calculus for Finance (3-0)3
Financial modelling beyond Black-Scholes Model. Stochastic processes. Building Lévy processes. Option pricing with stochastic processes: Stochastic calculus for semimartingales, change of measure, exponential Lévy processes, stochastic volatility models, pricing with stochastic volatility models. Hedging in incomplete markets, risk-neutral modeling. Integro-partial differential equations.

Further topics in numerical solutions, simulation and calibration of stochastic processes.

IAM 664 Inverse Problems (3-0)3
Classification of inverse problems, linear regression, discretizing continuous inverse problems, rank-deficiency, Tikhonov regularization, iterative methods, other regularization techniques, Fourier techniques, nonlinear inverse problems, Bayesian methods.

IAM 665 Advanced Continuous Optimization (3-0)3
Globalization techniques, semidefinite and conic optimization, derivative free optimization, semi-infinite optimization methods, Newton Krylov methods, nonlinear parameter estimation and advanced spline regression, multi-objective optimization, nonsmooth optimization, optimization in support vector machines.

IAM 70X Special Topics in Cryptography (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to the interest of students and instructor in charge.

IAM 72X Special Topics in Scientific Computing (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to the interest of students and instructor in charge.

IAM 74X Special Topics in Financial Mathematics (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge.

IAM 76X Special Topics in Actuarial Science (3-0)3
Courses not listed in catalogue. Contents vary from year to year according to interest of students and instructor in charge.

IAM 8XX Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her advisor.

IAM 9XX Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

METU NORTHERN CYPRUS CAMPUS

CAMPUS EXECUTIVE BOARD

TÜMER Turgut, ***(Department Chair of the Board)*;** B.S., METU; M.S., Ph.D., University of Manchester-UMIST

ALPAS Hami (**Member –** ***Acting Secretary General of METU***); B.S., M.S., Ph.D., METU

AYVAŞIK Belgin, **(Member -** ***Assistant to the President of METU);*** B.S., Hacettepe University; M.S., University of Michigan; Ph.D., University of Mississippi

DEĞĞİN Sevgi (**Member –** ***Undersecretary of Ministry of Education, TRNC***); B.S., Teacher Training Academy, M.S., Near East University

ERÇELEBİ Çiğdem, **(Member -** ***Vice President of METU)*;** B.S., M.S., Ph.D., METU

KAVAZ Hüseyin, **(Member -** ***Director of Higher Educational and Foreign Affairs Department of Ministry of Education, TRNC)*;** B.S., Gazi University

ÖZGÜVEN Nevzat, **(Member -** ***Vice President of METU)*;** B.S., M.S., METU; Ph.D., University of Manchester-UMIST

CAMPUS ADMINISTRATION

President of the Campus: TÜMER S. Turgut, Prof. Dr., B.S., METU; M.S., Ph.D., University of Manchester-UMIST (*From METU-Ankara*)

Vice President of the Campus: TAYMAZ Erol, Prof. Dr., B.S., M.S., METU; Ph.D., Case Western Reserve University (*From METU-Ankara*)

Vice President of the Campus: MEHMETOĞLU M. Tanju, Prof. Dr., B.S., METU; M.S., University of Manchester; Ph.D., McGill University (*From METU-Ankara*)

Vice President of the Campus: YILDIRIM Ali, Prof. Dr., B.A., Ankara University; M.A, M.Ed., Ed.D, Columbia University (*From METU-Ankara*)

Head of Academic Board of Engineering and Natural Sciences: GÜRKAN Türker, Prof. Dr., B.S., M.S., METU; Ph.D., University of Missouri (*From METU-Ankara*)

Head of Academic Board of Social Sciences: BOZTEMUR Recep, Prof. Dr., B.A., Ankara University; M.A., METU; Ph.D., University of Utah (*From METU-Ankara*)

Assistant to the President: KİŞİSEL Ali Ulaş Özgür, Assoc. Prof. Dr., B.S., METU; Ph.D., University of California, Los Angeles

Assistant to the President: SHIKAKHWA Mohammad, Assoc. Prof. Dr., B.S., University of Jordan; M.S., Ph.D., METU

Director of School of Foreign Languages: IŞIK TAŞ Eda, B.A., M.A., Ph.D., METU

Secretary General of the Campus: KÜPELİ Levent, B.S., Gazi University

ADMINISTRATIVE OFFICERS

Ecevit MERT	:	Director of Administrative Affairs
Mustafa Ozan UÇAR	:	Director of Construction and Technical Services
Servet Sadık HIRKA	:	Director of Financial Affairs
Dr. Sıdıka KAYIMBAŞIOĞLU	:	Director of Health Center
Aysel Arifoğlu GÜNSEL	:	Director of Human Resources
Doruk NEZİR	:	Director of Information and Communication Technologies
Habibe MUHTAROĞLU	:	Director of Institutional Relations and Communication
Zuhal TOPALOĞLU	:	Director of Library and Documentation

Ebru Yeltekin ERAS	:	Director of Procurement and Movable Property Office
Nazile KÜPELİ	:	Director of Social and Cultural Affairs
Metin GEZGİN	:	Acting Director of Sports and Recreation
Dr. Özcan KASAL	:	Director of Student Affairs
Dr. Eda Sun SELIŞIK	:	Director of Student Development and Counseling Center

GENERAL INFORMATION

Middle East Technical University Northern Cyprus Campus (METU NCC) was established as a result of an invitation conveyed to METU in the year 2000 by the Governments of Republic of Turkey and Turkish Republic of Northern Cyprus (TRNC), with the mission of carrying METU's educational standards to Northern Cyprus. It is a major higher education project financed by the Republic of Turkey and serves not only the Turkish students but also the international community. METU Northern Cyprus Campus is built on an area of 339 hectares (137 acres), approximately 50 km west of Lefkoşa (Nicosia) and 6 km north of Güzelyurt (Morphou) a town with a population of 19,000. The campus with modern education buildings, laboratories, student dormitories, staff housing and wide range of social, cultural and sports facilities and recreational areas has been completed to accomodate around 3000 students.

METU NCC started admitting students to undergraduate programs in Ankara Campus in 2003-2004, and has been carrying out education and research activities since the 2005-2006 academic year in the campus facilities established in Güzelyurt, TRNC. METU NCC commenced the 2013 – 2014 academic year with 15 undergraduate and 3 graduate programs in engineering and social sciences.

METU NCC is attached to the main campus in Ankara in all academic and administrative affairs. All degree programs of METU NCC are approved by the METU Senate, and provide the same quality standards of the main campus in Ankara. The METU NCC academic staff are recruited and promoted in accordance with the criteria set forth by METU Senate and Administrative Board.

METU NORTHERN CYPRUS CAMPUS
SCHOOL OF FOREIGN LANGUAGES

Academic Staff
(2013-2014 Academic Year)

Full-Time Academic Staff

ACAR Ülgen, B.A., Hacettepe University
AKGÜNAY Zeynep, B.S., METU
ARSLAN Gökçe, B.A., METU
AYDIN Ejber, B.A., Eastern Mediterranean University
BAŞER Pınar, B.A., İstanbul University; M.A. (in progress), METU NCC
ÇALIŞKAN SELVİ Bengü, B.A., METU; M.Ed., University of Maryland
ÇERKEZ Tanyel, B.A. Eastern Mediterranean University
ÇINAR SHIKAKHWA Meral, B.A., METU NCC
DEĞİRMENCİOĞLU Meryem, B.A., M.B.A, Stirling University
DRURY Dorinda Jane, R.S.A. Diploma TEFLA, Beet Language Center Bournemouth, R.S.A. Certificate TEFLA, ITTC Bournemouth
DUMRUL TÜM, Eda, B.A., METU
DURHAN Ömer Seyfi, B.A., M.A., Hacettepe University
DURMAZ Mehmet, B.A., METU; M.A. (in progress) METU NCC
DURMAZ GÜRAN Semra, B.A., METU; M.A. Bilkent University
GÖK Gökçen, B.A., Yıldız Technical University; M.A. (in progress), METU NCC
GÖREN Zehra, B.A., M.A., İstanbul University
GÜLBİÇEN Birsen Gizem, B.A., METU; M.A. (in progress) Çağ University
GÜNDÜZ Şeyda, B.A., Hacettepe University; M.A., European University of Lefke
GÜR Demet, B.A., Hacettepe University; M.A., European University of Lefke
GÜRESUN İlker, ***Coordinator of Basic English;*** B.A., METU
GÜZEL Erhan; B.A., Hacettepe University; M.A., European University of Lefke
IŞIK TAŞ Eda, ***Director of School of Foreign Languages***; B.A., M.A., Ph.D., METU
KAÇA Engin, B.A., Hacettepe University; M.A. (in progress) METU NCC
KARAAĞAÇ Gül, B.A., METU; M.A. (in progress) METU NCC
KARAFİSTAN Burak, B.A. Eastern Mediterranean University; M.A., University of Essex
KARAKUŞ Köksal, B.S., Boğaziçi University; M.S., Michigan State University
KARANFİL SİLMAN Leyla, B.A., Hacettepe University; M.A., Gazi University; Ph.D., (in progress) University of Sheffield
KARANFİL Talip, B.A., Hacettepe University; M.A., European University of Lefke
KAYA Tuğba Billur, B.A., METU NCC, M.A. (in progress) METU
KEECH Melek, B.A., Uludağ University; M.A. (in progress) European University of Lefke
KILINÇARSLAN Nuran, B.A., Atatürk University; MATEFL, Bilkent University
KNOX Robert, B.A., Center College; M.A. (in progress) University of Reading
KOCAMAN Ceren, B.A. Hacettepe University
KOCATÜRK Cennet, B.A., METU; M.A., European University of Lefke
KORKMAZ Filiz, B.A., METU
LAREDO VALERO Raquel, *Spanish*, B.A. Universidad Complutense de Madrid.
MİRİLLO Hüran, B.A., Hacettepe University; M.Ed., University of Manchester
NEUFELD Steve, B.Ed., University of Saskatchewan; M.S., University of Leicester
ÖCAL DURHAN Nükte B.A., Hacettepe University; M.A., Bilkent University
ÖNAL Burçin B.A., METU; M.A. (in progress) METU NCC
ÖZBARÇIN Algı, B.A., Eastern Mediterranean University; M.A., Oxford University

ÖZBAY Esra, B.A., Hacettepe University; M.A. (in progress) METU NCC
ÖZMENEK Seyhan, B.A., Marmara University; M.A., Yeditepe University; Ph.D., (in progress) Boğaziçi University
ÖZYAVRU ULUÇAY Çiğdem, B.A., METU NCC; M.A. (in progress) METU NCC
PERSONN Jan, B.A., Eastern Mediterranean University; M.A. (in progress) METU NCC
ŞAHİN Belgin, B.A., METU
ŞENOL Burçin, B.A., M.A, Eastern Mediterranean University
TANKUT Pınar, B.A., METU; M.A., Monterey Institute of International Studies
TARHAN Hakkı Nüvit, ***Coordinator of Modern Languages Program;*** B.A., Hacettepe University; M.A., Bilkent University
TOPUZ SEZEN Ezgi, B.A., Hacettepe University; M.A., European University of Lefke
TURA, Cansu, B.A., Hacettepe University
TÜM Danyal Öztaş, B.A., Eastern Mediterranean University; M.A., University of Texas at Austin; Ph.D., University of London
ÜNLÜSOY Mehmet, *German;* B.A., M.A., Ph.D., İstanbul University
YILMAZ Songül, B.A., METU NCC
YÜKSEK Süleyman Sercan, B.A. Çağ University; M.A., Çağ University

Part-Time Academic Staff

EKİCİ Şeray, *French*; B.A., Dokuz Eylül University; M.A., Blaise Pascal University

DESCRIPTION OF COURSES

ENGL 011 Beginner's Level
The initial 270 hours of this 480 hour course is designed to equip students with the basic language and vocabulary required to practice academic skills. Practice in listening, speaking, reading and writing is provided for language reinforcement purposes. The remaining contact hours are dedicated to introducing students to reading, listening, writing and speaking for academic purposes.

ENGL 012 Pre-Intermediate Level
This second-semester 480-hour course, which is designed as the continuation of the 011 course, aims to bring students to a level that will enable them to fulfill the requirements of their first-year courses. The focus is on practicing academic skills, namely reading, listening, writing and speaking, to complete a given task. Further language and vocabulary reinforcement is provided through exposure to academic texts, both written and spoken.

ENGL 021 Elementary Level
This 320-hour course is designed so as to provide students with 100 hours of initial language and vocabulary input during which practice in listening, speaking, reading and writing is provided for language reinforcement purposes. This initial stage is followed by practice in reading, listening, writing and speaking for academic purposes.

ENGL 022 Intermediate Level
This 320-hour second-semester course is a follow-up to the 021 course. The aim is to provide students with further language practice through exposure to upper-intermediate-level spoken and written texts. The course is designed to include ample opportunity for the students to further practice the academic skills that they will need in order to fulfill the requirements of their first-year courses.

ENGL 031 Intermediate Level
In this 320-hour course, the students are introduced to the academic skills required in their first-year courses. These skills include reading for academic purposes, listening and note-taking, writing short texts based on information from their readings and listening input as well as speaking. While practicing these skills, students are also provided with the opportunity to expand their knowledge of language use and vocabulary.

ENGL 032 Upper-Intermediate Level
This 320-hour course, which is the continuation of the 031 course, aims at bringing the students to a proficiency level required by their departments. The primary objective of this course is to enable students to purposefully use language through skills integration. Language and vocabulary are treated as a vehicle to extract meaning and facilitate task completion.

ENGL 041 Upper-Intermediate Level
This 320-hour course is designed to cater for the needs of upper-intermediate level students whose proficiency level is only slightly below the level required by the University. The aim of this course is to provide students with meaningful language practice through the use of tasks which require them to put into practice the academic skills that they will need to use during their freshman year

ENGL 042 English Towards Proficiency
This 320-hour course aims to provide students who have have obtained a score of 49.5-59 in METU English Proficiency Exam (EPE) with further input and practice in language skills. While the course content is mostly based on course books, ample practice aimed at EPE type tasks is given during the latter stages of the course.

ENGL 101 Development of Reading and Writing Skills I (4-0)4
The course reinforces academic reading skills (finding the main idea, skimming, scanning, inferring information, guessing vocabulary from context, etc.) through reading selections on a variety of topics. It also aims at developing critical thinking, which enables students to respond to the ideas in a well-organized written format. Other reading related writing skills such as paraphrasing and summarizing are also dealt with in this course.

ENGL 102 Development of Reading and Writing Skills II (4-0)4
The course reinforces academic writing skills. In this course students write different types of essays based on the ideas they are exposed to in the reading selections. The emphasis is on the writing process in which students go through many stages from brainstorming and outlining to producing a complete documented piece of writing.*Prerequisite: ENGL101*

ENGL 211 Academic Oral Presentation Skills (3-0)3
The course aims at developing oral presentation skills. To this end, students are engaged in classroom discussions following advanced reading texts on a variety of topics. In this course students study effective presentation techniques, do extensive reading and carry out research to give presentations of different functions with mature content and topical vocabulary.
Prerequisites: ENGL101, and ENGL102.

ENGL 311 Advanced Communication Skills (3-0)3
This is a course designed to develop communication skills in a business context. The course is divided into two parts, namely job-seeking skills (CV and application letter writing, interview skills, etc.) and on-the-job skills. Emphasis is given to accuracy, fluency and effectiveness of students in certain business tasks such as socializing, telephoning, presenting information, and holding meetings.
Prerequisites: ENGL101, ENGL102, and ENGL211.

FRENCH

FRN 201 Beginning French I (4-0)4
French 201 is a class for students with no experience in the language. Basic conversation, reading, listening and writing skills are taught at the 201 level. Students learn regular verbs ending in "er" and some irregular verbs: to be, to have, to do, to go, etc. Present tenses, basic negations, questions, adjectives, pronouns usage are also part of the 201 core. Main conversation topics include: introducing oneself, talking about food, clothes, family, telling time, and different actions in the present tenses.
Prerequisites: ENGL101,ENGL102 and consent of the instructor.

FRN 202 Beginning French II (4-0)4
French 202 is a continuation of FRN 201. Students who desire to enter the 202 level without taking 201 should acquire the textbook used in the 201 level and review the chapters covered in that class. More of the basic conversation, reading, listening and writing skills are taught at the 202 level. Students learn more regular and irregular verbs. Future, subjunctive and more past tenses are introduced as well as grammar items such as question formation and pronoun usage. Main conversation topics include: talking about memories, hobbies, future plans and cultural aspects of the French speaking world.
Prerequisite: ENGL101,ENGL102, FRN 201 and consent of the instructor.

FRN 203 Intermediate French I (4-0)4
French 203 is foremost a review of some of the basic grammar items covered in previous courses with an emphasis on exceptions to rules and new vocabulary items to improve conversation skills. Conversation, reading and writing skills are taught in order for students to improve their knowledge and usage of the language. French 203 reviews and improves usage of regular verbs (like "parler" "finir" "repondre") and some of the irregular verbs (using all the tenses).
Prerequisites: ENGL101,ENGL102, FRN 202 and consent of the instructor.

FRN 204 Intermediate French II (4-0)4
French 204 is a continuation of FRN 203. Students need to understand that entering a 204 level requires a good understanding of spoken French as well as the ability to write and express oneself in the language. Students entering this specific level will join a group of their peers who have used and reviewed the language at the 203 level with exercises in conversation, reading, listening and writing skills. French 204 reviews and improves the use of subjunctive, conditional and future tenses. Complex sentences, questions and prepositions use are also part of the curriculum.
Prerequisites: ENGL101,ENGL102, FRN 203 and consent of the instructor.

GERMAN

GRM 201 Basic German I (4-0)4
German 101 begins with an introduction to basic vocabulary, from numbers and greetings through foods and furniture to travel topics. Class time is used to practice speaking and listening skills, where you can expect to respond to questions, do numerous pair exercises and participate in role playing. Students learn about the gender of nouns and pronouns, the nominative, accusative and dative cases and the use of prepositions. Regular and irregular verbs in both the present and present perfect tenses are taught as well as modal auxiliary verbs. Among others, the basic functions of asking and giving personal information, making a purchase, ordering in a restaurant, and giving directions are stressed in written homework as well as in oral work in class. The reading assignments and supplements to the book provide interesting cultural information about the German-speaking countries.
Prerequisites: ENGL101,ENGL102 and consent of the instructor.

GRM 202 Basic German II (4-0)4
German 202 reviews the students' basic knowledge of the nominative, accusative and dative cases and introduces the genitive. Students will be taught how to tell stories in the simple past tense, use attributive adjectives, make comparisons, use the future tense, form sentences in passive voice, and to use the subjunctive to indicate conjecture. Discussion topics include sports and leisure, overnight lodging, entertainment, the German school system, fairy tales and German history. Written practice comes mainly in the form of homework, and time in class concentrates on practicing speaking and listening.*Prerequisites: ENGL101,ENGL102, GRM 201 and consent of the instructor.*

GRM 203 Intermediate German I (4-0)4
This first level of the intermediate sequence reviews the basic skills which students acquired in their elementary language study and expands upon them. Although a thorough review of all grammar is given, special attention is paid to the following difficult areas of grammar: adjective endings, past tenses, relative pronouns. The exercises are designed to increase your ability to read, write, speak and understand German. You will be given a selection of authentic reading assignments which are appropriate for your level, and which deal with topics of German-speaking culture and life in Europe. Role play, pair work and writing assignments ask for your personal, creative reaction to the readings. Real life situations such as dialogues in restaurants and at the train station are imitated in classroom pair work. All class discussions, readings and written assignments are in German, but do not require an advanced level of language ability.
Prerequisites: ENGL101,ENGL102, GRM 202 and consent of the instructor.

GRM 204 Intermediate German II (4-0)4
German 204 is a continuation of the intermediate level and builds upon the skills practiced in 203 including further work on passive voice, subjunctive and relative pronouns. GER 203 is the prerequisite for advanced level German language classes. Classroom discussions and written assignments center on authentic short literary and cultural texts and one novella of moderate length. The course is taught in German. Class work provides listening and speaking practice while homework affords the chance to sharpen writing skills.
Prerequisites: ENGL101,ENGL102, GRM 203 and consent of the instructor.

SPANISH

SPN 201 Beginning Spanish I (4-0)4
This course is designed for students with no previous knowledge of Spanish. Students will learn basic grammar in an oral/aural context in each class. Students of Spanish 201 are expected to develop the four language skills of speaking, listening, basic reading and writing as well as an appreciation of Hispanic culture. Students will be exposed to native speakers of Spanish in an interactive CD ROM and videos on Spain.
Prerequisites: ENGL101,ENGL102and consent of the instructor.

SPN 202 Basic Spanish II (4-0)4
Students of Spanish 202 are expected to enhance the four language skills of speaking listening, reading, and writing. This class will introduce the past

tenses, compound tenses, prepositions, and basic conversational skills. Speaking the language is greatly stressed at this level. Students will be exposed to native speakers of Spanish in an interactive CD ROM and videos on Spain. Moreover, they will improve their writing skills.
Prerequisites: ENGL101,ENGL102, SPN 201 and consent of the instructor.

SPN 203 Intermediate Spanish I (4-0)4
One purpose of this class is to review what the student already learned and to expand on her/his first year of Spanish. Students will learn how to use three different past tenses, future tense, and imperatives. All skills (reading, writing, listening, and speaking), as well as the three basic fields (grammar, literature, and culture) will be emphasized during the course.*Prerequisites: ENGL101,ENGL102, SPN 202 and consent of the instructor.*

SPN 204 Intermediate Spanish II (4-0)4
This course is a continuation and completion of the intermediate level: an expansion of Spanish language skills developed with exercises in conversation, oral comprehension, composition based on cultural and literary readings.
Prerequisites: ENGL101,ENGL102, SPN 203 and consent of the instructor.

NORTHERN CYPRUS CAMPUS
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(2013-2014 Academic Year)

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NORTHERN CYPRUS CAMPUS
BUSINESS ADMINISTRATION PROGRAM

GENERAL INFORMATION: The program prepares its students to careers in management by giving them a very wide ranging education. The curriculum has been designed to ensure that students are provided solid foundations in all of the functional areas of Business Administration, as well as, the basics of other economic and administrative sciences. Furthermore, a large number of electives allow students to deepen their knowledge in a number of areas that they choose. As a result, graduates of this program will be well equipped to tackle a wide range of issues they will encounter in their future as successful managers.

CAREER OPPORTUNITIES: Graduates of this program will be excellent candidates to work as managers with a strong background in business administration and solid foundations in all economic and administrative sciences. This will give them a broad vision and strengthen their ability to understand the rapidly changing world around them. They will be prime candidates for upwardly-mobile management positions in companies.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

BUS	111	Fundamentals of Business	(3-0)3
ECO	101	Microeconomics	(4-0)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
GPC	100	First Year on Campus Seminar	(0-2)1
MAT	119[a]	Calculus with Analytic Geometry	(4-2)5
PSIR	101	Intro. to Sociol. and Politics	(3-0)3
TUR	101[b]	Turkish I	(2-0)NC

Second Semester

BUS	142	Financial Accounting	(3-0)3
BUS	152	Statistics for Social Sciences	(3-0)3
CNG	100	Introduction to Information Technologies and Appl.	(2-0)NC
ECO	102	Macroeconomics	(4-0)4
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
PSIR	108	Introduction to Global Politics	(3-0)3
TUR	102[b]	Turkish II	(2-0)NC

SECOND YEAR

Third Semester

BUS	221	Org. Beh. and Soc. Psychol.	(3-0)3
BUS	271	Principles of Marketing	(3-0)3
BUS	281	Principles of Finance	(3-0)3
PSIR	237	Principles of Law	(3-0)3
XXX	xxx	Elective	(-)3
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC

Fourth Semester

BUS	222	Organization Theory	(3-0)3
BUS	232	Info. Sys. and Prog.	(3-0)3
BUS	242	Managerial Accounting	(3-0)3
ENGL	211	Acad. Oral Pres. Skills	(3-0)3
XXX	xxx	Elective	(-)3
HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester

BUS	321	Human Resource Manag.	(3-0)3
BUS	361	Operations Management	(3-0)3
ENGL	311	Advan. Communic. Skills	(3-0)3
XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3

Sixth Semester

BUS	312	Business Law	(3-0)3
BUS	352	Management Science	(3-0)3
XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3

FOURTH YEAR

Seventh Semester				Eighth Semester			
BUS	431	Information Systems	(3-0)3	BUS	400	Graduation Project	(0-6)3
XXX	xxx	Elective	(-)3	BUS	412	Strategic Processes and Management	(3-0)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3

[a] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119

[b] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[c] International students will take HST 205 and HST 206 instead of HST 201 and HST 202.

ELECTIVE COURSES

The curriculum has 14 elective courses, seven of which should be taken from the BUS program. At most three "free electives" can be taken. The remaining courses can be BUS (elective), ECO, PSIR courses (2nd year or higher level with at least 3 credits).

The list below shows *some* of the Business courses that may be offered as electives.

- BUS 362 Quality Management
- BUS 381 Financial Institutions and Markets
- BUS 413 Leadership Theory and Application
- BUS 415 Business Ethics
- BUS 416 Organization, Work and Society
- BUS 418 Project Management
- BUS 421 Organizational Influence Processes
- BUS 424 Current Issues of Industrial Relations
- BUS 427 Cases in HR Appraisal and Management
- BUS 436 Cases in Quality Management
- BUS 451 Business Forecasting
- BUS 457 Decision Analysis: Tools and Methods
- BUS 461 Supply Chain Management
- BUS 463 Production Planning and Control
- BUS 466 Services Management
- BUS 471 Marketing Research
- BUS 472 Principles of Advertising
- BUS 473 International Marketing
- BUS 474 Consumer Behavior
- BUS 476 Retailing
- BUS 480 Analysis of Financial Statements
- BUS 484 Investment Management
- BUS 486 Industrial Organization

The list below shows *some* of the non-Business courses that BUS students can take as electives:

- PSIR 203 History of Political Thought
- PSIR 202 Constitutional Law
- ECO 201 Intermediate Microeconomics
- ECO 202 Intermediate Macroeconomics
- ECO 301 Introduction to Econometrics
- ECO 455 Turkish Economic History
- ECO 466 Economics of Growth
- ECO 211 Economic History
- ECO 212 History of Econ. Thought
- PSIR 361 Turkish Politics and Political Structure
- PSIR 345 Turkish Foreign Policy
- ECO 303 International Trade Theory and Policy
- ECO 306 Monetary Theory and Policy

DESCRIPTION OF COURSES

BUS 111 Fundamentals of Business (3-0)3
Basic concepts and principles of Management; the functions of planning, organizing, staffing, directing and controling, and their relationships to key issues in Management practice such as leadership, motivation, and communication.

BUS 142 Financial Accounting (3-0)3
This course will provide students with a solid foundation for becoming a manager by giving them a fundamental understanding of accounting theory and practice both internationally and in Turkey. Students will be provided with the basic tools they require from the field of Financial Accounting.

BUS 152 Statistics for Social Sciences (3-0)3
This course covers basic statistical concepts and methods useful in decision making in the business environment. Emphasis on descriptive and inferential tools used in converting raw data into useful information. Use of statistical computer packages and interpretation of statistical results. Topics include descriptive statistics, discrete and continuous probability distributions, sampling distributions, estimation**,** hypothesis testing, analysis of variance, simple linear regression, multiple regression, multiple regression model building, and time series analysis.

BUS 221 Organizational Behavior and Social Psychology (3-0)3
The human element is a fundamental component of management. This course introduces students to the fundamental concepts and research in social psychology and human behavior. Particular attention is given to human behavior in large and complex organizations and the impact of organizations on human interrelationships. The course thus focuses on how social factors influence individual behavior. Topics include basic research methods, causes and effects of biases, attribution, happiness, depression, individualism, collectivism, conformity, gender, corruption, communitarianism, persuasion, groups and productivity, diversity and prejudice, conflict. Skills and strategies in organizational development and change, such as leadership, influence and control systems, group dynamics, and personal/organizational goals. The implications for managers in these areas are a major focus for this course.

BUS 222 Organization Theory (3-0)3
Introductory survey and analysis of major theories dealing with organizational characteristics and processes. The relationship between theories and supporting empirical evidence. Current issues in organization theory, decision-making, the organizational environment, and the changing nature of organization in contemporary society.

BUS 232 Information Systems and Programming (3-0)3
Advanced features of word processors, spreadsheets, and data base management systems. Internet applications. Web page design with html tags. Introduction to algorithms and structured programming. Structure and basic elements of a programming language: Character set, identifiers, data types and declarations, constants, and expressions. Selection and looping. Modular programming: Functions and procedures. Text files. One-dimensional arrays.

BUS 242 Managerial Accounting (3-0)3
Introduction to managerial accounting. Accounting as an informational system to provide managers with the basis for decision-making. Includes basic CVP analysis, job and process costing, standard costing and variance analysis, as well as specific situational decision-making matrices.
Prerequisite: BUS 142.

BUS 252 Applied Business Techniques (3-0)3
Use of intermediate statistical techniques in business and economic problem solving (ie cost estimation, forecasting, survey analysıs). Includes non-parametric tests, analysis of data across different groups, regression model buildıng and estimation (including non-linear forms and moderating and mediatıng effects), time series forecasting and index numbers.
Prerequisite: BUS 152.

BUS 271 Principles of Marketing (3-0)3
Introduction to the nature of marketing; development of marketing over time; consumer behavior; market segmentation; product development and policies; pricing methods and practices; distribution, marketing communications; marketing research; international marketing; contemporary issues in marketing.

BUS 281 Principles of Finance (3-0)3
This course addresses the theory and practice of financial management--the generation and allocation of financial resources. It provides students with grounding in the basic concepts of finance, including the time value of money, the role

of financial markets, asset valuation, capital budgeting decisions, portfolio theory, asset pricing, and the risk-return tradeoff.
Prerequisite: BUS 142.

BUS 312 Business Law (3-0)3
Introductory course on the legal environment of business. The course covers such subjects as: merchants, their rights and obligations; contract agency; legal forms of business; negotiable instruments; insurance law; maritime law.

BUS 321 Human Resource Management (3-0)3
The Management of human resources in complex organizations. Personnel recruitment and selection; increasing employee effectiveness; employee and Management development; performance evaluation; motivation communication; employee morale; labor Management relations; grievance and disciplinary actions; incentives and security.
Prerequisite: BUS 221.

BUS 352 Management Science (3-0)3
Covers the most commonly used models/methods of Operations Research/Management Science; emphasizes on business applications rather than a mastery of the solution algorithms. Linear and dynamic programming, inventory and queuing models, simulation modeling and applications are studied.
Prerequisite: BUS 152.

BUS 361 Operations Management (3-0)3
Introduction to Managerial problems in production and operations; design, planning and control of production and service systems. Topics covered; Demand Management, Product Design, Process Selection, Job Design and Work Measurement, Capacity Planning, Facility Layout/Location Problems, Aggregate/Master Production Scheduling, Inventory Management, Operations Scheduling, MRP II, JIT and TOC.
Prerequisite: BUS 152.

BUS 362 Quality Management (3-0)3
Provides a comprehensıve coverage of qualıty management as an important business enabler. Quality theory and global supply chain quality and İnternational Quality Standards. Design of quality and quality services, quality assurance. Tools of quality, statistically based quality improvement, six sigma quality management and tools. Managing learning for quality improvement.
Prerequısite: BUS 152.

BUS 381 Financial Institutions and Markets (3-0)3
The course does not aim to make experts of the students in the field of high finance but it does aspire to build with them a firm grasp of the basic financial principles that guide financial decisions and financial markets operations. Financial intermediation will be explained and substantiated along with operations, functions and participants of the markets. The evolution of the markets will be explained along with the pricing methods of money markets and capital markets. This overview will be extended to include international markets as well. The course will move also to the actual instruments the markets use and how these can be optimally used by the players. Principles of money management will be explained as well as industry-relevant portfolio management techniques. The advent of EU institutions and the introduction of the Euro will be examined and explained in terms of the above.
Prerequisite: BUS 281.

BUS 391 Innovation Management (3-0)3
This course is intermediate and advanced study of innovation management, focusing on radical innovation, which is a critical aspect of firm management in the global era. It will address the question of how firms survive in the era of globalization. In recent years, major multinational firms found themselves met with competition from small and medium start-ups that challenged giant firms with quick and radical innovation strategies. The radical innovation strategies were successful in the market place, as traditional innovation strategies of incremental changes couldn't survive new market challenges from new firms. This course provides students with existing and new theories of radical innovation through various case studies. Students are required to complete both take home and in class assignments, as well as developing their own cases.

BUS 400 Graduation Project (0-6)3
Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue that the students will identify. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

BUS 401 Fundamentals of Entrpreneurship (3-0)3

This course aims to provide the graduating students i.e potential entrpreneurs, with the basics they need in order to set up their own business, or become intrapreneurs, alias organizational entrepreneurs, within their own organizational framework. The course content includes introductory information into the concept of entrepreneurship, entrepreneurial perspectives, developing the entrpreneurial plan, marketing research, financial preparation, developing an effective business plan, assessment and evaluation of entrepreneurial opportunities, Turkish legal requirements, sources of capital, managing entrpreneurial growth, valuation of business ventures, and intrapreneurship.

BUS 411 E-Technologies and Managerial Applications (3-0)3

The course starts with the key issues of e-Technologies, e-Business, e-Government, and e-Commerce. Then the infrastructure, business environment, business strategy, CRM, SCM topics are discussed. Hands-on exercises and a term project will enable the students learn the basics by doing.

BUS 412 Strategic Processes and Management (3-0)3

This is a capstone course aimed at providing an opportunity for Business Administration students to integrate materials covered in their previous core and supporting courses. The course focuses on the development of skills in identifying, analyzing, and solving realistic business problems.

BUS 413 Leadership Theory and Applications (3-0)3

This course is designed to equip students with the knowledge and skills necessary to work more effectively with individuals and groups in contepporary organizations. Some examples of topics covered include using power of influence followers and others, delegating effectively, dyadic role making theories, contingency theories of leadership, leading change, strategic leadership and managing diversity**.**

BUS 415 Business Ethics (3-0)3

This course introduces students to a series of ethical challenges currently facing the corporate world by taking a historical look at the proponents and critics of capitalism as well as the role of business and businesspersons in civil society. Building on the work of a wide variety of authors presented in the textbook for the course. Discussion and debates on recent business crises and other disquieting trends in the corporate world. Implications for developing ethics policies are considered. This course examines the foundations of moral reasoning and the analysis of ethical issues that arise in a wide range of contemporary business practices, both domestically and globally. The central aim of the course is to enable students to develop a framework through which to recognize, analyze, and address challenges as they arise in their careers. The course also involves an evaluation of the institutions that structure the interaction of corporations and individuals in the conduct of business.

BUS 416 Organization, Work and Society (3-0)3

This course is concerned with the social-cultural ethnic context of work in business organizations; focusing on the business environment as affecting social behavior and applying OB concepts in diverse cultural settings. It overviews relevant topics in Human Relations area, focusing on selective human issues and topics that have must been covered in the previous courses, introduces OB in a global context in parallel with the developments in the larger world context, and tries to help students to integrate social-cultural-ethnic concepts in the light of changing world order. Topics include the individual, the group, and the organization system, with a specific emphasis on thought-provoking ideas to simulate interest and discussions.
Prerequisite: BUS 222.

BUS 418 Project Management (3-0)3

The course provides a review of CPM and PERT models to cover cases with certain and uncertain activity times; project crashing; and PERT/Cost analysis; GANTT charts and resource leveling decisions; use of simulation in connection with project scheduling; project control, revision and verification techniques; computer applications using commercial software.
Prerequisite: BUS 152.

BUS 421 Organizational Influence Processes (3-0)3

Influence processes that individuals go through within organizations in order to accomplish personal and/or organizational goals are analyzed in this course. Topics include formal versus informal organization; authority versus power; individual and organizational sources of power; organizational politics, methods of influence, strategies and tactics for acquiring, increasing and using power, and ethics of political behavior.
Prerequisite: BUS 221 or BUS 222.

BUS 424 Current Issues in Industrial Relations (3-0)3

The objective of the course is to acquaint the student with a general framework of the actual play

of forces in the labor market ant the international and national levels, taking into consideration the rapid change in the structure of the labor force and industrial relations as a result of the developments in technology, globalization and new forms of work organization.
Prerequisite: BUS 321

BUS 431 Information Systems (3-0)3
The course stresses the value of information as an organizational resource; covers system development methodologies, systems analysis, design, implementation and evaluation, prototyping, data communications and database management.
Prerequisite: BUS 232.

BUS 432 Topics in MIS (3-0)3
The course provides a practical understanding of the concepts and theories involved in the development and implementation of Management information systems. The identification of various information subsystems, the initiation of and responsibility fort he MIS project, the strategies for the determination of the system requirements, methods and tools fort he analysis and design of the new system, software and hardware selection criteria are among the topics discussed through various case studies.
Prerequisite: BUS 431.

BUS 433 Database Design and Management (3-0)3
Basic concepts of database design and management are offered in this course. File structures and data storage organization, searching, sorting and reporting, conceptual database design: relational models and table normalization; ER-model, relational query languages, information protection and concurrency control, computer applications are major areas covered. *Prerequisite: BUS 232.*

BUS 435 Computers and Networking (3-0)3
A practical hands-on course on UNIX and Internet. Topics include UNIX basics and command language, networking basics, communication protocols, services and tools available on Internet
Prerequisite: BUS 232.

BUS 451 Business Forecasting (3-0)3
Introduction to quantitative and subjective forecasting methods. Evaluating forecast accuracy. Smoothing methods: Simple, Holt's and Winters' exponential smoothing techniques. Forecasting with Regression Methods: Forecasting with simple linear trend, using casual regression models, and forecasting with multiple regression models. Time-series Decomposition models. Finding seasonal indexes, and long-term trend, and measuring cyclical component. Box-Jenkins (ARIMA) forecasting models. Introduction to simulation usage in forecasting. Combining Forecast results and Forecast Implementation are areas covered in the course.
Prerequisite: BUS 152.

BUS 461 Supply Chain Management (3-0)3
This course introduces the concepts, models, and solution tools that are needed in the design, control, and operation of supply chains. The discussion ranges from basic topics of inventory management, logistics network design, distribution systems, strategic alliances, buyer-supplier relationships, the value of information in the supply chain, utilizing readings, cases, and technical exercises.
Prerequisites: BUS 352.

BUS 463 Production Planning and Control (3-0)3
This is a continuation of BUS 361. Topics that will be covered include static and dynamic planning models, planning for mass production, planning and control of batch production; deterministic and stochastic models of batch production; deterministic and stochastic inventory models, MRP, maintenance and manpower planning.
Prerequisite: BUS 361.

BUS 466 Services Management (3-0)3
This course presents a study of the inherent characteristics of service organizations in the public and private sectors; the service package and service delivery system; service design and process selection; forecasting in services; location and layout of service firms; human resources management; capacity management and the quality challenge in services.
Prerequisite: BUS 152.

BUS 470 Cross-Cultural Management (3-0)3
The interdependence of economies, political systems, and cultures has created a world of organizations that is no longer limited by national boundaries. Society and organizations alike have become microcosms of human diversity reflecting demographic, social, psychological and cultural differences. Increasingly managers interact with individuals and groups of different national origin and cultural backgrounds - whether in their own domestic corporations, as members of international organizations, or when working in foreign environments. This course is an introduction to the unique challenges faced by persons attempting to enter, interpret, understand, and above all function effectively in foreign environments with the goal of

managing organizations and people having diverse notions of time, space, linguistic structures and work-related values and practices. There is a thematic focus on the "Big Emerging Market" countries, i.e. Argentina, Brazil, China, India, Indonesia, Mexico, Poland, South Africa, South Korea, and Turkey.

BUS 471 Marketing Research (3-0)3
This course provides a hands-on introduction to empirical methodology for market research applications. Problem formulation, research design, measure development, scaling techniques, attitude measurement, simple and applied multivariate analysis, report writing are topics covered. An extensive term project enables the student to put the course content into practice.
Prerequisite: BUS 152 and BUS 271.

BUS 472 Principles of Advertising (3-0)3
The course aims to introduce the student to an overview of the world of advertising industry and provide the fundamentals for developing, creating and implementing advertising campaigns based on strategic marketing principles and planning. The idea of the course is to develop students' knowledge and understanding of the advertising process. By the end of the course students will grasp the role of advertising and get familiar with the basic concepts and terminology used in the business.
Prerequisites: BUS 271

BUS 473 International Marketing (3-0)3
The course introduces the student to the global marketing environment including the global economy, cultural forces, and the political and regulatory climate, explores how managers analyze global opportunities, buyer behavior, competitors, and marketing research, describes global marketing strategies, foreign market entry options, and the global implications of managing the marketing mix.
Prerequisites: BUS 271.

BUS 474 Consumer Behaviour (3-0)3
This course centers on the role of the consumer in the marketing process, enables the student to understand why certain marketing strategies are more effective than others, how humans behave in the marketplace, and which social and cognitive mechanisms the consumer brings to the purchasing decisions. Strong managerial, psychological, and personal implications; individual, social, and marketing determinants of consumption behavior are covered in the course.
Prerequisites: BUS 271.

BUS 476 Retailing (3-0)3
The course aims to give the student an appreciation of the constant change and development in retailing. It introduces the students to basic qualitative and quantitative retail management concepts provides the student with current examples of retailing concepts in action: improves the student's skills in analyzing competitive situations and marketing opportunities.
Prerequisites: BUS 271.

BUS 480 Analysis of Financial Statements (3-0)3
The objective of the course is to provide the knowledge and the skills necessary to take full advantage of financial reports and analysis. Starting with an overview of financial accounting, the topics that will be covered include financial statements, ratio analysis, comparative analysis and the management of operating funds.
Prerequisites: BUS 281.

BUS 481 Quantitative Methods in Finance (3-0)3
This course will cover the application of select mathematical tools in business and economics. Among these topics are equilibrium analysis, sets, functions, matrices and determinants, sequences, limits, cobweb model, rate of change, exponential function, continuous compounding, introduction to optimization, derivatives, partial derivatives, chain rule, integration, martingales, Brownian motion, Markov processes. The aim is to introduce how mathematical tools are applied in economics and business, especially in finance.
Prerequisite: BUS 281.

BUS 482 Corporate Finance (3-0)3
This course is an introduction to the financial operations in business corporations and the related concepts like risk, rate of return, valuation. Topics covered: Risk, Rates of Return, Time Value of Money, Bond and Stock Valuation, Cost of Capital, Basics of Capital Budgeting, Cash Flow Estimation, Capital Structure and Leverage, Investment Banking and Securities Market.
Prerequisites: BUS 281.

BUS 484 Investment Management (3-0)3
The purpose of this course is to introduce the student to the area of investment with emphasis upon why individuals and institutions invest and how they invest. Topics include measures of risk and return; capital and money markets; process and techniques of investment valuation; principles of fundamental analysis; technical analysis; analysis and management of bonds; analysis of alternative investments; portfolio theory and application.
Prerequisite: BUS 281.

BUS 486 Industrial Organization (3-0)3
The course analyzes structure, conduct and performance in imperfectly competitive markets. It considers strategic interaction between firms, and provides understanding of competition within and for the market place. Topics include monopoly, price discrimination, product selection, oligopoly, price competition, collusion, entry deterrence, reputation, limit pricing, and predation.

BUS 487 International Finance (3-0)3
The first part of the course aims at introducing the student to foreign exchange markets, exchange rate determination theories, forecasting and international trade financing. A project on Turkey will be assigned. The second part of the course deals with aspects of financial management for multinational corporations.

Prerequisite: BUS 281.

BUS 490 International Joint Venture (3-0)3
This is an intermediate and advanced course on international business. Students will learn basic economic and international strategic theories of cooperation through international strategic alliances and other forms of joint ventures. Students will be familiarized with both theoretical issues of strategic cooperation in international business and practical ways of achieving and managing international alliances, including joint ventures. Therefore, there will be three parts in this course: (1) theories of strategic alliance, (2) practices of establishing cooperation, and (3) managing ongoing alliance patterns in international business.

NORTHERN CYPRUS CAMPUS - SUNY NEW PALTZ

DUAL-DIPLOMA PROGRAM IN BUSINESS ADMINISTRATION

GENERAL INFORMATION: Since its establishment, The Middle East Technical University has embraced international quality standards and aimed for international recognition. In recent years, our university has developed different collaboration models in education and research with foreign institutions.

This program is the result of a cooperation model between METU NCC and the State University of New York at New Paltz (SUNY NP). Students admitted to this program will be completing part of their education at METU NCC and part of it at SUNY NP. Upon successful completion of their studies, they will receive Business Administration Diplomas from METU NCC and SUNY NP. This model of education will allow the accumulated knowledge of the two universities to be at the disposal of the students and also adds an international perspective that Business Programs around the world have been striving for. As a result, graduates of this program will be particularly well suited to compete in a global environment.

In addition to the international exposure to various cultures, the program provides access to the resources of the two universities in order to deliver an education program that covers all of the functional areas of modern Business Administration and allows specialization through the numerous elective courses that are offered across a broad range.

CAREER OPPORTUNITIES: Graduates of this program will have significant cross-cultural experience which is becoming increasingly important for managers working in increasingly globalized economies. Furthermore, by making use of the resources of the two universities the students will have been able to receive an education focused on business administration areas of their choice. They will be highly-qualified candidates for management positions in companies doing business internationally or locally.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester (METU-NCC)				Second Semester (METU-NCC)			
BUS	111	Fundamentals of Business	(3-0)3	BUS	142	Financial Accounting	(3-0)3
BUS	221	Org. Beh. and Soc. Psychology	(3-0)3	BUS	152	Statistics for Social Sciences	(3-0)3
ECO	101	Microeconomics	(4-0)4	ECO	102	Macroeconomics	(4-0)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4	ENGL	102	Development of Reading and Writing Skills II	(4-0)4
MAT	119[a]	Calcul. with Analytic Geom.	(4-2)5	PSIR	108	Introduction to Global Politics	(3-0)3
TUR	101[b]	Turkish I	(2-0)NC	TUR	102[b]	Turkish II	(2-0)NC
GPC	100	First Year on Campus Seminar	(0-2)1	CNG	100	Introduction to Information Technologies and Applications	(2-0)NC

SECOND YEAR

Third Semester (METU-NCC)				Fourth Semester (SUNY-NP)			
BUS	271	Principles of Marketing	(3-0)3	BUS	202	Managerial Accounting	(3-0)3
BUS	281	Principles of Finance	(3-0)3	BUS	215	Decision Support Systems	(3-0)3
PSIR	237	Principles of Law	(3-0)3	BUS	250	Principals of Management	(3-0)3
		Elective	(-)3	BUS	429	Marketing Management	(3-0)3
ENGL	211	Acad.Oral Pres. Skills	(3-0)3			GE Elective *	(-)3

THIRD YEAR

Fifth Semester (METU-NCC)				Sixth Semester (METU-NCC)			
BUS	321	Human Resource Manag.	(3-0)3	BUS	222	Organization Theory	(3-0)3
BUS	361	Operations Management	(3-0)3	BUS	312	Business Law	(3-0)3
BUS	431	Information Systems	(3-0)3	BUS	352	Management Science	(3-0)3
		GE Elective*	(-)3			Elective	(-)3
		Elective	(-)3			Elective	(-)3
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC	HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

FOURTH YEAR

Seventh Semester (SUNY-NP)				Eighth Semester (SUNY-NP)			
BUS	xxx	Business Elective	(-)3	BUS	450	Strategic Management	(3-0)3
BUS	xxx	Business Elective	(-)3	BUS	xxx	Business Elective	(-)3
BUS	xxx	Business Elective	(-)3	BUS	xxx	Business Elective	(-)3
BUS	xxx	Business Elective	(-)3	BUS	xxx	Business Elective	(-)3
XXX	xxx	GE Elective*	(-)3	XXX	xx	GE Elective*	(-)

[a] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency

Exam are required to take MAT 100 before MAT 119

[b] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[c] International students will take HST 205 and HST 206 instead of HST 201 and HST 202.

* These four GE courses must be in USST, ART, NSCI and HUM areas.

ELECTIVE COURSES

The curriculum has 15 elective courses (5 from METU NCC-10 from SUNY New Paltz). Out of 5 METU NCC electives, one of them should be GE. Out of the remaining four; two courses should be BUS elective and the other two courses can be "free elective". All the elective courses should be taken by the approval of the student advisor.

For a list of some of the Business courses that may be offered as electives see the Business Administration Program.

Note: For description of courses see the Business Program.

NORTHERN CYPRUS CAMPUS

COMPUTER EDUCATION AND INSTRUCTIONAL TECHNOLOGY PROGRAM

GENERAL INFORMATION: For educators, it is important to know how to choose and process knowledge and teaching material for creating sufficient and enriched learning environment. METU Northern Cyprus Campus Computer Education and Instructional Technology Program aims to equip students with basic knowledge and skills that enable them to attain the above goals. The medium of instruction, as in all METU Programs, is in English. Computer Science, Informatics and Internet Technologies in their rapid progress and wide impact, increase the need for human force with skills to productively utilize and adapt these technologies into learning environments and to transfer this knowledge and abilities to others not only in our country but also in the whole world. In fulfilling the above task, the support of existing experience and accumulated knowledge at METU Main Campus is one of the strengths of our program. Curriculum of this program has been designed to provide up to date information to prospective teachers in their field of study, familiarize them with the learning environments which are supported by new technologies while achieving their professional skills. To graduate, one has to succeed in 48 courses (two of which are non credit) with the total 149 credits. METU Northern Cyprus Campus Computer Education and Instructional Technology Program is being conducted in coordination with, and the faculty support of the identical program existing in METU Main Campus.

CAREER OPPORTUNITIES: The graduates of the program will receive Bachelor of Science degree in Computer Education and Instructional Technology, which comprises the teachers formation as well. The graduates of this program can be employed as academics in Computer Education and Instructional Technology Programs of different institutions, as teachers, supervisors, inspectors, curriculum consultants, test and evaluation specialists in computer education and instructional technology in the private or public schools attached to the Ministry of Education. There is also a wide range of opportunities of employment in the computer and information technology industries.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
CTE	111	Information Technology in Education I	(3-2)4	CTE	112	Information Technology in Education II	(3-2)4
EDUS	200	Introduction to Education	(3-0)3	CTE	133	Programming in Internet Environment	(3-2)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4	CNG	100	Introduction to Information Technologies and Appl.	(2-0)NC
GPC	100	First Year on Campus Seminar	(0-2)1	MAT	119	Calculus with Analytic Geometry	(4-2)5
MAT	100	Precalculus	(1-2)2	ENGL	102	Development of Reading and Writing Skills II	(4-0)4
TUR	103	Turkish I: Written Communication	(2-0)2	TUR	104	Turkish II: Oral Communication	(2-0)2
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC	HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

SECOND YEAR

Third Semester				Fourth Semester			
CTE	210	Programming Languages I	(3-2)4	CTE	211	Programming Languages II	(3-2)4
CTE	207	Desing and Use of Inst. Material	(2-2)3	CTE	225	Instructional Design	(2-2)3
CTE	213	Computer Hardware	(2-2)3	CTE	218	Graphics and Animation in Education	(2-2)3
PHY	105	General Physics I	(3-2)4	CTE	216	Principles and Methods of Instruction	(3-0)3
ENGL	211	Acad. Oral Pres. Skills	(3-0)3	XXX	xxx	Elective	(3-0)3
EDUS	220	Educational Psychology	(3-0)3	PHY	106	General Physics II	(3-2)4

THIRD YEAR

Fifth Semester				Sixth Semester			
CTE	313	Use of Operating Systems	(2-2)3	CTE	314	Computer Networks and Communication	(2-2)3
CTE	321	Foundations of Distance Education	(2-2)3	CTE	390	Database Management Systems	(2-2)3
CTE	341	Measurement and Evaluation	(3-0)3	CTE	386	Community Work	(1-2)2
CTE	323	Multimedia Design and Development	(2-2)3	CTE	382	Computer Education Teaching Methods II	(2-2)3
CTE	380	Computer Education Teaching Methods I	(2-2)3	EDUS	304	Classroom Management	(3-0)3
XXX	xxx	Elective	(3-0)3	XXX	xxx	Elective	(3-0)3

FOURTH YEAR

Seventh Semester				Eighth Semester			
CTE	435	Project Development and Management I	(1-4)3	CTE	436	Project Development and Management II	(1-4)3
CTE	419	Web Design	(2-2)3	CTE	410	Practice Teaching	(2-6)5
CTE	421	Research Methods	(2-0)2	EDUS	424	Guidance	(3-0)3
CTE	411	School Experience	(1-4)3	EDUS	416	Turkish Educational System and School Management	(3-0)3
XXX	xxx	Elective	(3-0)3	XXX	xxx	Elective	(3-0)3
XXX	xxx	Elective	(3-0)3	XXX	xxx	Elective	(3-0)3[(c)]

International students will take HST 205 and HST 206 instead of HST 201 and HST 202.

DESCRIPTION OF COURSES

CTE 111 Information Technology in Education I (3-2) 4
Information systems in education and introduction to computers. Evolution of computers. Data presentation. Components of computer systems: the CPU, input-output devices, auxiliary storage devices, microcomputers, operating systems and environments, Windows. Managing text: processors. Managing numbers: spreadsheets. Impact of computers on society, computer ethics, security.

CTE 112 Information Technology in Education II (3-2)4
Telecommunications and computer networks. Internet fundamentals. Data and database structures. Programming languages. Structured program design. Programming basics, arithmetic and logical operations, basic control structures, modularizing programs. Use of computers in school education

CTE 133 Programming in Internet Environment (3-2)4
Fundamentals and functions of the Internet. Common Internet applications used in education: WWW, e-mail, gopher, ftp. Principles of using Internet applications in education.

CTE 207 Design and Use of Instructional Material (2-2)3
This course underlines major implications of learning theories as they are applied into development of instructional materials. The course introduces all major types and formats of instructional media including audio, visual, audio-visual, computers, and so on. The course also provides the necessary background and skills in selection, development, and assessment of all types of instructional media and materials.

CTE 210 Programming Languages I (3-2)4
General structure of a Pascal program, data types, variables, standard functions, subprograms, selection statements, loops, text files, user-defined data types, records, pointers, dynamic data structures.

CTE 211 Programming Languages II (3-2)4
This course introduces the underlying concepts and principles of programming in visual environments. The course emphasizes the design and implementation of visual software, such as Visual Basic. General structure of a VB program, data types, variables, standard functions, subprograms, selection statements, loops, text files, user-defined data types, records, pointers, dynamic data structures.

CTE 213 Computer Hardware (2-2)3
This course presents information about the installation, operation, maintenance and support of PC hardware. It will enable students to learn more about maintaining a personal computer system. The course provides fundamental information about personal computers, microprocessors, RAM, power supplies, motherboards, BIOS, CMOS, the expansion bus, input/output devices and other critical hardware component of an idealized PC.

CTE 216 Principles and Methods of Instruction (3-0)3
Basic concepts and principles of teaching and learning. The importance and benefits of instructional planning. Planning instruction (yearly plan based on units, daily plan and examples of activities). Teaching and learning strategies. Instructional methods and techniques and their relation to practice. Instructional tools and materials. Teacher's duties and responsibilities in improving the quality of instruction. Teachers' qualifications.

CTE 218 Graphics and Animation in Education (2-2)3
Communication through graphics, graphic design, design process and principles of design, history of graphic design, creativity in graphic design, basic design elements of graphic, application areas of graphic design (typography, signs, emblems, icons, logo and trademarks, visual identity design, poster design); basic graphic terminology (pixel depth, compression, picture layout, resolution); graphical software packages (Photoshop, Fireworks, etc.) and tools (toolbox, layers, filters, effects); animation, scripting languages in animation; animation in education.

CTE 225 Instructional Design (2-2)3
Principles of instructional design. Analysis of content, learner, and resources. Selecting instructional objectives and sequencing instruction. Instructional treatments, matching treatments and conditions of instructional events and selection of instructional media. Evaluation of instruction.

CTE 313 Use of Operating Systems (2-2)3
Comparative Anatomy of Operating Systems, Computer System Structures. Basic concepts and the evolution of operating system. Operating system functions and characteristics. Standard operating

systems and structures (NT, WINxx, UNIX (Linux)). Using operating systems: monitor programs and shells; system calls and the programmer interface. Processes, memory management, file systems.

CTE 314 Computer Networks and Communications (2-2)3

This course introduces the underlying concepts and principles of computer networks. It presents the different components of a network and how these components fit together. The course emphasizes the design and implementation of network software that transforms raw hardware into a richly functional communication system. Real networks (such as the Internet, ATM, Ethernet, Token Ring) are used as examples to reinforce the concepts and demonstrate various protocols.

CTE 319 Instructional Technology and Material (2-2)3

(For Non-CTE students) Characteristics of various instructional technologies, the place and the use of technologies in instructional process, development of teaching materials through instructional technologies (worksheets, transparencies, slides, videotapes, computer-based instructional material, etc.), assessment of various teaching materials.

CTE 321 Foundations of Distance Education (2-2)3

Historical development of distance education, definition and function of distance education, technologies used within distance education: TV, VCR, radio, printed materials, computers, and the Internet. Typology of distance education teaching systems. Techniques and methods used inplanning, development, and implementation of distance education teaching systems.

CTE 323 Multimedia Design and Development (2-2)3

Introduction of course development software, electronic courseware planning, design and development stages, screen design principles, digital image/audio/video software, animation, user interaction, feedback techniques, navigation, multimedia courseware packaging, evaluation.

CTE 341 Measurement and Evaluation (3-0) 3

This course offers participants the opportunity to explore concepts of measurement and evaluation as applied to behavioral sciences. How to measure outcome of the teaching-learning process in Computer Education. Cognitive, affective and psychomotor measurements. Teacher-made and standardized tests for Computer Education. Interpretation and treatment of the outcomes of the measurements. Basic descriptive statistics. Formative and summative evaluation. Alternative evaluation strategies.

CTE 360 Introduction to Visual Design / Basic Elements ofVisual Design (CTE only) (2-2)3

The course introduces the underlying concepts and principles of design in visual environments. Mainly two dimensional design and its basic definitions are given. Major concepts are: harmony, contrast, unity, color, background, texture and order. By defining and applying these keywords to their own projects, students will be forming their own understanding of visual design.

CTE 376 Introduction to C++ and Object Oriented Programming (3-0)3

Introduction to computers and C++ programming, control structures, functions, arrays, pointers and strings, classes and data abstraction, operator overloading, inheritance, virtual Functions and polymorphism, C++ stream input/output, templates, exception handling, file processing, data structures, bits, characters, strings and structures, the preprocessor, C legacy code topics, class string and string stream processing, standard template library (STL), standard C++ language additions.

CTE 380 Computer Education Teaching Methods I (2-2)3

Concepts of method and teaching strategies. Different methods of instruction and teaching as applied to computer education. Special emphasis on computer education at secondary education and special teaching methods using technology.

CTE 382 Computer Education Teaching Methods II (2-2)3

Teaching methods and teaching and learning processes in computer education and instructional technology, application of general teaching methods to specific content area, critical examination of textbooks and establishing their relations to teaching methods and strategies in computer education and instructional technology, microteaching applications, evaluation of classroom teaching.

CTE 386 Community Service (1-2) 2

The importance of community service; identification and proposing projects for possible solutions to current problems or an educational issue in society; organize, present, or participate in panel discussions, conferences, conventions, and/or symposia; voluntary work in various social

responsibility projects. Gaining required skills and knowledge for the implementation of community services in schools.

CTE 390 Database Management System (2-2)3
Foundations of database systems, data and data models, design of relational database, SQL, Basic SQL commands, SQL functions, using multi-tables with SQL, SQL programming and function, transaction and errors in SQL, DBMS installation and administrative operations, doing SQL queries in a DBMS.

CTE 410 Practice Teaching (2-6)5
Field experience and practice teaching including class observation, adjusting to classroom conditions, planning and preparation for teaching. Guided teaching practice in Computer Education and Instructional Technology.

CTE 411 School Experience (1-4)3
School experience is a course based on observations and discussions. The aim of the course is to give the students an opportunity to observe authentic teaching. During this course the student is introduced to different aspects of teaching and the teaching profession. The course is providing a structured induction into school life. The tasks and activities performed by student-teachers enable them to observe teachers at work and get to know pupils.

CTE 415 Routing Basics and WAN Protocols (2-2)3
This course introduces the basic concepts and principles of router, routing terminology and Wide Area Network protocols. The course covers topics related to Ethernet and Token Ring frames, TCP/IP basics, IP addressing, distance vector and link state routing protocols, RIP and IGRP, router IOS and basic router configuration. It also covers the various Wide Area Network services, including Frame Relay, ISDN, HDLC, PPP. This course provides additional information on routing protocols beyond that of CTE314 "Computer Networks and Communications".

CTE 419 Web Design (2-2)3
Fundamentals and functions of the Internet. Common Internet applications used in education: e.g., WWW, e-mail, chat, ftp, etc. Principles of using Internet applications in education.

CTE 420 Design, Development and Evaluation of Educational Software (2-2)3
Overview of computer aided instruction (CAI): types, strengths and weaknesses, effective CAI. Implications of learning theories for courseware design and authoring. Features, advantages and limitations of different CAI modes. Planning and managing CAI projects. Designing and producing CAI. Evaluation and revision.

CTE 421 Research Methods (2-0) 2
This course aims to provide prospective teachers with necessary skills and knowledge in planning, conducting and reporting a research in social sciences. This course focuses on such main issues as the nature of scientific inquiry, phases of educational research, intellectual property rights and ethics in educational research, forming research questions, data collection and analyses techniques and preparing a research report.

CTE 435 Project Development and Management I (1-4)3
This course underlines main components of project management in the field of instructional technology. This course will offer students with necessary background and skills in project management by providing with an understanding of the theory and practice of project management process. The course will cover project management context and processes, project integration, project management, time management, cost management, quality management, team management, risk management and project planning in the process of design development and evaluation of instructional software.

CTE 436 Project Development and Management II (1-4)3
This course underlines major steps and techniques used in design development and evaluation of instructional software. It also provides the necessary knowledge and skills to apply project management life cycle to instructional software design, development and evaluation process.

CTE 440 Special Problems in Computer Education and Instructional Technology (2-2)3
Research project carried out under the supervision of a staff member on CTE aiming at giving the student the necessary skill and experience in carrying out scientific research. Students are expected to complete a written report on their topics and give a seminar.

CTE 450 Advanced Programming in Visual Environments (2-2)3

The course introduces the underlying concepts and principles of programming in visual environments. The course emphasizes the design and implementation of a visual software, such as Visual Basic. In the course students have to complete a complete instructional material prepared by Visual Basic.

CTE 461 Professional Practice I (2-2)3

Definitions and discussions on Computer Education and Instructional Technology profession, career building, job application, resume writing, interview techniques, team work, communication skills, Total Quality Management, Intellectual Property and professional experiences.

CTE 462 Professional Practice II (2-2)3

Definitions and discussions on work relationships, supervisory interactions, personal relationships and day-to-day interactions, group dynamics, discussion techniques, consensus, agenda formation, decision making process, and facilitation techniques.

CTE 471 The Business of E-Learning (3-0)3

This course offers participants the opportunity to explore the emerging business side of e-learning. Participants will explore organizational and strategic issues associated with developing and delivering e-learning though a wide range of topics including: e-learning business analysis, e-learning business design, e-learning marketplace, legal and ethical considerations, strategic partnership and funding, special issues in e-learning and the global environment, the future of e-learning business. Participants will be provided with the fundamental background knowledge of the business design principles, using business planning models, conducting product and market analyses, the development of business and marketing plans, the use of common business analysis tools, financing major investments, and analyzing various risk considerations. Participants examine private and publicly traded education companies that are marketing e-learning products and services to the consumer market and study the use of sound business practices and market processes impacting the success of e-learning enterprises, conduct business evaluations of e-learning enterprises, and learn strategies for funding new e-learning enterprises to support the development and implementation of effective e-learning programs.

CTE 472 Knowledge Management in Education and Research (3-0)3

This course offers participants the opportunity to explore the framework for knowledge management in education and research. Participants will explore the potential of knowledge management in support of education and research for increasing the capacity of identifying, distilling, harnessing and using information to improve student and institutional success. This course provides the fundamental background for understanding knowledge management and offers necessary resources and practices to enable participants to design and implement a knowledge management strategy in order for education and research initiatives to succeed and flourish. This course includes a strong focus on the implementation of necessary tools and procedures to construct and maintain an outstanding sustainable knowledge management environment for education and research organization

NORTHERN CYPRUS CAMPUS

ECONOMICS PROGRAM

GENERAL INFORMATION: METU-NCC Economics program started education in the academic year of 2004-2005 with the principal aim of establishing and improving the understanding of economic problems from the elementary to the most complex, in an interdisciplinary manner, supported by historical, social and political aspects and providing its students with necessary skills and tools to undertake critical and systematic analysis of the economic environment, with a special focus on the local economic issues, and area studies.

Besides teaching basics of the economic theory to develop economic understanding at the international standards, the general structure of the program has enough flexibility to permit interdisciplinary feedback from different programs by allowing its students to take courses from Political Science and International Relations and Business Administration programs. Thus the students of the program will develop an extensive economic understanding as well as a general comprehension of social and administrative sciences.

CAREER OPPORTUNITIES: The graduates of the program are expected to have a wide range of opportunities both in Turkish and international job markets. Turkish government institutions and public organizations like the Central Bank, Treasury Department, State Planning Institute, Foreign Trade Department, State Institute of Statistics, Competition Board, Energy Board, and international institutions like World Bank, IMF, and NATO are examples of potential job opportunities. In general a wide variety of private sector jobs especially the ones in the banking and financial sector will be available for our graduates.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

ECO	101	Microeconomics	(4-0)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
GPC	100	First Year on Campus Seminar	(0-2)1
MAT	119[a]	Calcul. with Analytic Geom.	(4-2)5
PSIR	101	Intro. to Sociol. and Politics	(3-0)3
XXX	xxx	Restricted Elective	(3-0)3
TUR	101[b]	Turkish I	(2-0)NC

Second Semester

ECO	102	Macroeconomics	(4-0)4
BUS	152	Statistics for Social Sciences	(3-0)3
CNG	100	Introduction to Information Technologies and Appl.	(2-0)NC
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
MAT	120	Calcul. for Func.of Sev.Var.	(4-2)5
XXX	xxx	Restricted Elective	(3-0)3
TUR	102[b]	Turkish II	(2-0)NC

SECOND YEAR

Third Semester

ECO	201	Intermed. Microeconomics	(4-0)4
ECO	211	Economic History	(3-0)3
ECO	275	Mathematics for Economists	(3-0)3
ENGL	211	Acad. Oral Pres. Skills	(3-0)3
XXX	xxx	Elective	(-)3
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC

Fourth Semester

ECO	202	Intermed. Macroeconomics	(4-0)4
ECO	205	Statistics for Economists	(4-0)4
ECO	212	Hist.of Economic Thought	(3-0)3
BUS	232	Info. Sys. and Prog.	(3-0)3
XXX	xxx	Elective	(-)3
HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester

ECO	303	International Trade Theory and Policy	(3-0)3	ECO	304	Internat. Macroeconomics	(3-0)3
ECO	311	Princip. of Econometrics I	(4-0)4	ECO	306	Monetary Theory and Policy	(3-0)3
XXX	xxx	Elective	(-)3	ECO	312	Princip. of Econometrics II	(3-2)4
XXX	xxx	Elective	(-)3	ENGL	311	Advan. Communi. Skills	(3-0)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3

Sixth Semester

FOURTH YEAR

Seventh Semester

ECO	480	World Economy	(3-0)3	ECO	400	Graduation Project	(0-6)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3
XXX	xxx	Elective	(-)3	XXX	xxx	Elective	(-)3

Eighth Semester

[a] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119

[b] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[c] International students will take HST 205 and HST 206 instead of HST 201 and HST 202.

Restricted Electives: 1) BUS 221 or PSIR 105 in the first semester, and 2) BUS 142 or PSIR 110 in the second semester.

Electives: In addition to restricted electives, the curriculum has 14 electives, at least 7 of which should be taken from the ECO program. Maximum of 3 courses may be taken from the fields other than BUS, PSIR, MAT and engineering. Out-of-department electives should be second year or higher level and should have at least 3 credits. If the student's advisor lets him/her take more electives than stated above, they should be taken under NOT INCLUDED category.

Some ECO electives:

- ECO 401 Practical Training in Economics
- ECO 407 Input-Output Analysis and Economic Modeling
- ECO 411 Topics in Economic History
- ECO 416 Real Estate Economics and Finance
- ECO 424 Economics of Regulation and Antitrust
- ECO 421 The European Union
- ECO 425 Environmental Economics
- ECO 426 Economics of Natural Resources
- ECO 431 Economics of Gender
- ECO 433 Financial Markets
- ECO 442 Topics in Monetary Macroeconomics
- ECO 443 Game Theory and its Applications
- ECO 448 Technology and Industrial Dynamics
- ECO 451 Industrial Economics
- ECO 452 Agricultural Trade Policies
- ECO 453 Business Forecasting
- ECO 455 Turkish Economic History
- ECO 458 Project Evaluation
- ECO 459 Turkish Banking System
- ECO 460 Structure of the Turkish Economy
- ECO 465 Development Economics
- ECO 466 Economics of Growth
- ECO 476 Introduction to Mathematical Economics
- ECO 477 Welfare Economics and

Theory of Social Choice

- ECO 478 Topics in Linear and Non-Linear Programming
- ECO 489 European Union and Turkey
- ECO 490 International Economic Institution
- ECO 499 International Money, Finace and Banking
- ECO 538 Applied Econometrics

DESCRIPTION OF COURSES

ECO 101 Introduction to Economics I (4-0)4

This is an introduction to Microeconomics course. The topics to be covered are: the economic problem, demand and supply, competitive markets, monopoly and non-competitive market structures, factor markets and the theory of income distribution.

ECO 102 Introduction to Economics II (4-0)4

This is an introduction to Macroeconomics course. The topics to be covered are: national income accounting, the theory of income determination, money and monetary policy, the aggregate demand/supply analysis, international trade and finance.
Prerequisite: ECO 101.

ECO 201 Intermediate Microeconomics (4-0)4

Utility analysis of demand, theory of production and cost, imperfect competition, general equilibrium and welfare.
Prerequisite: ECO 101.

ECO 202 Intermediate Macroeconomics (4-0)4

Review of national income accounting and income determination, alternative theories of income determination, theories of consumption, investment and the demand for money, inflation and economic activity, open economy extensions.
Prerequisite: ECO 102.

ECO 205 Statistics for Economists (4-0)4

Frequency distributions, measures of central tendency and variability, basic theorems of probability, discrete probability distributions, important continuous distributions (normal, Poisson, Chi2,F), sampling distributions, correlation and analysis of variance, introduction to estimation (point and interval) and hypothesis testing, optimality of estimators.
Prerequisite: BUS 152.

ECO 210 Principles of Economics (3-0)3

A non-departmental course designed for students outside the Programs of BUS, PSIR and ECO. The nature of economics; a general view of price system; markets and pricing; the determination and the control of national income; fiscal policy; money, banking and monetory policy; international trade and finance; economic growth and development are some of the topics covered in this course.

ECO 211 Economic History (3-0)3

Pre-industrial Europe and transition to industrial societies, industrial revolution, an overview of economic and social change in the twentieth century.

ECO 212 History of Economic Thought (3-0)3

The course develops a history of the development of economic ideas and theories: mercantalism, physiocrats, the classical school (Adam Smith to Ricardo), Marxian school, marginal revolution, Keynesian revolution, and various responses to Keynesian macroeconomics to date.
Prerequisite: ECO 102

ECO 275 Mathematics for Economists (3-0)3

This course provides an introduction to mathematical techniques frequently used in economic analysis. Topics include differential and integral calculus, and matrix algebra. Emphasis is placed on the application of mathematics to topics in economic theory, such as profit maximization, utility maximization and output determination.
Prerequisite: MAT 120.

ECO 280 Engineering Economy (3-0)3

Introduction to engineering economy. Interest and money-time relationship. Depreciation, valuation depletion. Basic methods for making economy studies. Risk-decision analysis. Selection between alternatives and the replacement problem. Applications related to various constructions projects. Quantity measurement and cost estimating of a building project.

ECO 303 International Trade Theory and Policy (3-0)3

The classical theory of comparative advantage, the factor proportions theory of comparative advantage,

the Hecksher-Ohlin theory of gains from trade, classical theorems of two sector trade models, trade policy and welfare analysis.
Prerequisite: ECO 201.

ECO 304 International Macroeconomics (3-0)3
Balance of payments, open economy macroeconomics and monetary policy, exchange rate systems, economics of regional and global integration.
Prerequisite: ECO 202.

ECO 306 Monetary Theory and Policy (3-0)3
An overview of the financial mechanism, capital markets, and interest rate determination. Demand for and the supply of money. Monetary transmission mechanism. Tools and indicators of monetary policy. Inflation targeting.
Prerequisite: ECO 202.

ECO 311 Principles of Econometrics I (4-0)4
The simple regression model: basic assumptions, estimation, hypothesis testing and prediction, choosing among functional forms. The multiple regression model: estimation, hypothesis testing and prediction, functional forms and specification errors, multicollinearity.
Prerequisite: ECO 205.

ECO 312 Principles of Econometrics II (3-2)4
Autocorrelation: causes, consequences, tests and estimation. Univariate Time Series Modelling and Testing for Non-Stationary, Dynamic Models, Cointegration and Estimation of Equilibrium. Correction Models, Simultaneous Equations Models: Identification and single-equation estimation. Heteroscedasticity: Causes, consequences tests and estimation.
Prerequisite: ECO 311.

ECO 313 Public Finance (3-0)3
Theory of taxation, and public goods. Budgetary and fiscal policy and dept sustainability.
Prerequisite: ECO 201.

ECO 400 Graduation Project (0-6)3
Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit regular progress reports through the semester.

ECO 401 Practical Training in EconomicsI (3-0)3
The course is designed for 3rd and 4th year students to equip them with practical tools of their future careers. For those students planning to enter academic career, the course will involve teaching techniques, practical teaching in tutorials, discussion and problem hours. For those students planning to enter the applied research career, the course will involve research techniques, statistical data bases and practical training in reseach institutions.

ECO 402 Practical Training in Economics II (3-0)3
Same as ECO 401.

ECO 406 Real Estate Economics and Finance (3-0)3
Real estate represents a large fraction of the world's wealth and real estate investment represents a significant part of many institutional portfolios. Its efficient utilization and the markets in which it is traded involve many interesting and complex economic issues. This course applies the economic and finance theory to the real estate investment analysis. In particular, Urban Economics foundation of real estate investment in the space market and Financial Economics perspective on both equity real estate (REITs and real property) and debt real estate (mortgages and mortgage-backed securities) investments are covered.

ECO 410 Economics of Entrepreneurship (3-0)3
This course focuses on the role of innovation with a special emphasize on enterpreneurship in the growth and development of 21st century economies. During the course the economic theories behind enterpreneurship will be discussed. The methods used in succesfull enterprises will also be analyzed as an enterpreneurial process. The participants will develop and present their business plans as their final project.

ECO 411 Topics in Economic History (3-0)3
Study of Ottomon and Turkish social and economic structure beginning with developments in 16th century, followed by the study of 19th and early 20th century. *Prerequisite: ECO 211.*

ECO 412 Turkish Economy (3-0)3
An overview of economic development starting from 1920s, the planned era through to current state of the economy. The recent trends in fiscal and monetary policymaking. *Prerequisite: ECO 202.*

ECO 421 Economics of Integration and the EU (3-0)3
The course provides a broad perspective on globalization, regionalization and the European integration. The institutions and decision-making processes in the EU are discussed to provide a comprehensive picture of the EU.

ECO 425 Environmental Economics (3-0)3
The effects of economic activity on the natural environment with special reference to urban development forms the central subject matter of the course. Consideration is given to economic analysis of the causes of pollution and its control through taxes, the use of property rights and standards.

ECO 426 Economics of Natural Resources (3-0)3
This course is designed to introduce students to certain areas of natural resource economics. Topics include theories of replenishable and exhaustible resource exploitation and the environment. Specific natural resources (e.g. depletable energy resources, recyclable resources, replenishable but depletable resources, etc.) are studied in depth.

ECO 433 Financial Markets (3-0)3
The structure and functions of financial markets are analyzed. Operations and regulations in the money and capital markets introduced. Financial innovations and liberalization processes will be at the core of the course.

ECO 442 Topics in Monetory Macro Economics (3-0)3
The main objective of the course is to introduce students to a number of approaches to monetary theory and policy. The following topics are covered: Theoretical Fundaments of Monetary Policy, Vulnerabilities and Limits to Monetary Policy: Financial Dollarisation, Fiscal Dominance, New Monetary Macroeconomics Beyond IS-LM, Monetary Policy Transmission Mechanisms, Inflation Dynamics, Monetary Policy and Nominal Anchors, Inflation Targeting.

ECO 443 Game Theory (3-0)3
Game Theory involves the analysis of situations in which payoffs to agents depend on the behavior of other agents. It involves the analysis of conflict, cooperation, and (tacit) communication. Game theory has applications in several fields, such as economics, politics, law, biology, and computer science. In this course we will learn both the theory behind the games and their application in various fields.
Prerequisite: ECO 201.

ECO 448 Technology and Industrial Dynamics (3-0)3
The main objective of this course is to enable students to understand and to analyze the forces which determine industrial development. The material includes a wide range of issues from a variety of perspectives: Broad historical analyses, microeconomic theory, the economics of technological change and industrial policy from both a domestic and an international perspective.

ECO 451 Industrial Economics (3-0)3
This course is an extension of ECO 201. Organization and development, consentration, entry barriers and other aspects of oligopolistic market structures is discussed in the first part of the course. The second part involves the theoretical and empirical dimensions of firm behavior. The specific topics centers on the pricing, investment and growth process of modern oligopolistic firms.

ECO 453 Business Forecasting (3-0)3
Various forecasting methods are introduced with emphasis on their applications for social and economic planning. The core of the course is the use of models in forecasting future sales, capital, investment, new product development etc.
Prerequisite: BUS 152.

ECO 460 Structure of Turkish Economy (3-0)3
Overall structure of the economy; sources and use of income; economy of government; main sectors; agriculture, industry, services; income distribution; regional dispersion of economic activities.
Prerequisite: ECO 102.

ECO 465 Development Economics (3-0)3
This course studies the current policy issues of underdeveloped countries with reference to the relevant theoretical debates and country experiences, with some emphasis on the East Asian experience. Economic relations between North and South; trade, technology and financial policy issues; the role of the state; the implications of endogenous growth theory and international institutional constraints on policy making are discussed.

ECO 466 Economics of Growth (3-0)3
The main objective of the course is to familiarize the students with the key theories of growth and the implications for economic development. The course is designed to combine the theoretical rigor of main growth theories, with the intuition of major development issues. Another equally important aim of this course is to channel the students into thinking about various development issues and sources of growth in Turkey, or around the world.
Prerequisite: ECO 102.

ECO 480 World Economy (3-0)3
The course investigates developments, trends, cycles and facts of the world economy during the 1980's and its future. A framework is developed within which to examine the subject matter. Outcomes of "structural adjustment" on a major country basis as well on a global basis are evaluated.

ECO 494 Political Economy of Industrial Societies since 1945 (3-0)3
The course deals with conceptualizations of economic development in the past-World War II era. One objective of this course is to focus on concrete historical changes in the global development. Ultimately, the course aims at being an exercise in the global economic history and the economic thought of the past-war period.As such, it seeks to relativize the economic development process.

ECO 497 Comparative European Labor Markets (3-0)3
This course examines labor market characteristics and institutions in developed countries in general and Western European countries in particular. Comparisons to the most flexible labor market, the US, will be a focus of the course. Underlying paradigms are the skill-biased technological change adversely affecting low-skill workers and labor market institutions –as these institutions relate to labor market flexibility or wage rigidity.

ECO 498 Labor Market Economics (3-0)3
An up-to-date review of modern labor market theories, related policy issues and applications, as well as methods and findings of empirical research, including national and regional level analysis of these markets both in developed and developing countries. Open to economic and administrative sciences majors as well as to students from computer science, regional planning and engineering.
Prerequisite: ECO 101.

ECO 499 International Money, Finance and Banking (3-0)3
The course aims to introduce students to alternative approaches to international money, finance and banking. Whilst the emphasis is on policy questions, theory postulations and empirical evidence will be referred to frequently. The course is planned to cover some topical issues including i) International monetary regimes and financial integration, ii) Exchange rate determination theories and evidence, iii) Alternative exchange rate regimes and policies, iv) Banking system: risks and regulation, v) The international experience with currency and banking crises, vi) Turkish financial system: Issues, risks and regulation, vii) Monetary policy in financially open economies with special reference to Turkey.

NORTHERN CYPRUS CAMPUS

GUIDANCE AND PSYCHOLOGICAL COUNSELING PROGRAM

GENERAL INFORMATION: The Guidance and Psychological Counseling Program seeks to prepare students as highly qualified counseling professionals capable of functioning well in the dynamic counseling field. The program aims to equip students with necessary theoretical knowledge and skills to serve as counseling professionals in addressing the academic, career and personal/social needs of individuals. The program also intends to develop students' awareness regarding the nature of helping relationships to prevent problems, enhance human potential, and cope with life challenges. The program is committed to the development and improvement of counseling field by preparing highly qualified professionals capable of assuming leadership roles in the field of counseling through the effective technological infrastructure, English-medium instruction, and a highly qualified faculty. To graduate, one has to succeed in 52 courses (three of which are non-credit) with the total 147 credits.

CAREER OPPORTUNITIES: The graduates of the program will receive Bachelor of Science degree in Guidance and Psychological Counseling. The graduates of this program are qualified to work as guidance counselor/psychological counselor at public and private schools, university counseling centers, other educational settings, and mental health related institutions.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

PSYC	100	General Psychology	(3-0)3
GPC	124	Introduction to Guidance and Counseling	(3-0)3
GPC	136	Human Relations in Education	(3-0)3
EDUS	200	Introduction to Education	(3-0)3
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
GPC	100	First Year on Campus Seminar	(0-2)1
TUR	103	Turkish I: Written Expression	(2-0)2

Second Semester

GPC	122	Developmental Psychology	(3-0)3
GPC	126	Physiological Psychology	(3-0)3
CNG	100	Introduction to Information Technologies and Appl.	(2-0)NC
GPC	150	Psychology of Learning	(3-0)3
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
SOCL	109	Introduction to Sociology	(3-0)3
TUR	104	Turkish II: Oral Communication	(2-0)2

SECOND YEAR

Third Semester

EDUS	209	Introduction to Educational Statistics I.	(3-2)4
EDUS	230	Introduction to Curriculum and Instruction	(3-0)3
GPC	253	Psychology of Adolescence	(3-0)3
ENGL	211	Academic Oral Presentations	(3-0)3
PHL	xxx	Elective	(3-0)3
GPC	xxx	Departmental Elective	(2-0)2
HST	201[(b)]	Principles of Kemal Atatürk I	(2-0)NC

Fourth Semester

EDUS	210	Introduction to Educational Statistics II	(3-2)4
GPC	200	Observation in Schools	(2-2)3
GPC	254	Social Psychology	(3-0)3
GPC	355	Special Education	(3-0)3
SOCL	xxx	Elective	(3-0)3
GPC	xxx	Elective	(2-0)2
HST	202[(b)]	Principles of Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester

PSYC	340	Theories of Personality	(4-0)4
GPC	300	Career Counseling	(3-0)3
ENGL	311	Advan. Communic. Skills	(3-0)3
GPC	313	Theories of Counseling	(3-0)3
GPC	363	Measurement and Evaluation in Counseling	(3-0)3
XXX	xxx	Non-Departmental Elective	(3-0)3

Sixth Semester

EDUS	302	Research Methods in Education	(3-2)4
GPC	301	Practicum in Career Counseling	(1-4)3
GPC	314	Methods and Techniques of Counseling	(3-0)3
GPC	364	Appraisal of Students	(3-0)3
XXX	xxx	Non-Departmental Elective	(3-0)3
XXX	xxx	Non-Departmental Elective	(3-0)3

FOURTH YEAR

Seventh Semester

GPC	410	Field Practice in Individual Counseling	(1-4)3
GPC	411	Community Work	(1-2)2
GPC	415	Behavior Disorders	(3-0)3
GPC	437	Group Counseling	(3-0)3
GPC	xxx	Departmental Elective	(3-0)3
XXX	xxx	Non-Departmental Elective	(3-0)3

Eighth Semester

GPC	400	Field Practice in School Counseling Services	(1-4)3
GPC	438	Practicum in Group Counseling	(2-4)4
GPC	490	Professional Standards and Problems in Guidance and Counseling	(3-0)3
GPC	495	Seminar in Guidance and Counseling	(2-2)3
GPC	xxx	Departmental Elective	(3-0)3
XXX	xxx	Non-Departmental Elective	(3-0)3

DESCRIPTION OF COURSES

GPC 100 First Year on Campus Seminar (0-2)1

This course is a first-year student seminar designed to assist new students make a successful transition to the academic and social life of METU-NCC and thereby foster a sense of belonging to the institution. The course is taken by all students during the first year of enrollment at METU-NCC. The course is delivered through a combination of group seminars/activities and small group discussion sessions.

GPC 122 Developmental Psychology (3-0)3

Physical, sensory, motor, cognitive, social and emotional development from birth to late adulthood, with special reference to major theoretical approaches to human development.

GPC 124 Introduction to Guidance and Counseling (3-0)3

An introduction to basic concepts of guidance and counseling; historical background and development of the field; basic functions of the counseling and guidance services; roles and functions of school counselors; basic counseling and guidance techniques utilized by counselors.

GPC 126 Physiological Pyschology (3-0)3

Fields of physiological psychology, research methods in physiological psychology, physiology and anatomy of organism, mechanisms of behavior, functions of senses, motor functions, motives and physiological foundations of emotions, functional disorders and causes of functional disorders.

GPC 136 Human Relations in Education (3-0)3
An introduction to basic concepts and principles of human relationships with special emphasis on interaction, power, roles, conflict, development and change in human relationships; techniques of improving communication skills; the role of human relations in educational process.

GPC 150 Psychology of Learning (3-0)3
A survey of different theories and approaches to psychology of learning. Areas of major emphasis are concepts and principles of classical and instrumental conditioning. A selective treatment of behavior modification is included in the course material.

GPC 200 Observation in Schools (2-2)3
Experiencing school environment and school climate with its organization, process and problems. Understanding roles of all the personnel and their activities; their interactions and parent-school collaborations and school-community relationships.

GPC 253 Psychology of Adolescence (3-0)3
A detailed account of various theories of adolescent development emphasizing biological, cognitive and emotional changes in adolescence. Adolescents and their families, adolescents in schools and at work. Counseling services for adolescents

GPC 254 Social Psychology (3-0)3
An introduction to the basic concepts, principles, and theories of social psychology; the method of social psychology; analysis of major topics including human interaction and its products such as group structure, properties of groups, types of groups, intra and intergroup relations, leadership, power, communication, and social attitudes.

GPC 300 Career Counseling (3-0)3
Survey and critical analysis of theory and research on career choice and adjustment. Definition and correlates of career preferences, choices, motivation, success and satisfaction. Developmental trends in career decision making and career patterns.

GPC 301 Practicum in Career Counseling (1-4)3
Administering and evaluating instruments used in career counseling; preparing and implementing career development programs; conducting career counseling sessions with individuals and group.

GPC 310 Developing Skills for Peer Guidance (2-2)3
This course has been designed to facilitate the development of leadership, communication and helping skills among advanced 3rd and 4th year students by providing them an opportunity to assist in the delivery of the GPC 100 courses to first year METU-NCC students. The course will be conducted in an interactive small group format. Through discussion and small group exercises, students enrolled in this course will be introduced to a variety of topics designed to enhance their skills in the following areas: effective communication, ethical and professional behavior, peer education, study and time management skills, conflict resolution and problem solving. The focus of this course will be on the development of skills and knowledge that will not only support the students' work as peer guides with 1st year students but will provide essential training and experience in the development of leadership, communication, and helping skills that will be helpful in other settings. The class also provides the means for the evaluation, reflection and processing of student experiences as a peer guide.

GPC 313 Theories of Counseling (3-0)3
Introduction and overview of the counseling theories in terms of the emphasis placed upon the cognitive, affective and behavioral domains. Comparison of basic philosophies, key concepts, goals of counseling; development of relationship between counselor and client; clients and counselors work and techniques of various approaches in counseling.

GPC 314 Methods and Techniques of Counseling (3-0)3
Some perspectives on effective helping; characteristics of effective helpers; various methods and skills used in individual counseling; selecting and structuring skills to meet clients needs; developing counseling skills appropriate to different stages of counseling.

GPC 355 Special Education (3-0)3
Basic concepts and principles of special education; examination of the various types of handicaps in childhood and adolescence; types of special education services; intervention strategies offered to different types of handicaps. Organizations, programs, curriculum, and their implications provided for various types of handicaps.

GPC 363 Measurement and Evaluation in Counseling (3-0)3
Principles of measurement and evaluation; methods and techniques used for the measurement and evaluation of student behavior in various domains.

GPC 364 Appraisal of Students (3-0)3
Use of various non-test and test techniques in schoolcounseling services with special emphasis on assessment procedures and skills used in interpreting the test results in counseling.

GPC 400 Field Practice in School Counseling Services (1-4)3
In this practicum course, students attend to counseling services where they are expected to observe and practice guidance activities based on the needs of a particular school. Every student administers a test or non test guidance technique, writes observation reports about the schools and conducts a research project.

GPC 410 Field Practice in Individual Counseling (1-4)3
In this practicum course, students attend to the secondary schools or prep-schools and conduct interviews with students. Each session of these interviews is tape-recorded, transcribed and supervised. Theoretical discussions and providing feedback are essential elements of the course.

GPC 411 Community Work (1-2)2
Introducing the principles of community work; enhancing the skills of students to develop programs and strategies in assisting the community to meet its own needs.

GPC 415 Behavior Disorders (3-0)3
Misconceptions about abnormal behaviors, criteria for abnormality, the problem of classification, main approaches to behavior disorders, the basic nature of neurosis (the neurotic nucleus and paradox, anxiety disorders, somatoform disorders, affective disorders, sexual dysfunction and variants).

GPC 437 Group Counseling (3-0)3
Basic concepts and philosophies of group counseling; a survey and comparison of different theoretical approaches to group counseling; group processes, norms, and stages in the development of a counseling group; characteristics of group leadership and group members; effective group leadership skills; multicultural issues in group counseling.

GPC 438 Practicum in Group Counseling (3-0)3
Application of different techniques used in group counseling. Practicing group process and different stages of group counseling.

GPC 490 Professional Standards and Problems in Guidance and Counseling (3-0)3
The role definitions and work settings of the counselor, desired requisite preparation of counseling practice and the related ethical standards.

GPC 495 Seminar in Guidance and Counseling (3-0)3
Preparing and presenting comprehensive projects on chosen subjects according to students needs and interests.

NORTHERN CYPRUS CAMPUS

POLITICAL SCIENCE AND INTERNATIONAL RELATIONS PROGRAM

GENERAL INFORMATION: The aim of the Bachelor of Science degree program in Political Science and International Relations is to encourage and allow students to acquire the analytical skills to examine critically the organisation and expressions of political power, social power, economic power and cultural power that is, power in all its human expressions.

Where Political Science was traditionally concerned with the study of power within states and International Relations was traditionally concerned with the study of power between states, here in the PSIR programme at METU NCC we are concerned with examining the totality of these expressions of power. To that end, not only will undergraduate students be offered foundational courses in Political Science and International Relations thereby anchoring their knowledge in both traditions of enquiry, but they will be encouraged to examine and explain the development of more complex expressions of global power. Thus their primary concern will be the interaction between domestic politics, state behaviour and the international system and international society, and the issues these raise for the future of international relations in a world of changing economies, social structures, technologies, environments and ideologies. It is the aim of this program, therefore, to provide students with a thorough knowledge of the processes and practices which characterise the relations of power within states and between states whilst encouraging students to examine the combined development of world history.

On the basis of a firm foundation in study of government, economy and society, international history, and political and social theory, as well as law, students will then progress to a more interdisciplinary analysis of more specialist fields of enquiry. Having also completed a special course in research methods in social and political sciences, students will be guided through focused study in social and political theory, political economy and war and peace studies as well as being offered a number of electives across a range of specialisms.

The syllabus is designed to enable the student to examine and explain the complexities and processes that make up global power relationships, including analysis of the history, organisation and dynamics of state institutions and international institutions. Students will be able to examine the development, structural characteristics and crises in a wide range of political settings and political issues."

CAREER OPPORTUNITIES: While many of our graduates successfully continue on to M.A. and Ph.D. programs in Europe and Turkey, others pursue careers in the Turkish civil and foreign service, as well as in the private service sector, for instance in financial institutions and news media. Some of the potential employment opportunities in the public service include the State Planning Organization, the Ministry of Foreign Affairs, the Undersecretary of the Treasury, the Undersecretary of Foreign Trade, the General Secretariat for European Union, the Ministry of Finance, the Central Bank, the Capital Markets Board of Turkey, and also local and municipal government.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
PSIR	101	Intr. to Sociol. and Politics	(3-0)3	PSIR	108	Intr. to Global politics	(3-0)3
PSIR	105	World History, 1453-1914	(3-0)3	PSIR	110	Internat. History, 1914-1989	(3-0)3
PSIR	111	Study Skills in Social and Political Sciences	(3-0) 3	PSIR	112	Statistics for Political Scientists	(3-0)3
ECO	101	Microeconomics	(4-0)4	CNG	100	Introduction to Information Technologies and Appl.	(2-0)NC
ENGL	101	Development of Reading and Writing Skills I	(4-0)4	ENGL	102	Development of Reading and Writing Skills II	(4-0)4
GPC	100	First Year on Campus Seminar	(0-2)1	ECO	102	Macroeconomics	(4-0)4
TUR	101[a]	Turkish I	(2-0)NC	TUR	102[a]	Turkish II	(2-0)NC

SECOND YEAR

Third Semester				Fourth Semester			
PSIR	203	Hist. of Political Thought I	(3-0)3	PSIR	202	Constitutional Law	(3-0)3
PSIR	212	Comparative Politics	(3-0)3	PSIR	206	Hist. of Political Thought II	(3-0)3
PSIR	218	Political Sociology	(3-0)3	PSIR	210	Theories of Intern. Relations	(3-0)3
PSIR	237	Principles of Law	(3-0)3	PSIR	211	Comparative Government	(3-0)3
ENGL	211	Acad. Oral Pres. Skills	(3-0)3	PSIR	214	War and Peace Studies	(3-0)3
HST	201[b]	Principles of Kemal Atatürk I	(2-0)NC	HST	202[b]	Principles of Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester				Sixth Semester			
PSIR	303	Public International Law	(3-0)3	PSIR	304	International Organizations	(3-0)3
PSIR	305	Int. Political Economy	(3-0)3	PSIR	306	Process of Europ. Integration	(3-0)3
ENGL	311	Advan. Communic. Skills	(3-0)3	XXX		Elective 3 PSIR 308, Gender and Politics (guaranteed elective)	(-)3
XXX		Elective 1	(-)3	XXX		Elective 4	(-)3
XXX		Elective 2	(-)3	XXX		Elective 5	(-)3

FOURTH YEAR

Seventh Semester				Eighth Semester			
PSIR	401	Contemp. Political Theory	(3-0)3	PSIR	400	Graduation Project	(0-6)3
PSIR	403	Contemp. Issues in Global Political Economy	(-)3	PSIR	404	Contemporay Issues in War and Peace	(3-0)3
XXX		Elective 6	(-)3	XXX		Elective 9	(-)3
XXX		Elective 7	(-)3	XXX		Elective 10	(-)3
XXX		Elective 8	(-)3	XXX		Elective 11	(-)3

[a] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.
[b] International students will take HST 205 and HST 206 instead of HST 201 and HST 202.

ELECTIVE COURSES

At least seven of the elective courses must be taken from the PSIR program. Of the remaining non-PSIR portion, a maximum of four courses may be taken from any other program. The electives to be taken at METU Ankara during the summer school need to have prior approval of the PSIR co-ordinator. Otherwise they will not count. The only exception to the above mentioned rules is for the students who are taking a second language course and wants to take continuous courses of the same language.

Out-of-department electives should be second year or higher level and should have at least 3 credits.

The following is a list of possible elective courses. The list is not exhaustive and there will be additional electives to cover local and regional agenda and issues.

- PSIR 311 Nations and Nationalism
- PSIR 314 Political Economy of Turkey
- PSIR 316 Understanding Capitalism
- PSIR 320 International Human Rights
- PSIR 322 History of the Cyprus Conflict
- PSIR 323 Political Psychology
- PSIR 333 States and Societies in Central Asia
- PSIR 340 Politics in International Migration
- PSIR 341 Contemporary Social Theory
- PSIR 343 International Development
- PSIR 345 Turkish Foreign Policy
- PSIR 348 Public Opinion & International Relations
- PSIR 381 Development and the Developing World
- PSIR 413 Comparative Political Cultures: Greece, Turkey, Cyprus
- PSIR 415 Political Economy of Environment and Energy
- PSIR 416 Terrorism and Global Society
- PSIR 418 International Humanitarian Law
- PSIR 420 Politics and Society in Turkey
- PSIR 421 Transitional Justice
- PSIR 423 Historical Sociology and International Relations
- PSIR 424 Theories of Diplomacy
- PSIR 425 Ethics and International Relations
- PSIR 427 Approaches to State-Society Relations
- PSIR 428 Politics of Literature
- PSIR 429 International Politics of Oil
- PSIR 430 Imperialism & Making of the Modern Middle East
- PSIR 431 Law and Institutions of the European Union
- PSIR 451 Theories of Democracy
- PSIR 454 Ottoman Diplomacy and the European States System
- PSIR 463 Russian Foreign Policy
- PSIR 470 Turkey and the EC/EU
- PSIR 559 Politics and Society in Latin America

DESCRIPTION OF COURSES

PSIR 101 Introduction to Sociology and Politics (3-0)3
This course provides the introductory conceptual framework for the study of politics and the changing social world. Definition of the basic concepts of authority, power, ideology, socialization, stratification, culture and gender will be combined with the examination of the basic approaches in the sociological theory and political science.

PSIR 105 World History, 1453-1914 (3-0)3
This course examines the rise and fall of great powers as political, military and economic entities. Since 1500, history has shown many comparable examples regarding the relation of economic and military overstretch of many great states like Ming China, Ottoman Empire, France, Great Britain, Austrian-Hungarian Empire, Prussia and the two great powers at the beginning of this century: the United States and Russia. All this will be considered in the framework of the "European Balance of Power" and the traditional "isolationist foreign policy" of the U.S. in the last century. The beginning of World War I and its implications on the world balance of power will be considered. The developments in Europe and U.S. since 1919 until today will be examined. World War I and the new political structure after 1918 will be considered from the point of global developments. World War II and the involvement of the U.S. in European

affairs, the Cold War Sovietization of Eastern Europe and the emancipation of the Third World countries are also to be discussed. The relations among the industrial and non-industrial countries in political, economic and military fields will be explained with some comments on future prospects for global developments.

PSIR 108 Issues in Global Politics (3-0)3
The aim of this course is to introduce the students to main issues in international relations discipline and provide a general framework for understanding the processes of globalisation and the changing meanings of governance and order. The impact of globalisation on different structures and processes of world politics, including security, political economy, international organisations, nationalism, environment, gender and culture will be the main focus of this course.

PSIR 110 International History, 1914-1989 (3-0)3
This course is an introduction to the international history of the 'short' twentieth century. Its primary concerns are the rise and formation of the modern international order with analysis directed at the causes and consequences of the two world wars, the processes of decolonization, the development of the Cold War and the development of international organizations and world order over the twentieth century.

PSIR 202 Constitutional Law (3-0)3
This course represents a conceptual and historical introduction to constitutional government and law. Within that framework, it also examines the constitutional movements of the Ottoman Empire and the early Republican period. In the final part of the course, the 1961 and 1982 Turkish Constitutions are analyzed with a comparative outlook.

PSIR 203 History of Political Thought I (3-0)3
This course aims to give students a broad perspective on developments in the history of political philosophy. It starts with the pre-Socratic philosophers of nature and Socratic criticism of conventions through dialogue. Following the significant turn brought by the Platonic-Aristotelian tradition, the course examines Hellenistic worldviews and medieval outlook to political affairs. It focuses on the major works of the political thinkers of the Renaissance and modern eras. It analyses Renaissance Humanism, strategic approach to political action, the scientific and intellectual revolution of the 17th Century, the birth of liberalism, the rise of democratic theory, modernity and politics, the conception of historicity and the philosophy of life. Some of the themes that are surveyed in this course are early philosophical reflection on nature and human essence, time and matter, theory of forms, questions of justice, equality and freedom, practices concerning the self and the good life, and, the rising or declining significance attributed to political participation.

PSIR 206 History of Political Thought II (3-0)3
The aim of this course is to introduce students to main issues in the international relations discipline and provide a general framework for understanding the processes of globalisation and the changing meanings of governance and order. The impact of globalisation on different structures and processes of world politics, including security, political economy, international organisations, nationalism, environment, gender and culture will be the main focus of this course.

PSIR 210 Theories of International Relations (3-0)3
This course provides a systematic and comprehensive survey of contending theories of international relations with a special reference to important theoretical debates between idealist vs realist, traditionalist vs behavioralist and realist vs neo-realist approaches. The course will also address the central assumptions and key concepts of these theoretical perspectives.

PSIR 211 Comparative Government (3-0)3
This course provides a conceptual introduction to the field of Comparative Government. After briefly analyzing the legislative, executive and judiciary branches of government, it studies the governments of the United States, the United Kingdom, France, and the Russian Federation.

PSIR 212 Comparative Politics (3-0)3
This course attempts to deal with the question of how to analyse state-society relations within a comparative perspective. On the basis of alternative methodological approaches that will be introduced and key conceptual issues examined, it will specifically focus on the (ways in which different approaches study) dynamics of change and forms of representation in both developed and peripheral, capitalist social formations.

PSIR 213 Research Methods in Social and Political Sciences (3-0)3
This course introduces the students to a range of commonly used methods of social research at an introductory level. Particular emphasis will be on the needs of research in the disciplines of political

science and international relations. The course will focus on how to formulate research questions and subsequent hypotheses, how to design a research plan, how to determine appropriate methodologies, and how to perform data analysis. The course is not restricted to purely quantitative or qualitative approaches; rather, it will emphasize determining appropriate methodologies given specific research areas of interest.

PSIR 214 War and Peace Studies (3-0)3
This course examines the historically changing expressions and meanings of war and peace. Is 'war' a distinctive form of social and political violence? Is peace simply the absence of war? Is peace or war the international norm? How have the causes of war (and peace) changed over history? How have wars been concluded and has this entailed the outbreak of peace? These and other questions are addressed in the context of the development of international relations, the international system and imperialism. The basic ideas of war studies on the one hand and peace studies on the other hand are introduced and reviewed before considering a range of theoretical approaches to the field and examining distinct historical examples of the outbreak of wars and the conclusion of 'peace'.

PSIR 234 Introduction to Foreign Policy Analysis (3-0)3
This course is intended to provide an introductory examination of the subject of foreign policy analysis. In this general context, the nature, scope and definition of foreign policy; the impact of main theories and methods of international relations on foreign policy studies; and various approaches and methods to the study of foreign policy will be covered in the lectures.

PSIR 237 Principles of Law (3-0)3
This is an introductory course in which basic concepts and general principles of law, as well as issues concerning the Turkish legal system, are studied in order to provide an introduction to legal concepts and institutions that will serve as a foundation for other courses dealing with legal studies. The scope of the course includes, but is not limited to, the characteristics of law as compared to other rules of social conduct; functions of law; basic legal concepts and legal institutions; sources of law; the court systems; and other related issues.

PSIR 303 Public International Law (3-0)3
An introductory course, dealing with sources of international law, states, individuals, recognition, international agreements, international responsibilities of states, peaceful settlement of international disputes, theory and reality in modern law of war, coercive measures, laws of land and serial warfare, laws of maritime warfare, enemy persons and property within belligerent states, neutral states, termination of war.

PSIR 304 International Organizations (3-0)3
This course examines the evolution of international organizations in relation to developments in the international system, undertaking a comparative study between the various pacts and systems prior to the foundation of the League of Nations and the United Nations system. The course addresses the relevant international organizations of the post-World War II period and the post-Cold War international system

PSIR 305 International Political Economy (3-0)3
This course is intended to provide an introduction to the different methodological approaches in the field of international political economy and to the basic concepts and issues in international politics and economics. It will also undertake a comparative analysis of alternative strategies of capitalist development and/or modes of integration into the world economy with special reference to Latin America, South and East Asia, Africa and the newly emerging market economies of the former centrally-planned economies.

PSIR 306 Process of European Integration (3-0)3
This course is designed as a general introduction to the process of European integration and the politics of the European Union (EU). The course consists of three parts: Part One traces the history of European integration from the end of the WWII through 2002. To facilitate different interpretations of the EU in the making, part one also reviews the main academic debates about European integration and about the Union. Part Two looks at EU institutions, including the formal and informal aspects of EU governance. Part Three discusses the main policy areas ranging from agriculture to EMU. On the basis of the findings drawn from the theory and practice of European integration, the course addresses the relationship of post-1995 enlargement with the challenge of deepening of the EU and challenges students to think about the future of EU integration.

PSIR 311 Nations and Nationalism (3-0)3
This course aims to critically review competing theoretical approaches to nations and nationalism. It will also seek to deepen understanding of these theories through an analysis of a number of comparative case studies drawn from Europe, Latin

America and the Middle East. This analysis will draw on historical experiences of nationalism as well as contemporary examples of nationalist political movements. The course will also include an examination of the emergence of sub-nationalist and secessionist movements and the impact that globalisation is having on nationalism today.

PSIR 314 Political Economy of Turkey (3-0)3

This course is designed to introduce students to the political economy of Turkey. The course topics are grouped according to the various political and economic issues that Turkey has faced. The course will start with the economic and political foundations of the early Turkish Republic and continue with the state-led development, agricultural policies, and import substitution industrialization experience. Later, it will focus on the political and economic crisis in the 1970s and the military coups. Next, addresses the economic and political liberalization efforts of the 1980s and the main problems faced in the 1990s. Lastly, some current issues in Turkish political economy will be discussed. Underdevelopment, the tension between democracy and economic growth, industrialization, agricultural policies, class conflicts, economic liberalization, regionalization, chronic inflation, and financial crises will be among the course topics.

PSIR 316 Understanding Capitalism (3-0)3

This course aims to introduce students to the debates on the origins, nature and development of capitalism. The course is divided into four parts: the first part introduces students to the literature on the historical origins of capitalism. The second part then looks at the nature of capitalism from a political economy perspective. The third part highlights the relationship between capitalism and the state whilst the final part focuses on theories of contemporary capitalism.

PSIR 318 Imperialism and the Making of Modern Middle East (3-0)3

This course introduces students to the history of imperial organisation, state formation and imperial interventions in the making of the modern Middle East. In particular, focus will be concentrated on four periods: first, the formal 'great power' post-Ottoman divisions of the region, the peace treaties and settlement treaties, out of which the new state order was built. The geo-politics prior to and in preparation of the Paris peace treaties, Sevres and later Lausanne will be scrutinised. Second, the geo-politics of resource access (oil) and demographic movements during and throughout the League of Nations period, up to and including the second world war will be examined. Third, the contemporaneous rise of Arab and Jewish nationalism and their imbrication in imperial and Cold War order will be studied. And finally the tensions of confessional politics in the post-Cold War order, focusing on Israel-Palestine, Iraq and Iran will be used to assess more recent expressions of imperial interventions. Whilst principally a course in international history, regular reference will be made to theories of imperialism, critical political economy and historical sociology.

PSIR 320 Interational Human Rights (3-0)3

This course introduces students to key issues concerning international human rights. The goal of the course is to provide an overview of international human rights and consider the role of human rights in the international realm. There will be an examination of treaty texts, state reports, recent research, and actual cases before international bodies, along with media presentations. The course will be conducted through readings, lectures, and student presentations.
Prerequisite: PSIR 303

PSIR 321 Political Sociology (3-0)3

This course aims to examine the major issues of political science from the vantage point of sociological theories and concepts. In this vein, the course will discuss the social origins of state, civil society, citizenship, parties and law, as the fundamental objects of inquiry in political science. The relationships between power struggles, social movements and the transformation of political structure/regime will be another central issue to be dealt with. The examination of the issues such as citizenship, democracy and civil society will be linked to some pertinent political issues such as the enlargement of the European Union and new social movements.

PSIR 322 History of Cyprus Conflict (3-0)3

This course introduces students to questions in the history of the Cyprus conflict, representing both a history of the conflict itself and an examination of the role of history in the conflict. The course will require students to examine both primary and secondary materials and to conduct research on contested issues in the island's recent history, including the role of British colonialism in the conflict, the rise of nationalist mobilization, and the increasing division of society leading to partition. Students will learn what materials are available to research Cyprus' recent history, and they will also examine the construction of history within the context of conflict.

PSIR 333 States and Societies in Central Asia (3-0)3
This course is designed as an undergraduate level interdisciplinary introduction to the states and societies of contemporary Central Asia. Fundamentally, the course aims to shed light on post-Soviet developments in the region through a critical reading of the politics, economy, society and culture of Central Asia since Russian colonization. The organization of the course includes two parts. The first part aims to familiarize the student with socio-political and cultural transformations experienced by the people of Central Asia under the colonial rule of tsarist Russia and the Soviet Union. Then the course proceeds to discuss major issue areas that have emerged in post-Soviet Central Asia and which dominate the scholarly debate in the field of Central Asia Studies. The course will consist of lectures, reading assignments, class discussions and film screenings. No special knowledge of the region on the part of students is presumed.

PSIR 341 Contemporary Social Theory (3-0)3
The course is an effort to understand the content of contemporary sociological theory that emphasizes the manner in which sociological theory provides insights in to the character and dynamics of social reality. The focus is on making the theory accessible and relevant to an intellectual community that includes not only social science students that must acquire familiarity with sociological theory, but also to a broader intellectual community of persons and groups interested in unraveling, and piecing together, characteristics of social world. The course will focus on variety of forms of what is termed sociological theory, while at the same time examining contemporary expressions of it.

PSIR 342 Southern Europe in World Politics (3-0)3
This course intends to provide the student with an understanding of Southern Europe and the Mediterranean (including theoretical and conceptual approaches). Case studies: Greece and Spain. Economic Environment: Economic development patterns; characteristics of the economic elites; state as an actor in the economy; the role of foreign economic aid and foreign investment. Political Environment: The nature of the political establishment; authoritarianism; democratization; the role of individual leaders. External Environment: Supportive and reactionary responses in the international system (intervention, solidarity, etc.); foreign policy behavior; the role of the USA, EEC/EC/EU and USSR/Russia.

PSIR 343 International Development (3-0)3
This course is designed to build a core understanding of the basic theories, concepts, and policies of international development. Major contemporary issues facing Third World countries (e.g. industrialization, urbanization, agricultural development, poverty, gender and development, environmental degradation) are also examined.The course is multi-disciplinary as it draws on history, economics, politics, and sociology to discuss the problems and prospects of development. It will be integrating theory with practice in development. All issues will be examined from diverse perspectives, and students will learn to integrate and reconcile these diverse views.

PSIR 345 Turkish Foreign Policy (3-0)3
The course aims to identify and analyze various factors contributing to Turkey's foreign policy orientation. While the main focus of this course is the political dynamics and issues of Turkish foreign policy after World War II, the problems and determinants of Turkish foreign policy between 1919-1945, with reference to past experiences and geopolitical imperatives placing certain constraints on the state's decision makers, will also be briefly discussed.

PSIR 381 Development and the Developing World (3-0)3
This course aims to provide an introduction to the study of development and the developing world. It introduces students to the key theoretical perspectives and conceptual frameworks through a wide-ranging analysis of contemporary issues in Third World development. By using an interdisciplinary approach the course hopes to explore the nature of structural changes taking place in the developing world. It will cover a variety of development problems and issues and explore different interpretations of such issues. The first part of the course focuses on definitions and theories of development, providing an historical account of the evolution of development theory and practice in recent decades. The second part of the course consentrates on key development strategies by paying specific attention to the role of state and international agencies.

PSIR 400 Graduation Project (3-0)3
Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

PSIR 401 Contemporary Political Theory (3-0)3

This course is aimed to introduce students to the works of major political thinkers of the 20th Century with the central focus on the problems of domination and inequality. It begins with the four major thinkers of the previous century who have influenced heavily the 20th Century political philosophy: Kant, Hegel, Nietzsche and Marx. It then examines, Arendt, Althusser, Foucault, Habermas, Rawls and Mouffe with the aim of reaching certain generalizations and comparisons.

PSIR 403 Contemporary Issues in Global Political Economy (3-0)3

This course aims to introduce students to the core theoretical debates and empirical issue-areas of contemporary Global Political Economy (GPE), and to develop their research and critical analysis skills in the study of GPE. The course is divided into three parts. In the first part, it introduces students to the historical and theoretical foundations of GPE. The second part then looks at core GPE issues such as economic globalization, neoliberalism and state restructuring. The last part focuses on broader GPE issues such as global inequality, labour and social justice movements in the North and South.
Prerequisite: PSIR 305

PSIR 404 Contemporary Issues in War and Peace (3-0)3

This course is a capstone course for the war, peace and security studies courses in the PSIR programme, bringing together the theories, concepts, methods, historiographical debates and techniques developed in earlier courses and now brought to bear in the analysis of current expressions of war and peace. Current and recent examples of war and of peace negotiations and settlements, including post-war reconstruction, will be examined. The course will select, on a case study basis, current or recent examples for examination.
Prerequisite: PSIR 214.

PSIR 413 Comparative Political Cultures: Greece, Turkey, Cyprus (3-0)3

This course provides a comparative introduction to political cultures in the eastern Mediterranean, with a specific focus on Greece, Turkey, and Cyprus. The course will explore the ways in which citizens in a nation-state, or those who aspire to build a nation-state, legitimize politics, define inclusion in the nation, and formulate the rights and responsibilities of citizens. We will draw upon the anthropological and sociological literature on the region to examine the norms, symbols, and practices of politics, including the formation and often contradictory practices of nationalist ideologies. The latter half of the course will focus on the emergence of nationalisms in Cyprus as an instance of divisive political cultures, as well as on more recent attempts to formulate an anti-nationalist politics.

PSIR 415 A Global Political Economy of Environment and Energy (3-0)3

This course will introduce students to the principal political economic debates, controversies and policies that have developed regarding key aspects of global environmental change. In addition to a brief examination of the international history of environmental change, the course seeks to focus on a select number of environmental problems and to discuss some of the proposed remedies for environmental harms or policies for 'sustainability'. This course forms an introduction and foundation for anyone interested in the problems of environment and energy. Insofar as it is possible and desirable, a non-technical approach will be taken in the organisation and study of this course.

PSIR 416 Terrorism and Global Society (3-0)3

This course introduces students to questions regarding the contemporary nature of terrorism, and in particular will examine the global, political, economic and cultural roots of terrorism and terrorist groups. There will be an examination of theoretical debates on terrorism as well as detailed analysis of case studies, past and present. The course will also examine the relationship between the United States and terrorist groups during the Cold War period and contrast this with its present day 'War on Terror'. This course will be conducted through discussions of leading theories of nations and nationalism as well as examination of different case studies.

PSIR 418 Humanitarian Law (3-0)3

This course introduces students to key issues concerning international humanitarian law. The goal of the course is to provide an overview of international humanitarian law and consider the role of humanitarian law in the international realm. There will be an examination of treaty texts, recent research, the role of human rights, and actual cases before international bodies. The course will be conducted through readings, lectures, and student presentations.
Prerequisite: PSIR 303.

PSIR 420 Politics and Society in Turkey (3-0)3

This course introduces five political and sociological themes in the study of Turkish society, which are discussed and analyzed from different

perspectives. These themes and issues have both historical roots and incessant actuality. In view of this, these themes could function as vantage points for developing a coherent perspective to the historical transformation as well as to the current structure of Turkish society. These issues include

a) State apparatus in Turkey, which will deal with the topics such as democratisation in Turkey, center-periphery paradigm, the role of military in Turkish political history.
b) Nationalism in Turkey, which will cover the themes such as Kemalism, citizenship practices, ethnicity and race, ultra-nationalism in Turkish politics.
c) Religion and Politics in Turkey, which will elaborate on secularization, laicism, the rise of Islamic conservatism in Turkish society.
d) Gender and Society in Turkey, which willl focus on nationalism and women, Muslimhood and women, Kemalism and women and feminist movement in Turkey.
e) Urban Life in Turkey, which will examine trajectory of urbanization, migration and urban poor.

PSIR 421 Transitional Justice (3-0)3

How do states or societies that have suffered massive human rights abuses deal with the complex legacies of their past as they transition to peace and democracy? What can policymakers or activists do to defuse the bitterness of past conflict or repression and meet rhetorical and political demands for justice?

This course examines the ethical, political, legal, and practical challenges that states face when trying to overcome the legacy of a violent past. It begins by looking at the development of transitional justice as field of political and social activism, including its relationship to political science and international law. It sets out the developing legal framework that supports such activism, as well as the practical constraints and ethical dilemmas that both characterize such contexts and make transitional justice such a complicated field.

PSIR 423 Historical Sociology and International Relations (3-0)3

This course provides a critical analysis of different historical sociological approaches to international relations. It aims to provide a comprehensive account of international political and economic change. Can international relations be explained only as an interaction between states? What is the effect of war on social change? What is the relation between capitalism and the international state system? Does domestic class structure of societies and their economic transformation effect international change? This course will adress these questions in the context of different historical sociological approaches thus analysing the overlapping concerns of international relations, history and sociology.

PSIR 425 Ethics and International Relations (3-0)3

This course provides a framework for discussing the ethical dimensions of international relations. It aims to provide students with different approaches to international ethics. Is ethics only what the powerful say? Is it possible to have a moral foreign policy? Under what circumstances is it legitimate to intervene into the affairs of another state? How can we define the national interest? Can ethics and international business coincide? What are the ethical issues involved in global climate change? Do the rich nations owe to help the poor ones? This course will adress these questions in the context of different ethical traditions in international relations.

PSIR 431 Law and Institutions of the European Union (3-0)3

The course is designed as a general introduction to the primary and secondary sources of European law covering European institutions involved in the European law making process. The materials follow three basic themes: 1) The constitutional and institutional architecture of the Union and its evolution, 2) Select issues of EU-Turkey relations, and 3) Incorporation of European law into national legislation. Attention focuses on equipping the students with the basic information necessary to understand the basic principles of European legal integration.

PSIR 451 Theory of Democracy (3-0)3

In this course the concept of democracy is studied from its genesis to our day. The analysis includes different theories and aims to provide the student the ability of critically compr-ehending and evaluating the practice(s) of democracy in the contemporary world.

NORTHERN CYPRUS CAMPUS

PSYCHOLOGY PROGRAM

GENERAL INFORMATION: The undergraduate program is designed to acquaint students with a broad knowledge and basic skills in the main fields of psychology. The required courses aim to equip students with the basics of different fields of psychology, such as social, clinical, developmental, industrial/organizational, physiological, and health psychology, and methodologies employed in psychological research. In addition to the required courses, students are expected to take a minimum of 13 elective courses. Six of these courses are departmental elective courses (see the list below) and aim to provide students with in-depth knowledge in their areas of interest in psychology. Six non-departmental elective courses aim to introduce students other scientific disciplines which are closely related to psychology (e.g., sociology, philosophy, economics, etc.). By offering a broad spectrum of elective courses, the undergraduate program gives the students opportunity to specialize in different areas of psychology and to get familiar with the interdisciplinary nature of social sciences.

CAREER OPPORTUNITIES: Students graduating from psychology department can work in hospitals, counseling centers (e.g., health centers of universities), nursery schools and higher level schools, research institutions, or assume administrative and research positions at state institutions. They can also work at various advertisement firms, and other public and private organizations to develop assessment techniques for selection, placement, and to coordinate human relationships, public relations, and human resources. Naturally, the level at which they will be employed and the nature of their responsibilities will tend to vary depending on their post-graduate qualifications and the requirements of the related institutions. A significant number of graduates may also work towards a masters' degree for specialization or study in a Ph.D. program with the goal of becoming an academician.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

PSYC	101	Introduction to Psychology I	(3-0)3
PSYC	116	Statistics for Psychology I	(3-2)4
XXX	xxx	Non-Dept.Elect. (SOCL)	(3-0)3
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
BIOL	106	General Biology	(3-0)3
TUR	101[a]	Turkish I	(2-0) NC
GPC	100	First Year on Campus Seminar	(0-2)1

Second Semester

PSYC	102	Introduction to Psychology II	(3-0)3
PSYC	113	Research Meth.in Psych. I	(3-2)4
XXX	xxx	Non-Dept.Elect.(PHL)	(3-0)3
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
TUR	102[a]	Turkish II	(2-0)NC
CNG	100	Intr. to Information Tech.and Applications	(2-0)NC

SECOND YEAR

Third Semester

PSYC	217	Statistics for Psychology II	(3-2)4
PSYC	221	Developmental Psychology I	(4-0)4
PSYC	251	Social Psychology I	(3-0)3
PSYC	281	Exp.Psychology I: Learning	(3-0)3
ENGL	211	Acad. Oral Pre. Skills	(3-0)3
HST	201[b]	Principles of Kemal Atatürk I	(2-0)NC

Fourth Semester

PSYC	214	Research Meth.in Psych. II	(3-2)4
PSYC	200	Ethics in Research and Practice of Psychology	(2-0)2
PSYC	222	Developmental Psych. II	(4-0)4
PSYC	252	Social Psychology II	(3-0)3
PSYC	284	Exp.Psych. II: Cognition	(3-0)3
XXX	xxx	Non-Depart. Elective	(-)3
HST	202[b]	Principles of Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester

PSYC	331	Testing & Meas. in Psych.	(3-2)4
PSYC	335	Industrial Psychology	(3-2)4
PSYC	340	Theories of Personality	(4-0)4
PSYC	xxx	Departmental Elective	(-)3
XXX	xxx	Non-Departmental Elective	(-)3

Sixth Semester

PSYC	342	Psychopathology	(4-0)4
PSYC	374	Biological Psychology	(4-0)4
ENGL	311	Advan.Communic.Skills	(3-0)3
XXX	xxx	Non-Departmental Elective	(-)3
XXX	xxx	Non-Departmental Elective	(-)3

FOURTH YEAR

Seventh Semester

PSYC	442	Clinical Psychology	(4-0)4
PSYC	449	Intr.to Health Psychology	(3-0)3
PSYC	xxx	Departmental Elective	(-)3
PSYC	xxx	Departmental Elective	(-)3
PSYC	xxx	Departmental Elective	(-)3
PSYC	400	Summer Practice	NC

Eighth Semester

XXX	xxx	Free Elective	(-)3
PSYC	xxx	Departmental Elective	(-)3
PSYC	xxx	Departmental Elective	(-)3
PSYC	xxx	Departmental Elective	(-)3
PSYC	xxx	Departmental Elective	(-)3

[a] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.
[b] International students will take HST 205 and HST 206 instead of HST 201 and HST 202..

ELECTIVE COURSES

PSYC	240	Coping with Stress
PSYC	272	Human Nervous System
PSYC	282	Experimental Psychology II: Perception
PSYC	301	Background in Psychology
PSYC	302	Visual Perception
PSYC	312	Experimental Design and Analysis
PSYC	320	Topics in Developmental Psychology
PSYC	321	Cognitive Development
PSYC	322	Social Development
PSYC	332	Intelligence Testing
PSYC	336	Organizational Psychology
PSYC	341	Psychology of Adjustment
PSYC	343	Topics in Clinical Psychology
PSYC	345	Speech And Language Pathology
PSYC	347	Counseling the Communicatively Disordered
PSYC	349	Aging and Communication Disorders
PSYC	350-353	Topics in Social Psychology
PSYC	352	Environment and Behavior
PSYC	354	Introduction to Traffic Psychology
PSYC	357	Culture and Relationship
PSYC	358	Social Identity, Majority-Minority Relations and Acculturation
PSYC	371	Emotion
PSYC	372	Motivation and Emotion
PSYC	380	Topics in Experimental Psychology
PSYC	381	Cognitive Processes I
PSYC	382	Cognitive Processes II
PSYC	384	Speech Perception
PSYC	385	Introduction to Cognitive Science
PSYC	386	Auditory Perception
PSYC	390-399	Workshop
PSYC	410	General Experimental Psychology
PSYC	414	Computer Applications in Psychology
PSYC	420	Experimental Child Psychology
PSYC	421	Topics in Developmental Psychology
PSYC	422	Language Acquisition and Development
PSYC	424	Applied Developmental Psychology
PSYC	426	Childhood Psychopathology
PSYC	431	Personality Assessment
PSYC	432	Job Analysis and Performance Appraisal

PSYC	434	Industrial and Organizational Psychology	PSYC	452	Psychology of Gender
PSYC	436	Job Analysis and Personnel Selection	PSYC	454	Social Psychological View of Media
PSYC	440	Topics in Clinical Psychology	PSYC	455	Psychology of the Self and Attachment
PSYC	441	Theories of Psychotherapy	PSYC	456	Applied Social Psychology
PSYC	443	Community Psychology	PSYC	460	Issues in Contemporary Psychology
PSYC	447	Family Therapy Approaches	PSYC	470	Systems and Theories in Psychology
PSYC	448	Methods of Family Therapy	PSYC	483	Psychopharmacology
PSYC	450	Topics in Social Psychology			
PSYC	451	Experimental Social			

DESCRIPTION OF COURSES

PSYC 100 General Psychology (3-0)3
This course aims to provide a general overview of theoretical and empirical areas of literature in psychology for non-psychology students. Students are exposed to major areas of psychology such as physiological psychology, developmental psychology, learning, memory and perception, personality and social psychology, and psychopathology. Individual instructors may tailor the course in accordance with the needs of the students taking the course. (Elective for non-Psychology Program students).

PSYC 101 Introduction to Psychology I (3-0)3
An introduction to general theories and methods of psychology; basic concepts and research findings in major areas of psychology, such as perception, learning, cognition and emotion.

PSYC 102 Introduction to Psychology II (3-0)3
A continuation of PSYC 101. Basic concepts and research findings in the areas of developmental psychology, personality, individual differences, abnormal behavior, psycho-therapy and social psychology.

PSYC 113 Research Methods in Psychology I (3-2)4
This course is intended, first, to introduce the basic concepts of psychological research, such as the relationship between theory and research formulating and testing hypotheses, ethics in research, presentation of results, and second, to explain the nature of and problems associated with observational research in psychology. In addition to three lecture hours a week, two hours will be devoted to the discussion, exemplification, and application of the basic principles of sound psychological research.

PSYC 116 Statistics for Psychology I (3-2)4
This course will introduce the basics of descriptive statistics and the principles of hypothesis testing. Methods of summarizing data, principles of probability, and basic assumptions and methods of hypothesis testing will be discussed as they relate to psychological research. The course will include weekly problem sessions (2 hours a week) to reinforce the learning of the principles by application.

PSYC 214 Research Methods in Psychology II (3-2)4
This course aims to familiarize students with the use of experimental methods in psychology. The content will include basic principles of good experimentation, between group and within-group experiments, how to deal with the problems associated with these kinds of experiments, design and interpretation of factorial experiments. During the course of the semester, students will be required to create a simple experiment of their own, collect data, and report the result in a computer generated report in the appropriate format.
Prerequisite: PSYC 113.

PSYC 217 Statistics for Psychology II (3-2)4
This course is intended to introduce the methods of statistical hypothesis testing that are used frequently in more complex research designs in psychology. The main part of the course will cover the use of Analysis of Variance (ANOVA) in analyzing psychological data. In addition, the use of non-parametric tests and the issue of statistical power will be discussed.
Prerequisite: PSYC 116.

PSYC 221 Developmental Psychology I (4-0)4

An integrated account of the various approaches to human development emphasizing the relevant research findings in this area with special reference to psycho-motor, mental, emotional and social development from birth through adolescence. Discussion of basic issues in developmental psychology.

PSYC 222 Developmental Psychology II (4-0)4

Review of theory and research on psychological problems associated with different periods of life. Adolescence, early and late adulthood, family, parenthood, work environment and retirement. Old age, abilities and psychological development of the elderly.

PSYC 251 Social Psychology I (4-0)4

Introduction to the field and methods of social psychology; historical perspective, review of theoretical and empirical work related to areas such as social perception, cognition, attitude formation, change and measurement.

PSYC 252 Social Psychology II (4-0)4

Review of theoretical and empirical work in the areas of interpersonal attraction, group processes including norms, conformity, negotiation, cooperation, conflict, leadership, productivity and socialization processes such as sex-role learning and pro and antisocial behavior.

PSYC 281 Experimental Psychology I: Learning (4-0)4

A course designed to acquaint the students with the experimental literature of the psychology of learning. Areas of major emphasis are principles of classical and instrumental conditioning, reinforcement and its patterns, extinction, relation of learning to motivation, generalization and discrimination. A selective treatment of major learning theories in various contexts is distributed throughout the course material.

PSYC 284 Experimental Psychology II: Cognition (4-0)4

A survey course built upon the experimental cognitive approach to human information processing. Topics to be covered include sensory memory, attention, pattern recognition, short-term storage and processing, non-acoustic coding and forgetting in short-term memory.

PSYC 331 Testing and Measurement in Psychology (3-2)4

Students wil be exposed to the basic principles of measurement in psychology; norm development validity, reliability, and related statistics. Special emphasis will be given to test development and use of tests. Nature of abilities, intelligence and issues in intelligence testing are among the other topics covered in this course.

PSYC 335 Industrial Psychology (3-2)4

This course provides a general overview of industrial psychology. Topics, such as methods used in the science and practice of industrial psychology, job analysis, criterion development, personnel selection, placement and training, and performance appraisal are covered with the purpose of providing a foundation in both theoretical and applied areas of the field.

PSYC 340 Theories of Personality (4-0)4

A survey of different theories and approaches to the study of personality. Comparison, critique and evaluation of different theories.

PSYC 342 Psychopathology (4-0)4

Historical review of the field; concepts of normal and abnormal behavior; theoretical approaches to abnormal behavior; examination of the types of adulthood psycho pathology as proposed in the latest classification system.

PSYC 343 Topics in Clinical Psychology * (3-0)3

The course objective is development of knowledge and understanding of the basic skills of clinical interview. By the end of the course, students will have the knowledge and understanding of the basic skills of clinical interview.

PSYC 350-353 Topics in Social Psychology * (3-0)3

This course will focus on the topic of close relationships. The course expands on what students have learned about this topic in PSYC 252 by addressing in more depth a number of questions, which include why we fall in love with particular individuals, the qualities we look for in potential mates, causes of relationship dissolution, and factors that help relationships endure. Students will be introduced to basic research and theory in this subarea of social psychology. There may be prerequisites as per the consent of the instructor.

PSYC 374 Biological Psychology (4-0)4

The physiological basis of behavior; study of sensory, neural and motor structures for sensory coding, hunger and thirst, sleep-waking cycle,

communication emotion, learning, and psychosomatic disorders.

PSYC 380 Topics in Experimental Psychology* (3-0)3

This course aims at expanding students' knowledge in the area of experimental psychology by focusing on a select number of topics tackled by psychologists. Students will learn to critically read and analyze journal articles addressing experimental questions on topics such as learning, perception, memory, and social behavior. Through readings and class discussions, students will become well versed with various experimental designs and methods employed by experimental psychologists. There may be prerequisites as per the consent of the instructor.

PSYC 384 Speech Perception & Development (3-0)3

The aim of this course is to teach the acoustics of speech and its perception. Basic concepts are explained. Then these concepts are applied to the description of speech sounds, and acoustic research on the perception of speech sounds and their meanings are presented.
Prerequisite: PSYC 284.

PSYC 400 Summer Practice NC

This course is designed to give studens a first hand experience in the application of psychology in real life setting. Students will have the opportunity to make observations and applications related to psychology in various institutions. They are expected to develop an understanding of practical issues relevant for the applications of their theoretical knowledge. The course also aims to give students an appreciation of ethical guidelines for the professional conduct of psychology.

PSYC 410 General Experimental Psychology (3-0)3

A course designed to acquaint the student with experimentation and report-writing in a problem area of experimental psychology. Typically, the student finds a research problem, designs an experiment, collects dara, analyzes and interprets data and writes an article based on the experiment.

PSYC 421 Topics in Developmental Psychology* (3-0)3

The aim of this course is to look at psychopathology from a developmental perspective while familiarizing students with the main disorders of childhood.

PSYC 422 Language Acquisition & Development (3-0)3

This course focuses several aspects of language development: audio-visual speech perception, contemporary models and theories of speech perception and development and developmental language disorders.

PSYC 434 Topics in Industrial & Organizational Psychology (3-0)3

The course provides a detailed review of the current issues, theories, and applications in I/O psychology. Topics covered include job analysis and applications; personnel selection systems and techniques; the turnover process; performance and management theory and practice; human factors in work organizations; organizational culture and climate; leadership; and cross cultural I/O issues.
Prerequisite: PSYC 335

PSYC 440 Topics in Clinical Psychology * (3-0)3

A review of classical and contemporary schools of psychotherapy as well as current research and applied issues in clinical psychology.

PSYC 441 Theories of Psychotherapy (3-0)3

Survey of different schools of psychotherapy. Review of psychotherapy research, critique and ethical standards for therapists.

PSYC 442 Clinical Psychology (4-0)4

Historical development and relationships with other disciplines; review of recent theories and research in the major areas of clinical psychology such as measurement of abilities, personality assessment, psychotherapy and prevention of behavior disorders; clinical psychology as a profession; training, legislation, licensing and ethical standards. Visits to settings where clinical psychologists are working may be arranged.

PSYC 444 Undergraduate Research Thesis (0-6)3

PSYC 444 is a fourth-year thesis course. Students enrolled in this course will run a semester long undergraduate research thesis in an area of their choice with a faculty member who is an expert in that area. The 30% of this course will be assessed with a research proposal and the remainder 70% will be assessed with an empirical thesis submitted during the final exams period.

PSYC 449 Introduction to Health Psychology **(3-0)3**

This course is designed to explore the bio-psychosocial factors associated with health and wellness. The aim of the course is to familiarize students with behavioral changes that facilitate the acquisition and maintenance of health, primary and secondary prevention, and the role of psychosocial factors such as stress in the development of illness. Multicultural aspects of health behavior will be examined throughout the course.

PSYC 450 Topics in Social Psychology * **(3-0)3**

Main objectives of this course are to make students to acquire knowledge and appreciation of biopsychosocial and behavioral factors associated with health, wellness and illness, to encourage them to develop skills and behavioral strategies for lifestyle change and to promote health and wellness, and to make them recognize the importance of assuming responsibility for making significant choices that enhance quality of life and personal contribution to society.

NORTHERN CYPRUS CAMPUS

TEACHING ENGLISH AS A FOREIGN LANGUAGE PROGRAM

GENERAL INFORMATION: The B.A. Program in Teaching English as a Foreign Language provides students with the opportunity to expand and refine their knowledge of English and equips them with the means and resources to assist their students in learning English. Students learn the best practices in the planning, teaching and evaluating of second language instruction and are given the opportunity to observe how these practices are implemented in local schools. To address some of the needs of globalization, students are also provided with courses in a second foreign language, which they learn to actively use in communication and to obtain or reinforce knowledge of other subject areas. The program provides students with a wide selection of elective courses mainly focusing on English literature and translation. Most of these courses are also open to interested students studying at the METU Northern Cyprus campus, giving them the opportunity to learn English literature and practice translation from English or another European language to Turkish.

CAREER OPPORTUNITIES: Graduates of this program will be certified English teachers and will be qualified to work as English teachers, curriculum designers and material developers at public and private schools and universities as well as in other areas requiring advanced English language skills.

UNDERGRADUATE CURRICULUM

FIRST YEAR

(0-2)1

First Semester				Second Semester			
EFL	121	Contextual Gram.&Comp. I	(3-0)3	EFL	122	Contextual Gram.&Comp. II	(3-0)3
EFL	123	Listening and Pronunciation	(3-0)3	EFL	124	Oral Communication Skills	(3-0)3
EFL	125	Advanced Read.&Writing I	(3-0)3	EFL	126	Advanced Read.&Writing II	(3-0)3
XXX(*)	201	Basic German I / Basic French I	(4-0)4	EFL	130	Introduction to Literature	(3-0)3
EDUS	200	Introduction to Education	(3-0)3	XXX(*)	202	Basic German II / Basic French II	(4-0)4
TUR	103(a)	Turkish I: Written Comm.	(2-0)2	TUR	104(a)	Turkish II: Oral Comm.	(2-0)2
CNG	100	Introduction. to Information Tech. and Applications	(2-0)NC				
GPC	100	First Year on Campus Seminar					

SECOND YEAR

Third Semester				Fourth Semester			
EFL	211	English Literature I	(3-0)3	EFL	212	English Literature II	(3-0)3
EFL	245	Linguistics I	(3-0)3	EFL	244	Translation Studies	(3-0)3
EFL	249	ELT Methodology I	(3-0)3	EFL	246	Linguistics II	(3-0)3
XXX(*)	203	Intermediate German I / Intermediate French I	(4-0)4	EFL	250	Oral Expr. &Publ.Speaking	(3-0)3
EDUS	220	Educational Psychology	(3-0)3	EFL	254	ELT Methodology II	(3-0)3
EFL	xxx	Departmental Elective I	(3-0)3	EFL	xxx	Departmental Elective II	(3-0)3

THIRD YEAR

Fifth Semester

EFL	311	Adv.Writng&Research Skills	(3-0)3
EFL	313	Language Acquisition	(3-0)3
EFL	315	Contast. Turkish-Engl. Struc.	(3-0)3
EFL	319	Drama Analysis	(3-0)3
EFL	321	Teaching Language Skills – Speaking and Listening	(3-0)3
CTE	319	Instr.Tech. &Mater.Develop.	(3-0)3
HST	201[(b)]	Principles of Kemal Atatürk I	(2-0)NC

Sixth Semester

EFL	318	Novel Analysis	(3-0)3
EFL	320	Teach.Engl.to Young Learn.	(3-0)3
EFL	322	Teaching Language Skills – Reading and Writing	(3-0)3
EFL	324	Community Service Practice	(1-2)2
EDUS	304	Classroom Management	(3-0)3
EDUS	416	Turk.Edu.Sys. &Sch. Mang.	(3-0)3
XXX	xxx	Non-Departmental Elec. I	(3-0)3
HST	202[(b)]	Principles of Kemal Atatürk II	(2-0)NC

FOURTH YEAR

Seventh Semester

EFL	411	The English Lexicon	(3-0)3
EFL	413	Eng.Lang.Test.&Evaluation	(3-0)3
EFL	415	Mat.Adap. & Development	(3-0)3
EFL	417	School Experience	(2-4)4
XXX	xxx	Non-Departmental Elec. II	(3-0)3

Eighth Semester

EFL	414	Schools of Modern Thought	(3-0)3
EFL	418	Practice Teaching	(1-6)4
EDUS	424	Guidance	(3-0)3
EFL	xxx	Departmental Elective III	(3-0)3

[(a)] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.
[(b)] International students will take HST 205 and HST 206 instead of HST 201 and HST 202.

[(*)] FRN ya da GRM kodlu dersler.

ELECTIVE COURSES

The following courses may be offered as electives:

- EFL 260 The Novel I
- EFL 261 The Novel II
- EFL 262 Shakespeare
- EFL 263 Modern Drama
- EFL 264 Poetry
- EFL 265 Literary Theory
- EFL 266 Comparative Literature
- EFL 267 The Renaissance
- EFL 268 History of Ideas
- EFL 269 Mythology
- EFL 270 American Literature
- EFL 274 European Theater
- EFL 275 Postmodern Literature
- EFL 276 European Arts in Context, 1800 to 1918
- EFL 277 20th Century European Arts
- EFL 278 Global English
- EFL 279 Sociolinguistics and Intercultural Communication
- EFL 280 Etymology
- EFL 285 Language and Culture

DESCRIPTION OF COURSES

EFL 121 Contextual Grammar and Composition I (3-0)3

This course aims to develop students' grammatical competence in English by increasing awareness of how meaning is created through structure and how structure and vocabulary are related to produce texts. This course will enable students to employ these structures in context starting from narrative, descriptive and expository paragraph levels to the introduction of full essays.

EFL 122 Contextual Grammar and Composition II (3-0)3

This course is a continuation of EFL 121 Contextual Grammar and Composition. It aims to improve students' use of linguistic structures at the discourse

level focusing on relation between form and text type. Students will examine texts that increase sensitivity to grammar in context and will produce comparison and contrast, classification, process analysis, cause and effect analysis and argumentative essays.

EFL 123 Listening and Pronunciation (3-0)3

This course aims to develop students' listening and pronunciation skills by providing them with the fundamentals of listening and phonetics—vowels, consonants, stress in words, rhythm and intonation--as well as the usage of phonetic alphabet. Students will be exposed to authentic listening materials; and the course, starting from basic listening and phonetic skills such as discriminating minimal pairs and formulating phonetic transcriptions of problematic sounds in class, will also focus on higher level listening skills and strategies such as note-taking, predicting, extracting information and guessing meaning from context.

EFL 124 Oral Communication Skills (3-0)3

This course offers a variety of different communication oriented speaking opportunities for students to improve their oral competence by developing effective language use both in formal and informal contexts. Students will develop a good command in supra-segmental features (pitch, stress and intonation) as well as strategic competence, in repairing communication breakdowns. By exploring components of communicative competence this course aims to equip students with the necessary skills to become successful communicators as well as language teachers. The course includes discussion topics, literary texts and the use of audiovisual aids (OHP, power point, posters) and techniques for effective presentations.

EFL 125 Advanced Reading and Writing I (3-0)3

This course aims to improve students' reading proficiency, effective critical thinking and study skills by exposing them to authentic academic texts in order to comprehend contrasting viewpoints and to predict and identify main ideas and to decode intersentential clues. Critical thinking skills such as analyzing, synthesizing and reacting on the basis of evaluation are employed in students' writing as an integral part of critical reading skills.

EFL 126 Advanced Reading and Writing II (3-0)3

This course is a continuation of EFL 125 Advanced Reading and Writing I. By processing authentic reading texts students will be able to make inferences and deductions and read between the lines. By means of the awareness gained from the texts, students will analyze, synthesize and evaluate information and react to readings in their compositions and develop basic research skills including library/ internet search and basic research report writing skills such as citing, paraphrasing and referencing.

EFL 128 English-Turkish Translation (3-0)3

Skills necessary for dealing with a broad range of translation problems through analysis, discussion and practice with a variety of texts.

EFL 130 Introduction to Literature (3-0)3

This course aims to introduce fundamental terms and techniques of literary analysis through selected texts from various genres and periods.

EFL 211 English Literature I (3-0)3

This course aims to introduce intensive study of advanced level literary texts representing different periods and genres of English literature up to the 18th Century

EFL 212 English Literature II (3-0)3

This course is a continuation of EFL 211 and aims to introduce intensive study of advanced level literary texts representing different periods and genres of English literature from the 18th Century to the present.

EFL 244 Translation Studies (3-0)3

Examines fundamental theories and approaches in translation studies. Aspects of translation to be examined include style, word selection, cultural aspects of translation, and the role and importance of translation in language teaching. Readings covering historical and contemporary issues in the field of English language translation are included.

EFL 245 Linguistics I (3-0)3

Introduction to language, brain and language, phonetics, phonology and morphology of English.

EFL 246 Linguistics II (3-0)3

Syntax, semantics, the functioning of language in society, pragmatics.

EFL 247 Turkish-English Translation (3-0)3

Skills necessary for dealing with a broad range of translation problems through analysis, discussion and practice with a variety of texts.

EFL 249 ELT Methodology I (3-0)3

Developing students' awareness concerning the relationship between linguistics, psychology and educational psychology; enabling students to make

presentations with major approaches, methods and techniques of teaching English.

EFL 250 Oral Expression and Public Speaking (3-0)3
This course is an introduction to public speaking and focuses on development of practical skills for effective communication. Students will deliver extended presentations as an outcome of extensive reading and research. The course also aims to foster students' oral and written language skills in job related situations such as interviewing, socializing, telephoning, presenting information, holding meetings as well as CV and application writing.

EFL 252 Instructional Principles and Methods (3-0)3
This course introduces fundamental educational concepts; learning and teaching principles; the importance and advantages of planning in learning; planning teaching on daily and yearly basis as units with examples of activities; learning and teaching strategies; teaching methods and techniques and their relation to teaching; tools and materials in teaching; responsibilities and duties of teachers in developing the quality of teaching and teachers.

EFL 254 ELT Methodology II (3-0)3
Skills necessary for teaching different language skills to learners of all age groups and language proficiency levels with special emphasis on learning and teaching strategies, lesson planning and class management.

EFL 262 Shakespeare (3-0)3
This course is an introduction to the works of Shakespeare as literature and as theatre. At least three of four genres (comedy, history, tragedy, romance) are considered, with emphasis on close analysis of the text, historical background, and thematic and dramatic structures. This course will approach Shakespeare's plays from cultural, theatrical, and literary viewpoints.

EFL 263 Modern Drama (3-0)3
Drama is introduced as a literary genre with emphasis on origins of drama and traditional modes, modern movements and principles of critical evaluation. A brief history of drama from its origins to the birth of modern theatre is introduced and discussed with selected representative plays

EFL 264 Poetry (3-0)3
This course aims to introduce elements, literary devices, and forms of poetry. Analysis of poems in English from a variety of time periods and contexts is emphasized.

EFL 266 Comparative Literature (3-0)3
This course explores a variety of approaches to the comparative or transnational study of literature through readings of several kinds: texts from different cultural traditions that raise questions about the nature and function of literature; texts that comment on, respond to and rewrite other texts from different historical periods and nations; translations; and readings in critical theory. The course will address themes such as race, class, gender and sexuality, religion, colonialism, immigration, exile, and integration and alienation in relation to key literary texts.

EFL 269 Mythology (3-0)3
This course will investigate mythological narratives that have shaped human actions, art and thought across space and time. Students will learn approaches to myth analysis, and identify cross-cultural commonalities in myths, as well as what they reveal about specific cultures -- European, Middle Eastern, Native American, Indian, Pacific, and others. The primary focus will be on myths about language itself, including language origins, the magical power of names and words, the search for original or perfect languages, the intellectual and political ramifications of such searches, and 'modern myths' about language held even today.

EFL 270 American Literature (3-0)3
This course is a thematic survey of American literature. Students will read short stories, poems, and novels, that address or help to define the formation of the United States and theories of government; literature written by and about slavery and racial prejudice; literature that defines the philosophy of transcendentalism; and works that have contributed to diversity in American culture.

EFL 271/291 Second Foreign Language I (3-0)3
German Language Structure I:
Language training in German; German grammar, German grammar compared to English grammar. French Language Structure I: Language training in French language with focus on grammar, explaining the grammatical structure of French.

EFL 272/292 Second Foreign Language II (3-0)3
German Language Structure II:A continuation of EFL 271.
French Language Structure II :A continuation of EFL 291.
Prerequisite: EFL 271 / 291.

EFL 273/293 Second Foreign Language III (3-0)3
Read. Comprehension and Writing in German I: Developing reading and writing skills in German;

textual practice of the grammatical knowledge of the German language.
Read. Comprehension and Writing in French I: Developing reading and writing skills and textual practice of the grammatical knowledge of the French language.
Prerequisite: EFL 272 / 292

EFL 276 European Arts in Context: 1800-1918 (3-0)3
This course explores the major 19th century art movements of Europe to the end of World War I and the cultural contexts within which they existed. The movements to be discussed include Romanticism, Realism, Impressionism, Post-Impressionism, Cubism, and Fauvism as well as the invention of photography. Selected examples from the visual arts, literature, and music will be discussed in conjunction with contextually related political, economic, social, and philosophical occurrences.

EFL 277 20th Century European Arts (3-0)3
This course explores the major 20th century art movements of Europe and the cultural contexts within which they existed. Some of the movements to be discussed include Dadaism, Surrealism, the Bauhaus School, Performance Art, Conceptual Art, and Neo-Expressionism. In addition, philosophical and critical schools such as feminism, existentialism, and the Frankfurt School will be considered as well as stylistic trends and developments in European cinema. Selected examples of visual arts, films, and literary works will be discussed in conjunction with contextually related political, economic, social, and philosophical occurrences.

EFL 311 Advanced Writing and Research Skills (3-0)3
Practice in writing a research paper; conducting library research and producing a full-length term paper.

EFL 313 Language Acquisition (3-0)3
Theories of native and second languages; stages of language development and acquisition; learning grammar and other components of language in L1 and L2.

EFL 315 Contrastive Turkish – English Structure (3-0)3
Comparison of English and Turkish with respect to phonetic, morphologic and syntactic structure.

EFL 318 Novel Analysis (3-0)3
This course aims to introduce the characteristics of the novel as a literary genre: approaches to analyzing the novel: analysis of sample British and American novels that represent various literary periods.

EFL 319 Drama Analysis (3-0)3
This course aims to introduce the characteristics of drama as a type of literature: types of drama: analysis of significant examples from English, including selected plays from Shakespeare and his contemporaries, American and World drama representing different trends in drama.

EFL 320 Teaching English to Young Learners (3-0)3
The learning strategies of young children and the acquisition of the mother tongue as well as the learning of a foreign language; the classroom methods and techniques to be used when teaching English to young learners; the development of games, songs and visual materials and their use in teaching.

EFL 321 Teaching Language Skills – Speaking and Listening (3-0)3
Builds language awareness and teaching skills through the study of techniques used in teaching speaking and listening. Includes skills for language learners at various ages and language proficiency levels. Group and micro-teaching activities will be used to practice and refine lesson planning and teaching techniques for listening and speaking.

EFL 322 Teaching Language Skills – Reading and Writing (3-0)3
Builds language awareness and teaching skills through a detailed study of techniques used in teaching reading and writing. Includes skills for language learners at various ages and language proficiency levels. Group and micro-teaching activities will be used to practice and refine lesson planning and teaching techniques for reading and writing.

EFL 324 Community Service Practice (3-0)3
Understanding the importance of participating in community service; identifying the current problems of local community and developing projects to generate solutions for these problems; attending academic events such as panels, conferences, symposiums and conventions as speakers, organizers or participants; taking part in various projects, approved by the department, with the aim of assuming social responsibility and acquiring basic knowledge & skills for the application of community service in educational environments.

EFL 411 The English Lexicon (3-0)3
An indepth analysis of the relation between lexical semantics, clause structure and discourse in English, with a focus on aspects of English grammar that are problematic for second language learners. Argument structure: types of verbs and passivisation. Lexical aspect and discourse: types of lexical aspect; aspect in discourse; adverbial modification. The syntax and the semantics of the noun phrase in English: definiteness, quantifiers and subject-verb agreement.

EFL 413 English Language Testing and Evaluation (3-0)3
Types of tests; test preparation techniques for measuring various language skills and knowledge; preparing various types of test items and alternative assessment tools; evaluation and analysis techniques; statistical calculations.

EFL 414 Schools of Modern Thought (3-0)3
Representative readings from such topics as structuralism, empiricism, mentalism, semiotics, post-structuralism, Marxism, Feminism, postmodernism and postcolonialism.

EFL 415 Materials Adaptation and Evaluation (3-0)3
Skills necessary for evaluating language teaching materials in current textbooks, adapting and developing materials for language teaching.

EFL 417 School Experience (2-4)4
Preparing students for teaching practice through observation and application tasks under the supervision of a cooperating teacher.

EFL 418 Practice Teaching (1-6)4
Consolidating the skills necessary for teaching English as a foreign language at primary and secondary schools through observation and teaching practice in pre-determined secondary schools under staff supervision; critically analyzing the previously acquired teaching related knowledge and skills through further reading, research and in class activities in order to develop a professional view of English Language Teaching.

DESCRIPTION OF SERVICE COURSES

ARTS

ART 113 Intr. to Artistic Drawing (2-2)3
This course aims to teach the students (how) to look, see, draw, make a composition, and therefore to enable them to develop their abilities and aesthetic senses. This course offers an introduction to drawing materials, basic rules of drawing, mental calculation of dimensions and proportions and working with coloured pencils. Lessons begin with the simplest and easiest drawing medium, lead pencil. By following simple, step by step procedures, students can learn how to use texture and line, how to create light and shade and illusion of depth.

ART 211 Intr. to Basic Design in Art (2-2)3
This course is designed: i) to introduce basic design methods in art, two and three-dimension forms of production originating from the imaginary and the reality (real objects), ii) to help students acquire the related technical knowledge and skills and iii) to enable them to have discussions on the works they have produced by utilizing different design techniques; i.e. drawing, study, modelling, patchwork, composition, small models, etc.) and to evaluate them. The goal of the course is to provide the students with basic design principles and to put these principles into practice.

ART 232 Introduction to Clay Sculpture (2-2)3
This course is designed for students who have interest in the art of sculpture and who would like to start working on it to furnish them with basic knowledge on this specific branch of art. Within this context the aim of the course is to supply the beginners with an insight into the whats of sculpture and how to approach it. This course offers an introduction to the techniques of hand building with an emphasis on sculptural form and individual project development. Students not only become familiar with basic construction techniques in clay object making but they also work with a number of different surface treatments particularly suited to sculptural ceramics.

EDUCATIONAL SCIENCES

EDUS 200 Introduction to Education (3-0)3
Characteristics and principles of teaching profession, school and classroom contexts, alternative perspectives in education, social, psychological, philosophical and historical foundations of education, Turkish education system.

EDUS 220 Educational Psychology (3-0)3
Various dimensions of human development (cognitive, social, psychological, moral and physical), approaches to learning and learning process, learning styles, individual differences in learning.

EDUS 304 Classroom Management (2-2)3
Social and psychological factors that influence student behavior, basic characteristics and functions of classroom context, designing the physical environment, starting a new school year, developing and teaching rules and routines for classroom management, gaining student cooperation, protecting and restoring order, creating a positive learning environment, managing seatwork, group work, recitations and discussions, productive and effective use of time in class, motivation and communication, problem behaviors and ways of dealing with them.

EDUS 416 Turkish Educational System and School Management (3-0)3
This course introduces the objectives and basic principles of Turkish educational system; the legislative arrangements related to education; the examination of Turkish educational system in terms of its structure, management theories and educational processes; school systems and management; personnel, student, teaching and administrative tasks in school management and ways of promoting involvement of society in schools.

EDUS 424 Guidance (3-0)3
Purposes of student personality services and their place in education, introduction to guidance services in schools, principles of guidance, diagnosing and guiding students, collection and use of data on student counseling, placement, follow-up advising, research and evaluation, relations with parents and beyond the school community, vocational guidance, purposes of special education, identifying students with special learning needs.

HISTORY

HST 201 Principles of Kemal Atatürk I (2-0)NC
A history of the foundation of the Turkish Republic under the light of Kemal Atatürk's principles. (This course is taught in Turkish)

HST 202 Principles of Kemal Atatürk II (2-0)NC
Continuation of HST 201. (This course is taught in Turkish)

HST 205 History of the Turkish Revol. I (2-0)NC
(International students only)
A required course for international students, with particular consentration on the War of Independence, the foundation of the Republic, Atatürk's domestic and foreign policies.
. (This course in taught in English).

HST 206 History of the Turkish Revol. II (2-0)NC
(International students only)
Continuation of HST 205. (This course in taught in English).

PHILOSOPHY

PHL 101 Introduction to Philosophy I (3-0)3
An introductory survey of the main problems of philosophy.

PHL 291 History of Science I (3-0)3
A general survey of the development of science from Greeks to Newton.

STATISTICS

STAS 221 Statistics for Engineers I (3-0)3
Introduction to probability. Finite sample spaces. Conditional probability and independence. Discrete and continuous random variables. Random sample and statistics. Statistical inference, estimation and tests of hypotheses. Simple linear regression.
Prerequisite: MAT 120.

SOCIOLOGY

SOCL 109 Introduction to Sociology (3-0)3
An introduction to basic principles, concepts and theories of sociology; analysis of social structure, cultural processes and patterns: the relationship of individual with society. Emphasis on case studies. Offered to non-Sociology majors.

SOCL 134 Social Anthropology (3-0)3
The study of human beings in different cultural contexts. Theories of culture and social structure. An examination of major human institutions (kinship, economic, political and religious) in cross-cultural perspective

TURKISH

TUR 101 Turkish I (2-0)NC
The course will cover the following: The importance of language as a social institution in the life of a nation; relations between culture and language; the Turkish languages and their geographical distribution; history of the Turkish language; phonology of the Turkish language; rules of punctuation. The rule of inflection (declension and conjugation) and derivation in the Turkish language. General rules of composition; various forms of written expression.

TUR 102 Turkish II (2-0)NC
Reading from literature; exercises in composition. Errors in sentence structure and their correction, writing research papers; development of students' ability to speak and write well through the use of selected texts from world literatures.
Prerequisite: TUR 101.

TUR 103 Turkish I: Written Communication (2-0)2
Written expression; composition and punctuation rules; types of written expression; colloquial, literary, scientific and official language; criticism; researching and using sources; classroom exercises and discussions concerning all the subjects.

TUR 104 Turkish II: Oral Communication (2-0)2
Language, its definition and importance, relations between speaking and thinking, developing the comprehension and expression ability; language and culture relations, listening and its importance, effective listening; reading, its importance and functions; reading types; expression and its rules, expression units, types, forms and means; oral expression and types of oral expression; fluent, correct and effective speaking, body language; classroom exercises and discussions.
Prerequisite: TUR 103.

TUR 201 Elementary Turkish (4-0)NC
Designed to instruct foreign students in the Turkish language in terms of grammar, syntax and vocabulary. Basic characteristics of Turkish language: sound, vowel and consonant harmonies, changes in consonants, nominal compounds, possessive suffixes, cases, the verb "imek" basic tenses and modes, comparative and superlative, numerals, compound tenses. (Course is for foreign students)

TUR 202 Intermediate Turkish (4-0)NC
Designed to increase students' knowledge of Turkish language. Compound sentences, voices, compound verbs written and oral expression of ideas within the limits of a paragraph, written and oral translation. (Course is for foreign students)
Prerequisite: TUR 201.

NORTHERN CYPRUS CAMPUS
DEGREE PROGRAMS UNDER ACADEMIC BOARD OF ENGINEERING AND NATURAL SCIENCES
Academic Staff
(2013-2014 Academic Year)

Full-Time Academic Staff

AKER Kürşat, Instr. Dr., *Mathematics,* B.S., METU; Ph.D., University of Pennsylvania

AKINTUĞ Bertuğ, Assist. Prof. Dr., ***Coordinator Civil Engineering Program***; B.S., M.S., Eastern Mediterranean University; Ph.D., University of Manitoba

ALAÇAM Burak, Assist. Prof. Dr., *Electrical and Electronics Engineering*; B.S., METU; M.S., Drexel University; Ph.D., Rensselaer Polytechnic Institute

ANWAR Sabieh, Assoc. Prof. Dr., *Physics*; B.S., University of Engineering and Technology; Ph.D., University of Oxford, U.K. *(Guest Faculty)*

ARİFLER Dizem, V. Assist. Prof. Dr., *Physics;* B.S., M.S., Ph.D., The University of Texas – Austin

ARTUN Emre, Assist. Prof. Dr., *Petroleum and Natural Gas Engineering,* B.S., METU; M.S., West Virginia University; Ph.D., Penn State University

BAKER Keith Derek, V. Assoc.Prof. Dr., *Mechanical Engineering;* B.S. Virginia Tech; M.S., Ph.D., University of Texas at Austin

BAŞARAN Can, V. Assist. Prof. Dr., *Computer Engineering;* B.S., M.S., Yeditepe University; Ph.D., Binghamton University

CAN Cüneyt, Prof. Dr., *Physics;* B.S., METU; M.S., Ph.D., Kansas State University (*From METU-Ankara*)

CANDAN İdil, Instr. Dr. (Adjunct), *Computer Engineering;* B.S., M.S., Ph.D, Eastern Mediterranean University

ÇAĞNAN Zehra, Assoc. Prof. Dr., *Civil Engineering*; B.S., University of London; M.S., METU; Ph.D., Cornell University

ÇELENLİGİL Mehmet Cevdet, Prof. Dr., ***Coordinator of Aerospace Engineering Program****;* B.S., METU; M.S., Ph.D., Princeton University (*From METU-Ankara*)

ÇELİK Ozan Cem, Assist. Prof.. Dr., *Civil Engineering*; B.S., M.S., METU; Ph.D., Georgia Institute of Technology

DA SILVA Manuel Carlos Gameiro, Assoc. Prof. Dr. *Mechanical Engineering;* M.S., Ph.D., University of Coimbra, Portugal *(Guest Faculty)*

DOSIEV Anar, V. Assoc. Prof. Dr., *Mathematics*; B.S., Novosibirsk State University; M.S., Ph.D., Baku State University

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ELGEDAWY Islam, Assist. Prof. Dr., *Computer Engineering*; B.S., M.S., Alexandria University; Ph.D., RMIT University-Australia

ESAT Volkan, Assist. Prof. Dr., ***Assistant to the Head of Academic Board of Engineering and Natural Sciences***, *Mechanical Engineering;* B.S., Gazi University; M.S., METU; Ph.D., Loughborough University

EVER Enver, V. Assist. Prof. Dr., *Computer Engineering;* B.S., Eastern Mediterranean University; M.S., Ph.D., Middlesex University

FAHRİOĞLU Murat, Assist. Prof. Dr., *Electrical and Electronics Engineering;* B.S., Michigan State University; M.S., Ph.D., University of Wisconsin-Madison

GÜNDÜZ Güngör, Prof.Dr. (Adjunct), *Chemical Engineering*, B.S., M.S., METU; Ph.D., Iowa State University

GÜNDÜZ Ufuk, Prof. Dr., Biology; B.S., Iowa State University; M.S., Iowa State University; Ph.D. METU (*From METU-Ankara)*

GÜREL Erhan, Assist. Prof. Dr., *Mathematics*; B.S., METU; Ph.D., Michigan State University

GÜRKAN Türker, Prof. Dr., ***Head of Academic Board of Engineering and Natural Sciences***; *Chemical Engineering;* B.S., M.S., METU; Ph.D., University of Missouri *(From METU-Ankara)*

İŞÇİ Hüseyin, Prof. Dr. (Adjunct), *Chemistry*; B.S., METU; Ph.D., Northern Illinois University

KENTEL Behzat Bahadır, Assist. Prof. Dr., *Mechanical Engineering*; B.S., M.S., METU; Ph.D., Loughborough University

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KOCAOĞLAN Erol, Prof. Dr. (Adjunct), *Electrical and Electronics Engineering;* B.S., M.S., Ph.D., METU

MEHMETOĞLU Mustafa Tanju, Prof. Dr., ***Vice President of the Campus***, *Petroleum and Natural Gas Engineernig;* B.S., METU; M.S.,University of Manchester; Ph.D., McGill University (*From METU-Ankara*)

MUHTAROĞLU Ali, Assoc. Prof. Dr., ***Coordinator of Sustainable Energy and Enviromental Systems Graduate Program***, *Electrical and Electronics Engineering*; B.S., University of Rochester; M.S., Cornell University; Ph.D., Oregon State University

NESİMOĞLU Tayfun, Assoc. Prof. Dr., ***Coordinator of Electrical and Electronics Engineering Program***; B.S., Eastern Mediterranean University; M.S., University of Westminster; Ph.D., University of Bristol

NIKMEHR Hooman, V. Assist. Prof. Dr., *Electrical and Electronics Engineering*, B.S., M.S., The University of Tehran; Ph.D., The University of Adelaide

OKUTMUŞTUR Baver, Assist. Prof. Dr., *Mathematics;* B.S., METU; M.S., Bilkent University; Ph.D., Universire Pierre et Marie Curie (*From METU-Ankara*)

ONURHAN Erdal, Assist. Prof. Dr. (Adjunct), *Chemistry*; B.S., M.S., Ph.D., METU

ÖZER Mustafa Murat, V. Assist. Prof. Dr., *Physics*, B.S., M.S., METU; Ph.D., University of Tennessee

ÖZSER Mustafa Erkut, V. Assist. Prof. Dr., *Chemistry;* B.S., Hacettepe University; M.S., University of Southampton; Ph.D., Max-Planck Institute

ÖZTÜRK IŞIK Hande, V. Assist. Prof. Dr., *Civil Engineering;* B.S., M.S., METU; M.S., Ph.D, Michigan State University

SABAH Cumali, Assist. Prof. Dr., *Electrical and Electronics Engineering;* B.S., M.S., Ph.D., Gaziantep University

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SHIBLI Mohammad Awais, Assist. Prof. Dr. *Computer Engineering*; B.S., Foundation University, Pakistan; M.S., Ph.D., The Royal Institute of Technology, Sweden *(Guest Faculty)*

SHIKAKHWA Mohammad, V. Assoc. Prof. Dr., ***Assistant to the President***, *Physics*; B.S., University of Jordan; M.S., Ph.D., METU

SÖNMEZ Murat, Assoc. Prof. Dr., *Mechanical Engineering*; B.S., Ankara State Academy of Engineering and Architecture; M.S., Ph.D., METU

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UZGÖREN Eray, Assoc. Prof. Dr., ***Coordinator of Mechanical Engineering Program***; B.S., METU; M.S., Ph.D., University of Florida

ÜNAL İbrahim, Assist. Prof. Dr., *Mathematics*, B.S., METU; Ph.D., Stony Brook University

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ALBAYRAK, Kahraman, Prof. Dr., *Mechanical Engineering*; B.S., M.S., Ph.D., METU *(From METU-Ankara)*

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BOR Şakir, Prof. Dr., *Material and Metalurgical Engineering;* B.S., M.S., Ph.D., METU (*From METU-Ankara*)

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SARIHAN HUVAJ Nejan, Assist. Prof. Dr., *Civil Engineering*, B.S., METU; M.S., Ph.D., University of Illinois at Urbana-Champaign (*From METU-Ankara*)

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YALÇINER Uğur, Instr., *Industrial Design;* B.S., M.S., METU

YETİŞ Ülkü, Prof. Dr., *Environmental Engineering*, B.S., METU, M.S., University of Pittsburg, Ph.D., METU (*From METU-Ankara*)

YILDIRIM, Orhan, Prof. Dr., *Mechanical Engineering; B.S., M.S., METU; Ph.D.*, University of Birmingham (*From METU-Ankara*)

YOZGATLIGİL, Ahmet, Assist. Prof. Dr., *Mechanical Engineering*; B.S., M.S., METU; Ph.D., Drexel University (*From METU-Ankara*)

NORTHERN CYPRUS CAMPUS

AEROSPACE ENGINEERING PROGRAM

GENERAL INFORMATION: The mission of the METU NCC Aerospace Engineering Program is to educate students and to do research in aerospace sciences including analysis, design, manufacturing and testing of air and space flight vehicles, in order to contribute to economic progress and welfare of the society.

Aerospace Engineering Program is multi-disciplinary in nature and is very closely related to the disciplines of Mechanical, Electrical and Computer Engineering. The students are required to take courses in the fields of Aerodynamics, Structures and Materials, Propulsion, Flight Mechanics and Control during their undergraduate studies.

The undergraduate program objectives are:

- To teach students fundamental knowledge of mathematics, science, and engineering, and educate them to apply this knowledge in the solution of aerospace engineering problems.
- To educate students to design aerospace systems and components.
- To educate students to do experiments.
- To encourage students to do research.
- To train students to function within multidisciplinary teams, and communicate effectively.
- To broaden perspectives of the students with respect to economical and societal issues, responsibilities, ethics and professionalism.

CAREER OPPORTUNITIES: Today, aerospace industry in the world is growing very rapidly and is considered as one of the major driving force for the technology. As a result, the aerospace sector provides a significant number of attractive job opportunities for young Aerospace Engineers. Demand for high technology placed an increased emphasis in the investment of scientific R&D projects to develop novel and more efficient, more performant manned and unmanned aerial and space systems as well as wind turbines for energy production.

METU NCC Aerospace Engineering graduates have a lot of career opportunities in both the public and private sector related to aerospace engineering around the world. Graduates may also pursue academic careers in leading universities with the knowledge and perspective they gain through the METU NCC Aerospace Engineering Program.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

GPC	100	First Year on Campus Sem.	(0-2)1
ASE	101	Introduction to Aerospace Engineering	(0-2)NC
MECH	113	Computer Aided Engineering Drawing 1	(2-2)3
MAT	119(a)	Calculus with Analytic Geometry	(4-2)5
PHY	105	General Physics I	(3-2)4
CHM	107	General Chemistry	(3-2)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
CNG	100	Introduction to Information Technologies and Applications	(2-0)NC

Second Semester

ASE	172	Introduction to Aircraft Performance	(3-0)3
MAT	120	Calculus for Functions of Several Variables	(4-2)5
PHY	106	General Physics II	(3-2)4
CNG	230	Introduction to C Programming	(2-2)3
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
GPC	100	First Year on Campus Seminar	(0-2)1

SECOND YEAR

Third Semester

ASE	231(*)	Thermodynamics	(4-0)4
ASE	261(*)	Statics	(3-0)3
MECH	202	Manufacturing Technologies	(3-2)4
MECH	227	Engineering Materials	(3-0)3
MAT	219	Int. to Differential Equations	(4-0)4
		Non-Technical Elective	(3-0)3
HST	201(b)	Principles of Kemal Atatürk I	(2-0)NC
ASE	200	Summer Practice I	

Fourth Semester

ASE	244(*)	FluidMechanics	(4-0)4
ASE	262(*)	Dynamics	(3-0)3
ASE	264(*)	Mechanics of Materials	(4-0)4
MAT	210	Applied Math. for Engineers	(4-0)4
EEE	209	Fund.of Elec.andElectro.Eng.	(3-0)3
ENGL	211	Acad. Oral Pres.Skills	(3-0)3
HST	202(b)	Principles of Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester

ASE	331(*)	Heat Transfer	(3-0)3
ASE	341	Aerodynamics I	(3-2)4
ASE	361	Applied Elasticity	(3-0)3
ASE	383(*)	System Dynamics	(3-0)3
MAT	310	Numerical Analysis for Engineers	(3-0)3
ENGL	311	Advan. Communic. Skills	(3-0)3
TUR	101(c)	Turkish I	(2-0)NC
ASE	300	Summer Practice II	NC

Sixth Semester

ASE	301	Numerical Methods for Aerospace Engineering	(3-0)3
ASE	334	Propulsion Systems I	(3-2)4
ASE	342	Aerodynamics II	(3-2)4
ASE	362	Aerospace Structures	(4-0)4
ASE	372	Flight Mechanics	(3-0)3
TUR	102(c)	Turkish II	(2-0)NC

FOURTH YEAR

Seventh Semester				Eighth Semester	
ASE	435	Propulsion Systems II	(3-0)3	Restricted Departmental	
ASE	451	Aeronautical Eng. Design	(2-2)3	Elective (d)	(2-2)3
ASE	463(*)	Mechanical Vibrations	(3-0)3	Technical Elective	(3-0)3
		Technical Elective	(3-0)3	Technical Elective	(3-0)3
		Non-Technical Elective	(3-0)3	Technical Elective	(3-0)3
ASE	400	Summer Practice III	NC	Free Elective	(3-0)3

Notes:
(a) Students who successfully completed "MAT 100 Precalculus (1-2)2″ course or passed "Mathematics Proficiency Examination" can take MAT 119 course.
(b) International students are required to take HST 205 and HST 206 to replace HST 201 and HST 202.
(c) International students are required to take TUR 201 and TUR 202 to replace TUR 101 and TUR 102.
(d) Following courses are offered as "Restricted Departmental Elective":

ASE 438 Aircraft Engine Design (2-2)3
ASE 446 Int. to Helicopter Aero. and Design (2-2)3
ASE 452 Aeronautical Engineering Design-II (2-2)3
ASE 462 Design of Aerospace Structures (2-2)3

(*) Courses listed in the following table can be substituted:

Courses for Aerospace Engineering Program	Substitute Courses
ASE 231 Thermodynamics (4-0)4	MECH 203 Thermodynamics (4-0)4
ASE 261 Statics (3-0)3	MECH 205 Statics (3-0)3
ASE 261 Statics (3-0)3	CVE 221 Engineering Mechanics-I (3-0)3
ASE 244 Fluid Mechanics (4-0)4	MECH 305 Fluid Mechanics (4-0)4
ASE 262 Dynamics (3-0)3	MECH 208 Dynamics (3-0)3
ASE 262 Dynamics (3-0)3	CVE 222 Engineering Mechanics-II (3-0)3
ASE 264 Mechanics of Materials (4-0)4	MECH 206 Strength of Materials (4-0)4
ASE 331 Heat Transfer (3-0)3	MECH 311 Heat Transfer (4-0)4
ASE 331 Heat Transfer (3-0)3	CHME 325 Heat Transfer (3-0)3
ASE 383 System Dynamics (3-0)3	MECH 304 Control Systems (3-0)3
ASE 383 System Dynamics (3-0)3	EEE 302 Feedback Systems (3-0)3
ASE 463 Mechanical Vibrations (3-0)3	MECH 429 Mechanical Vibrations (3-0)3

DESCRIPTION OF COURSES

ASE 101 Introduction to Aerospace Engineering (0-2)NC
Aerospace Engineering Department of METU: METU; Faculty of Engineering; Department of Aerospace Engineering; Purpose, Staff, Facilities, Courses, Rules and Regulations. History of Turkish Aviation. Turkish Aerospace Industry : Existing industry, opportunities in Aerospace Industry; Companies and factories related to aviation located in the vicinity of Ankara. Ethics in Aerospace Engineering. Aviation authorities in the world. Safety rules and regulations in Aerospace Applications.

ASE 172 Introduction to Aircraft Performance (3-0)3
Elements and functions of A/C basic configuration. Forces and moments acting on an A/C; aerodynamic coefficients. Standard atmosphere. Performance: equations of motion; horizontal flight; climb performance; take-off performance; gliding; descent and landing performance; range and endurance; flight envelope; V-n diagram. Longitudinal static stability; aerodynamic center; criterion for longitudinal static stability; static margin; unstable A/C.

ASE 200 Summer Practice I NC
Students are required to participate in a one-week summer practice at a certified model aircraft school. The student learns how to build a small model airplane during this period and earns a Participant's Certificate and submits it to the department.

ASE 231 Thermodynamics (4-0)4
Introduction, definition and physical properties of fluids, concept of continuum, definitions of density, pressure and viscosity, Kinematics, motion of a fluid element, rotation, deformation, streamlines. Fluid statics and buoyancy. Forces acting on flat and curved surfaces. Eulerian and Lagrangian flow descriptions, conservation laws, flow properties, system-control volume approaches, Reynolds Transport theorem. Governing equations: conservation of mass, linear momentum and energy equations. Bernoulli equation and its applications. Flow of real fluids: Newtonian fluids, Navier-Stokes equations. Application for incompressible flows, laminar - turbulent flow definitions, and application to pipe flows.

ASE 261 Statics (3-0)3
Fundamental concepts and principles of mechanics. Introductory vector analysis. Statics of particles. Statics and equilibrium of rigid bodies in 2-D and 3-D. Equivalent system of forces and couples. Analysis of simple structures, trusses and machines. Analysis of simple beams.Friction. Moments of Inertia.

ASE 262 Dynamics (3-0)3
A vectorial approach to dynamics of particles and rigid bodies. Kinematics of particles, kinetics of particles. Kinematics of rigid bodies and kinetics of rigid bodies. Newton's second law and the laws of linear and angular momentum. Conservation Laws. The principle of impulse and momentum. Impact of particles and rigid bodies. Potential and kinetic energy, conservation laws and energy methods. Relative motion. The emphasis on dynamics of particles, system of particles and plane motion of rigid bodies. Introduction to three dimensional motion of rigid bodies.
Prerequisite: ASE 261 or consent of the program.

ASE 264 Mechanics of Materials (4-0)4
Introduction to stress and strain concepts. Concept of analysis and design. Structural joints. Introduction to determinate and indeterminate problems, stress concentrations. Analysis of linearly elastic problems in "axial loading", "torsion" and "pure bending" cases. Transverse loading and analysis of shear stresses. Transformations of stress and strain. Design of beams and shafts for strength. Analysis of deflection of beams with various support conditions by integration and by moment-area methods.
Prerequisite: ASE 261 or consent of the program.

ASE 300 Summer Practice II NC
Workshop practice; aircraft maintenance, repair, parts production.

ASE 301 Numerical Methods for Aerospace Engineers (3-0)3
Numerical solution of Ordinary Differential Equations (ODE), initial value problems, Runge-Kutta methods, adaptive stepping, systems of ODEs, higher order ODEs, boundary value problems. Numerical solution of partial Differential Equations (PDE): Finite Volume method, numerical solution using triangular grids, Finite Difference method, model equations, finite difference approximations, convergence and stability analysis of finite difference equations, numerical solutions of parabolic PDEs, elliptic PDEs, hyperbolic PDEs.
Prerequisite: MAT 310 or consent of the department.

ASE 331 Heat Transfer (3-0)3

Basic concepts. One dimensional steady-state conduction, extended surfaces, two-dimensional steady-state conduction, shape factors, transient conduction. Forces convection, Reynolds analogy, convection for external and internal flows. Free convection, boiling and condensation, heat exchangers. Radiation heat transfer between surfaces, basic concepts of mass transfer.

ASE 334 Propulsion Systems I (3-2)4
Introduction to propulsion systems. Reciprocating engines. Propeller Theory. Aerothermodynamics of ideal airbreathing propulsion systems (turbojet, turbofan, turboprop, turboshaft, ramjet, scramjet). Mixtures, Combustion, Equilibrium and Dissociation. Rocket Engines.
Prerequisite: ASE 231 or consent of the program.

ASE 341 Aerodynamics I (3-2)4
Potential flow theory, complex potential function, flow around a cylinder, formation of lift, Kutta-Joukovsky theorem, conformal mapping, Joukovsky airfoil, definition of aerodynamic coefficients, Panel Method. Thin airfoil theory, Kutta condition, Kelvin's circulation theorem, symmetrical and cambered airfoils, lift curve slope and zero lift angle of attack, flapped airfoil. Finite wing, lifting line theory, elliptic and general wing loading. Slender wing theory, pressure distribution, aerodynamic coefficients.
Prerequisite: ASE 244 or consent of the program.

ASE 342 Aerodynamics II (3-2)4
Compressible flow, normal and oblique shock waves, Prandtl-Mayer expansion wave. Subsonic Compressible Flow over Airfoils; Linear Theory, Linearized Supersonic Flow. 2D Boundary layers, concept and governing equations, similar flows and similarity transformation, Blassius problem. Integral methods of solution. Laminar and turbulent flows, stability and transition. Turbulence and transition. Turbulent boundary layers, Law of the wall and various turbulence models, Prandtl mixing length concept. Combined B/L along a flat plate, separation and stall, B/L on airfoils.
Prerequisite: ASE 341 or consent of the program.

ASE 361 Applied Elasticity (3-0)3
Generalized theory of pure bending. Unsymmetric loading of beams and shear center. Shear stresses in beams of thin walled open sections. General theory for shear stresses, analysis of statically indeterminate beams. Stress, stress tensor, variation of stress within a body. 3-D stress equilibrium equations, definitions of plain stress and plain strain, three dimensional stress at a point. Transformation of stress, principal stresses in 3D, normal and shear stresses on an oblique plane. Strain displacement relations, strain compatibility equations. State of strain and transformation of strain, measurement of strain. Generalized Hooke's law. General solution of torsion problem. Prandlt's membrane analogy, torsion of thin-walled members of open cross sections, torsion of multiply connected thin walled sections. Fluid flow analogy. Warping function. Significance of torsion in open section thin walled members. 2-D problems in elasticity: plane stress and plane strain problems, stress function and applications. Equations of elasticity in polar coordinates. Stress concentrations and thermal stresses. Thick walled cylinders, compound cylinders. Rotating disks of constant thickness. Thermal stresses in thin disks.
Prerequisite: ASE 264 or consent of the program.

ASE 362 Aerospace Structures (4-0)4
Main structural elements in aircraft. Loads on aircraft. V-N diagrams. Failure theories. Energy methods. Analysis of open and closed section stiffened box beams and torque boxes. Bending of unsymmetrical sections. Structural analysis of aircraft sub-structures: ribs, frames, wing box sections with cut-outs. Elastic stability: Column buckling, buckling of flat and curved panels, buckling analysis of stiffened closed section box beams, post-buckling behavior of stiffened flat and curved panels.
Prerequisite: ASE 361 or consent of the program.

ASE 372 Flight Mechanics (3-0)3
Reference frames, coordinate systems and transformations. Aircraft general equations of motion, small gain theory, longitudinal static stability and control, lateral static stability and control. Stability derivatives. Dynamic stability of uncontrolled motion.

ASE 383 Systems Dynamics (3-0)3
System concepts; Laplace transformation and properties; transfer function, block diagram, and reduction; lumped parameter modelling of physical systems; state space formulation, linearization of nonlinear systems; stability of linear time invariant systems, Routh test; time domain analysis of dynamic systems, response, performance specifications; feedback control system examples, P, PD, PID control; frequency response methods.
Prerequisite: MAT 219 or consent of the department.

ASE 400 Summer Practice III NC
Students are required to perform summer practice at a factory or engineering firm to get acquainted with managerial work.

ASE 435 Propulsions Systems II (3-0)3
Aerothermodynamic performance of aircraft engines. Non-ideal cycle analysis of turbojet, turbofan and turboprop engines. Performance characteristics of axial and radial compressors and turbines. Performance of non-rotating components: inlets, nozzles and combustion chambers. Matching of compressors and turbines.
Prerequisite: ASE 334 or consent of the program.

ASE 451 Aeronautical Engineering Design (2-2)3
Conceptual design of fixed wing aircraft. Aircraft sizing. Airfoil and geometry selection. Thrust to weight ratio and wing loading. Configuration layout. Propulsion and fuel system integration. Landing gear and subsystems. Weights and balance. Stability, control and handling qualities. Performance and flight mechanics. Cost. Certification and qualification.
Prerequisite: ASE 342 or consent of the program.

ASE 463 Mechanical Vibrations (3-0)3
Free and forced vibrations of single degree-of-freedom undamped linear systems. Types and characteristics of damping and its effects on the response. Two degree-of-freedom systems. Coordinate transformation. Coupling. Free vibration, response to harmonic excitation. Multi degree-of-freedom systems. Eigenvalue problem, modal vectors and orthogonality. Vibration of continuous systems. Transverse vibration of beams. Effects of boundary conditions on the response. Vibration measurement and isolation.
Prerequisite: ASE 262 or consent of the program.

NORTHERN CYPRUS CAMPUS

CHEMICAL ENGINEERING PROGRAM

GENERAL INFORMATION: A unique chemical engineering program has been designed for METU Northern Cyprus Campus. The over fifty years of experience from the chemical engineering program of the METU Ankara Campus, has been blended with the current trends and future expectations of the industry, to come up with a program aiming to educate the next generation of chemical engineers, who are expected to assume new responsibilities in addition to the more conventional ones. In this respect the traditional backbone of the modern chemical engineering program has been retained. Thus it is aimed for the graduates to have a solid background in fundamental sciences, mathematics, engineering sciences, the unit operations, thermodynamics and reaction engineering, and engineering design and economics. Additionally, the graduates will have the necessary background and understanding of ethical responsibilities, environmental, occupational health and safety issues, and will have developed life-long learning habits.

CAREER OPPORTUNITIES: Chemicals are utilized as finished products and as inputs to various manifacturing sectors of the industry, and they cover a very large spectrum. Thus, chemical engineers are employed in very different production areas. As such they are considered to be among the most versatile engineers and traditionally work in petroleum refining, petrochemicals, rubber and plastics, pulp and paper, fiber and textiles, pharmaceuticals, dyes and paints, cosmetics, sugar, starch, fermentation, fine and specialty chemicals, soap and detergents, oil, glass, ceramics, cement, industrial gases, catalysts, semiconductors, food, fertilizers, agricultural chemical industries. The graduates of our program are expected to be highly sought as they will have developed an expertise either in resource or chemical product engineering. Resource engineering will particularly emphasize sustainable material and energy utilisation. Chemical product engineering, however will emphasize the production of specific products, such as ceramics, plastics, composites, dyes and paints.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester				Second Semester			
MAT	119[a]	Calculus with Analytic Geometry	(4-2)5	MAT	120	Calculus for Functions of Several Variables	(4-2)5
PHY	105	General Physics I	(3-2)4	PHY	106	General Physics II	(3-2)4
CHM	111	General Chemistry I	(3-2)4	CHM	112	General Chemistry II	(3-2)4
MECH	113	Computer Aided Engineering Drawing 1	(2-2)3	CNG	230	Introduction to C Programming	(2-2)3
ENGL	101	Development of Reading and Writing Skills I	(4-0)4	ENGL	102	Development of Reading and Writing Skills II	(4-0)4
CNG	100	Introduction to Information Technologies and Applications	(2-0)NC	CHME	102	Int. to Chemical Engineering	(1-0)1GPC
					100	First Year on Campus Seminar	(0-2)1

SECOND YEAR

Third Semester				Fourth Semester			
CHME	203	Chem. Process Calculations	(2-2)3	CHME	204	Thermodynamics I	(3-0)3
MAT	219	Int. to Differential Equations	(4-0)4	MAT	210	Applied Math. for Engineers	(4-0)4
CHM	237	Organic Chemistry I	(3-2)4	CHM	230	Analytical Chem. for Eng.	(3-2)4
ENGL	211	Acad. Oral Present. Skills	(3-0)3	CHM	238	Organic Chemistry II	(3-0)3
XXX	xxx	Hum.and Soc.Scien. Elective	(-)3	ECO	210	Principles of Economics	(3-0)3
HST	201[b]	Principles of Kemal Atatürk I	(2-0)NC	HST	202 [b]	Principles of Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester			
CHME	305	Thermodynamics II	(2-2)3
CHME	323	Fluid Mechanics	(3-0)3
CHME	325	Heat Transfer	(3-0)3
CHM	351	Physical Chemistry	(3-2)4
ENGL	311	Advan. Communic. Skills	(3-0)3
TUR	101[(c)]	Turkish I	(2-0)NC
CHME	300[(d)]	Summer Practice I	NC

Sixth Semester			
CHME	302	Chem. Eng. Laboratory I	(0-4)2
CHME	312	Chem. Reaction Engineering	(3-0)3
CHME	326	Mass Trans. and Separ. Proc.	(3-2)4
CHME	xxx	Track Course I	(3-0)3
XXX	xxx	Engineering Elective	(-)3
TUR	102[(c)]	Turkish II	(2-0)NC

FOURTH YEAR

Seventh Semester			
CHME	401	Chem.Eng. Laboratory II	(0-4)2
CHME	417	Chem. Eng. Design I	(3-2)4
CHME	xxx	Track Course II	(3-0)3
CHME	xxx	Track Elective 1	(3-0)3
CHME	xxx	Track Elective 2	(3-0)3
CHME	400[(d)]	Summer Practice II	NC

Eighth Semester			
CHME	418	Chem.Eng. Design II	(3-2)4
CHME	xxx	Track Elective 3	(3-0)3
CHME	xxx	Track Elective 4	(3-0)3
XXX	xxx	Free Elective	(-)3
XXX	xxx	Non-Technical Elective	(-)3

[(a)] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119

[(b)] International students will take HST 205 and HST 206 insread of HST 201 and HST 202.

[(c)] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[(d)] Students are expected to complete their summer training prior to registering CHME 300 and CHME 400

ELECTIVE COURSES

Engineering Elective: Students are allowed to choose from a number of courses offered in other engineering departments, choices are announced each semester

Track Course I: CHME 332 Resource Engineering I (3-0)3 or CHME 342 Chemical Product Engineering I (3-0)3.

Track Course II: CHME 433 Resource Engineering II (3-0)3 or CHME 441 Chemical Product Engineering II (3-0)3.

Track Electives 1, 2, 3, 4: Resource Engineering (Track A) or Chemical Product Engineering (Track B) Electives are listed below:

Track A Electives: CHME 407, CHME 443, CHME 446, CHME 448, CHME 452, CHME 482, CHME 499 and other approved electives.

Track B Electives: CHME 407, CHME 442, CHME 444, CHME 447, CHME 449, CHME 454, CHME 461, CHME 462, CHME 482, CHME 499 and other approved electives.

DESCRIPTION OF COURSES

CHME 102 Intr. to Chemical Eng. (1-0)1
Basic concepts of chemical engineering profession; ethical issues, environmental responsibilities and future trends; literature survey and oral presentation of a term project.

CHME 203 Chem. Process Calculations(2-2)3
Basic chemical engineering concepts and methods of analysis. Introduction to mass and energy balance calculations applied to solution of problems in systems of interest to chemical process industries.

CHME 204 Thermodynamics I (3-0)3
Concepts of equilibrium, temperature and reversibility. First law and concepts of heat and work; second law and entropy. Equations of state and thermodynamic properties of pure substances. Engineering applications of these principles in the analysis and design of closed and open systems. Thermodynamic analysis of cyclic processes including power generation and refrigeration.

CHME 300 Summer Practice I NC
A practical training for a period of 20 works-days in an organization with sizeable operations that are of interest to chemical engineering. Emphasis is made on the application of mass and energy balances. A formal report is required to reflect the work carried out.
Prerequisite: CHME 102 and CHME203 or CHME204.

CHME 302 Chem.Eng.Laboratory I (0-4)2
.Laboratory studies demonstrating the principals of fluid mechanics and heat transfer. Emphasis is on laboratory safety, correlation of experimental results and on written reports and oral presentations.
Prerequisite: CHME 323 or CHME325, and one of the following: CHM237, CHM230, CHM351.

CHME 305 Thermodynamics II (2-2)3
Thermodynamic properties of pure fluids and mixtures. Phase equilibrium. Chemical reaction equilibrium. Applications to real and ideal processes.
Prerequisite: CHME204.

CHME 312 Chemical Reaction Engineering (3-0)3
Nonequilibrium processes including chemical reaction mechanisms, rate equations and reactor design applied to homogeneous and heterogeneous systems under isothermal and non isothermal conditions
Prerequisite: CHM351.

CHME 323 Fluid Mechanics (3-0)3
Hydrostatics. Fundamentals of momentum transport. Newton's law of viscosity. Interphase momentum transport and friction factors. Flow in conduits and around submerged objects. Mechanical energy balances and Bernoulli equation. Dimensional analysis. Applications to practical problems. Principles of settling and filtration.

CHME 325 Heat Transfer (3-0)3
Molecular mechanisms of heat transfer. Fourier's law. Transport of heat in one dimension by molecular mechanisms and by convection. Transport of heat in turbulent regime, Heat transfer by radiation. Heat transfer to fluids with phase change. Evaporation. Heat exchanger design.

CHME 326 Mass Transfer& Separation Processes (3-2)4
Molecular mechanisms of mass transfer. Fick's law. Transport of mass in one dimension by diffusion and by convection. Transport of mass in turbulent regime. Principles of stagewise and continuous contact operations. Absorption, distillation, extraction, and simultaneous heat and mass transfer. Applications and design of separation process units.
Prerequisite: CHME323 or CHME325.

CHME 332 Resource Engineering I (3-0)3
Intoduction of green process engineering with effective use of resources, such as coal, petroleum and natural gas. Fast depletion of resources and environmental impacts. Synthesis and use of petrochemicals. Basic principles of equilibrium and rate concepts in physical and chemical processes. Case studies illustrating sustainable chemical processes and trends in chemical technology.
Prerequisite: CHME203.

CHME 342 Chemical Product Engineering I (3-0)3
Statistics theory relevant to process engineering; Data collection, management and quality in production environments; Basic design of experiments; Statistical process control; Process health monitoring, reliability and yield enhancement; Process development cycle; Total quality management.
Prerequisite: CHME203.

CHME 400 Summer Practice II NC
A practical training for a period of 20 working days in an organization where chemical engineering is extensively practiced. A formal report is required to reflect the work carried out.
Prerequisite: CHME323 or CHME325.

CHME 401 Chem. Eng. Laboratory II (0-4)2
Laboratory experiments to illustrate the application of chemical and physical principles to chemical processes. Emphasis is given to mass transfer, simultaneous heat and mass transfer, process control and instrumental analysis. Report writing is emphasized.
Prerequisite: CHME-312 or CHME-326, and *one of the following: CHM237, CHM230, CHM351.*

CHME 407 Process Control (3-2)4
Modeling of steady and unsteady-state behavior of chemical processes. Optimal control strategies of processes of particular interest to chemical engineers. Discussion of both classical and modern control theory with applications.

CHME 417 Chemical Engineering Design I (3-2)4
Application of chemical engineering principles and methods of chemical process synthesis, simulation and economics on open ended process and/or product design problems. Use of computer programming and/or design packages in iterative decision making and optimization. Emphasis on process safety and ethical issues.
Prerequisites: Three out of following four courses: CHME 305, CHME 312, CHME325 and CHME 326.

CHME 418 Chemical Engineering Design II (3-2)4
Continuation of CHME 417. Equipment selection and design. Cost estimation, project evaluation, process and product safety and ethical issues.
Prerequisite: CHME417.

CHME 433 Resource Engineering II (3-0)3
Assessment of current and potential energy systems, covering extraction, conversion and end-use, with emphasis on meeting regional and global energy needs in a sustainable manner. Examination of energy technologies in each fuel cycle stage for fossil, nuclear, and renewable (solar, biomass, wind, hydro, and geothermal) energy types, along with storage, transmission, and conservation issues. Focus on evaluation and analysis of energy technology systems in the context of political, social, economic, and environmental goals.

CHME 441 Chemical Product Engineering II (3-0)3
Overview to the batch and continuous and hybrid processes. Synthesis of reaction and separation systems. Introduction to the process intensification and utility integration in chemical production facilities and their applications. Mathematical modeling and optimization of batch processes. Resource planning, product scheduling, and supply chain management.
Prerequisite: CHME 204

CHME 442 Polymer Technology (3-0)3
Chemistry of polymerization; mechanisms such as step, radical chain, emulsion, ionic chain, chain copolymerization, ring opening, etc. Production, properties and fabrication of plastic materials of industrial importance. Rheology of polymers and polymer solutions. Polymer composites, new polymers.

CHME 443 Downstream Processing of Bio Products (3-0)3
Fundamentals and importance of downstream processing. Recovery, separation and purification of both low and high molecular weight biotechnological products by various methods.
Prerequisite: CHME 204

CHME 444 Structure. Polymer Relationships (3-0)3
Macromolecular chains. Thermodynamics of macromolecules. Diffusion in macromolecules. Gelation, rheological properties.

CHME 446 Fundamentals of Industrial Waste Treatement (3-0)3
Introduction to waste treatment in industrial plants. Kinetics of reactions involved in different methods. Chemical study of unit processes and unit operations. Design of treatment devices for purification of waste water and control procedures for environmental protection.

CHME 447 Chemical Processes in Microelectronics (3-0)3
Introduction to microelectronics processing. Silicon Refining. Crystal growth. Chemical rate processes and kinetics. Chemical vapor deposition incorporation and transport of dopants. Physical and physico-chemical rate processes. Design of chemical reactors and process equipment used in microelectronics manufacturing.

CHME 448 Ceramic Technology (3-0)3
Raw materials, structure and properties of clays, feldspars, and silicate minerals. Forming and firing of ceramics, vitrification. Rate process theory and use of phase equilibrium diagrams. Whitewares, refractories, enamels, and glazes. Glass and glass forming. Special ceramics.

CHME 449 Macromolecular Technology (3-0)3
Inorganic and organic macromolecules, structure and behavior of macromolecules. Structure of clays.

Vitrification. Properties of ceramic materials like whitewares, refractories and glass. Principles and methods of polymerization, types of polymers, industrial polymers. Composites, natural macro-molecules, biomaterials.

CHME 452 Chemical Process Optimization (3-0)3
The nature and organization of optimization problems. Formulation of the objective functions. An overview of optimization of individual units as well as complete flowsheets.

CHME 454 Polymer Process Analysis and Design (3-0)3
Development of tools of continuum mechanics necessary for the quantitative description of viscoelastic media. Use of principles of chemical kinetics, fluid and continuum mechanics and heat and mass transfer to describe the production and processing of polymeric materials.

CHME 461 Polymer Additives, Blends and Composites (3-0)3
Additives for processing, surface and optical property modification, fire retardants, UV protecting agents, blowing agents. Principles of blending and compatibilization. Thermodynamics, rheology and morphology of polymer blends. Principles of composites, interfaces, geometrical aspects, elastic properties. Introduction to laminate theory. Short fiber reinforced plastics. Processing of composites.

CHME 462 Polymer Solutions (3-0)3
Fundamentals of dilute polymer solutions, single chain conformations and configurations. Polymer solution thermodynamics, lattice models, equation of state approach. Phase equilibria and phase separation in polymeric solutions. Behavior of concentrated and/or multicomponent solutions, physical gelation. Diffusion in polymeric systems.

CHME 482 Chemical Process Safety (3-0)3
Industrial hygiene and loss statistics, toxicology, source models (fluid flow through holes in tanks, pipes etc.) toxic release and dispersion models, fires and explosions, designs to prevent accidents, hazard identification and risk assessment, accident investigations with some sample case historie.

CHME 499 Topics in Chemical Engineering (3-0)3
Faculty-supervised term projects assigned to individual students or groups on new and developing areas of chemical engineering. A written report and an oral presentation are required.

NORTHERN CYPRUS CAMPUS

CIVIL ENGINEERING PROGRAM

GENERAL INFORMATION: The goal of the METU NCC Civil Engineering Program is to educate future engineers who can apply basic science in the analysis and synthesis of complex civil engineering problems, who are competent in oral and written communication, and who can co-operate with disciplines other than engineering. In this regard, graduates are expected to have developed skills in critical thinking, searching and learning, adherence to ethical principles, leadership qualities, and the ability to maintain interaction with social environment in which they live.

The METU NCC Civil Engineering curriculum has been designed and based on current trends in engineering programs as well as the needs of the Middle Eastern countries, and comprises a series of compulsory and elective courses in the areas of structural mechanics, water resources, geotechnical engineering, construction materials, surface transportation, construction management and geodesy.

CAREER OPPORTUNITIES: METU NCC Civil Engineering graduates will have career opportunities in both the public and private sector in any field of civil engineering. With a strong background in engineering and communication skills, they can be especially sought after candidates for companies operating in the Middle East and Euro-Asia. Those who would like to carry on with academic research will have ample opportunities both in Turkey and elsewhere, due to the analytical abilities they have gained by following the curriculum.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MAT	119[a]	Calculus with Analytic Geometry	(4-2)5
PHY	105	General Physics I	(3-2)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
CNG	100	Introduction to Information Technologies and Applications	(2-0)NC
CNG	230	Introduction to C Programming	(2-2)3
GPC	100	First Year on Campus Seminar	(0-2)1

Second Semester

MAT	120	Calculus for Functions of Several Variables	(4-2)5
PHY	106	General Physics II	(3-2)4
MECH	113	Computer Aided Engineering Drawing 1	(2-2)3
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
CHM	107	General Chemistry	(3-2)4
CVE	102	Introduction to Civil Engineering	(2-0)NC

SECOND YEAR

Third Semester

MAT	219	Int. to Differential Equations	(4-0)4
CVE	202	Surveying	(1-4)3
CVE	221	Engineering Mechanics I	(3-0)3
CVE	241	Materials of Construction	(3-2)4
XXX	xxx	Non-technical Elective	(-0)3
TUR	101 [b]	Turkish I	(2-0)NC

Fourth Semester

MAT	210	Applied Math. for Engineers	(4-0)4
CVE	222	Engineering Mechanics II	(3-0)3
CVE	224	Mechanics of Materials	(3-0)3
ECO	280	Engineering Economy	(3-0)3
ENGL	211	Acad. Oral Present. Skills	(3-0)3
XXX	xxx	Non-technical Elective	(-)3
TUR	102 [b]	Turkish II	(2-0)NC

THIRD YEAR

Fifth Semester

CVE	303	Prob. and Stat. for Civil Eng.	(3-0)3
CVE	323	Int. to Structural Mechanics	(3-0)3
CVE	353	Transport. and Traffic Eng.	(3-0)3
CVE	363	Soil Mechanics	(3-2)4
CVE	371	Int. to Fluid Mechanics	(3-0)3
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC
CVE	300[d]	Summer Practice I	NC

Sixth Semester

CVE	332	Construc. Eng.and Manag.	(3-0)3
CVE	366	Foundation Engineering	(2-2)3
CVE	372	Hydromechanics	(3-2)4
CVE	376	Engineering Hydrology	(3-0)3
CVE	382	Reinfor. Concrete Fund.	(3-0)3
CVE	384	Structural Analysis	(3-0)3
HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

FOURTH YEAR

Seventh Semester

CVE	471	Water Resources Engineering	(3-0)3
CVE	485	Design of Steel Structures	(2-2)3
CVE	xxx	Technical Elective	(-)3
CVE	xxx	Technical Elective	(-)3
ENGL	311	Advan. Communic. Skills	(3-0)3
CVE	400[d]	Summer Practice II	NC

Eighth Semester

CVE	xxx	Technical Elective	(-)3
CVE	xxx	Technical Elective	(-)3
CVE	xxx	Technical Elective	(-)3
CVE	xxx	Technical Elective	(-)3
XXX	xxx	Free Elective	(-)3

[a] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119

[b] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[c] International students will take HST 205 and HST 206 instead of HST 201 and HST 202

[d] Students are expected to complete their summer training prior to registering CVE 300 and CVE 400

ELECTIVE COURSES

Some courses that may be offered as electives are:

- CVE 420 Irrigation and Drainage
- CVE 421 Applied Surface Hydrology
- CVE 423 Advanced Mechanics of Materials
- CVE 425 Introduction to Finite Elements
- CVE 427 Civil Engineering System Analysis
- CVE 434 Construction Planning
- CVE 444 Advanced Materials of Construction
- CVE 457 Highway Design
- CVE 366 Foundation Engineering
- CVE 464 Ground Improvement
- CVE 465 Earth Structures
- CVE 473 Open Channel Hydraulics
- CVE 470 Intermediate Fluid Mechanics
- CVE 476 Groundwater Engineering
- CVE 477 Design of Wastewater Collection Systems
- CVE 481 Reinforced Concrete Structures
- CVE 485 Fundamentals of Steel Design
- CVE 483 Advanced Structural Analysis
- CVE 491 Coastal Engineering
- CVE 494 Port Planning and Port Design

DESCRIPTION OF COURSES

CVE 102 Int. to Civil Engineering (2-0)NC
An orientation course to provide counsel to the students on the major areas of Civil Engineering including information on typical activity of civil engineers, integrated course sequences and content, and an introduction of the faculty. Professional engineering practice. Oral and written engineering communication.

CVE 202 Surveying (1-4)3
Introduction. Distance measurement. Taping. Angle measurement. Errors. Direct, indirect and conditional adjustment of observations. Differential leveling. Rise and fall. Height of collimation method. Traverse surveys. Azimuth and coordinate computations. Area computations. Stadia survey. Trigonometric leveling. Contour lines. Curve layout. Remote sensing and photogrammetry.

CVE 221 Engineering Mechanics I (3-0)3
Introduction to rigid body mechanics. Equivalent force systems: Concepts of moment, couple, resultant. Equilibrium: Free-body diagram; equations of equilibrium. Structural analysis: Trusses; beams. Shear force and bending moment diagrams by method of sections and by method of integration. Properties of surfaces: Area moment and centroid; moments and product of inertia; to the principal directions.

CVE 222 Engineering Mechanics II (3-0)3
Kinematics of particles and rigid bodies: absolute motion, relative motion. Kinetics of particles: equations of motion, work-energy and impulse-momentum. Systems of particles. Kinetics of rigid bodies: Euler's equation, plane motion of rigid bodies, kinetic energy of rigid bodies. Introduction to the dynamics of vibrating systems.
Prerequisite: CVE221

CVE 224 Mechanics of Materials (3-0)3
Simple stress and strain. Equilibrium, compatibility and constitutive relations. State of stress and state of strain with emphasis on two dimensional problems. Bending and shear stresses. Deflection of beams. Torsion of circular shafts. Combined stresses. Buckling of columns.
Prerequisite: CVE221

CVE 241 Materials of Construction (3-2)4
Mechanical properties of materials and basic concepts. Production, types, uses in construction, properties and related tests for the following materials are covered: ferrous metal, bituminous materials, clay products, timber, building stones, mineral aggregates, lime, gypsum, hydraulic cements and concrete. Constituents, theories of mix design, principal steps in production, physical and mechanical properties of concrete.

CVE 300 Summer Practice I NC
Subjects that are acceptable for summer practice: Surveying, time-keeping, checking and testing construction materials, assisting resident engineers. Preparing quantity and cost estimates, unit price estimates, civil engineering drawings and graphs. Use of computational machines, taking part in construction work. The department may organize a compulsory, collective Summer Practice Program in place of the above. (20 working days).
Prerequisite: CVE241.

CVE 303 Probability and Statistics for Civil Engineering (3-0)3
Descriptive statistics, histograms, central tendency, dispersion and correlation measures. Basic probability concepts, random variables, probability density and mass function. Hypothesis testing, confidence intervals. Law of large numbers and central limit theorem. Regression analysis. Applications in engineering.
Prerequisite: MAT119.

CVE 323 Int. to Structural Mechanics (3-0)3
Unsymmetrical bending, shear center. Definition, classification, idealization and modeling of structures. Analysis of statically determinate structures, including beams, frames and arches. Analysis of cables. Work and energy principles and their application in deformation analysis of structures. Force method of structural analysis.
Prerequisite: CVE224.

CVE 332 Construction Engineering and Management (3-0)3
Profile of the construction sector; company and site organization and types of contracts. Construction projects; estimating, tendering, planning and execution. Professional responsibility and engineering ethics. Productivity, quality, health and safety issues. Construction equipment; selection criteria, hourly cost determination and output analysis of excavators.

CVE 353 Transportation and Traffic Engineering (3-0)3
Introduction to transportation systems. Vehicles, network and terminals as components of

transportation systems engineering. Design of transportation facilities emphasizing land transportation. Operations planning of transportation systems and traffic engineering. Models of traffic flow. Traffic analysis at intersections. Basic definitions and computations of level of service. Planning and management techniques.

CVE 363 Soil Mechanics (3-2)4
Basic geology for civil engineers. Engineering problems involving soils. Basic characteristics of soils, classification and compaction of soils. Principle of effective stress. Permeability and flow of water (seepage) in soils. Shear strength of soils. Slope stability. Lateral earth pressure theories. Consolidation theory.
Prerequisite: CVE224.

CVE 366 Foundation Engineering I (2-2)3
Site investigations, retaining structures, excavations, dewatering, shallow foundation design, bearing capacity, settlement, stress distribution in soils, initial settlement, consolidation settlement, permissible settlement, deep foundation design, bearing capacity, settlement, types of piles, ground improvement.
Prerequisite: CVE 363.

CVE 371 Introduction to Fluid Mechanics (3-0)3
Definitions, physical properties. Hydrostatics, forces on plane and curved surfaces, buoyancy, hydrostatics in moving and rotating containers. Lagrangian and Eulerian descriptions, derivatives, rate of deformation, flowlines. System and control volume approach, Reynolds transport theorem, principles of conservation of mass, momentum and energy, Bernoulli equation. Dimensional analysis, Buckingham pi theorem, similitude.
Prerequisite: CVE 221, and MAT219.

CVE 372 Hydromechanics (3-2)4
Laminar and turbulent flows. Friction factor in pipe flow. Computation of flow in single pipes: Hydraulic machinery: turbines and pumps. Pipeline systems and networks. General characteristics and classification of open channel flow: pressure and velocity distribution. Continuity equation. Energy concept. Momentum principle. Uniform flow. Rapidly varied flow gradually-varied flow. Wave hydraulics.
Prerequisite: CVE371.

CVE 376 Engineering Hydrology (3-0)3
Hydrologic analysis in water resources: Precipitation, streamflow and hydrograph analysis. Hydrologic flood routing. Statistical analysis in water resources. Groundwater hydrology. Engineering applications.

CVE 382 Reinforced Concrete Fundamentals (3-0)3
Mechanical behavior of concrete in uniaxial and multiaxial states of stress. Time dependent behavior of concrete. Mechanical behavior of reinforcing steel. Behavior and strength of uniaxially loaded members; confinement. Behavior and strength of members in pure bending. Behavior and strength of members under combined bending and axial load. Behavior and strength of members under combined shear and bending.
Prerequisite: CVE224.

CVE 384 Structural Analysis (3-0)3
Introduction to structural analysis. Displacement methods: slope deflection, moment distribution, special topics. Stiffness method, derivation of element stiffness matrices, assembly procedures. Computerized implementation of the stiffness method and use of instructional programs. Large scale structural analysis. Influence lines and moving loads.
Prerequisite: CVE 323.

CVE 400 Summer Practice II NC
Subjects that are acceptable for summer practice: quantity and cost estimates, application of plans to site conditions, mix design, taking part in reinforced concrete work. Structural, highway and hydraulic designs. Preparing standard engineering drawings (20 working days).

CVE 430 Construction Management in Practice (3-0)3
Introduction to management, general description of construction industry, contract systems, types of construction contracts. Review of typical organizational structures for construction companies and projects. Planning and scheduling, resource analysis and leveling, management of resources. Survey of main activities and procedures for starting a new project. Communication basics and communication in construction sites. Monitoring and control systems. Procedures and formalities for project completion.

CVE 458 Design of Hydraulic Struc. (3-0)3
Dam design concepts. Design of overflow and outlet structures; frontal overflow, side channel, morning glory overfall, siphon, free fall, chute, cascade spillway. Design of dissipation structures; hydraulic jump and stilling basin, drop structures and plunge pools, trajectory basins. Design of bottom outlets; gate types, hydraulics of high-head gates, air entrainment, cavitation. Design of intake structures; hydraulic losses, vortex formation, hydraulic loadings, control gates and valves, penstock.
Prerequisites: CVE372, and CVE376.

CVE 462 Foundation Engineering II (3-0)3
Deep foundations. Piles and pile foundations, types of piles, pile foundation design. Types of sheet pile walls. Single-wall, double-wall and cellular cofferdams. Box open and pneumatic caissons. Underpinning of existing structures.
Prerequisites: CVE366.

CVE 471 Water Resources Engineering (3-0)3
Introduction to water resources. Reservoirs. Classification of dams. Failure and rehabilitation of dams. Types of spillways, energy dissipation facilities, crest gates. Water uses and quantities, water quality, water treatment. Elements of water transmission and distribution. Design and construction of sewer systems. Land classification for irrigation, soil-water relationships. Design of classical irrigation networks. Characteristics of land drainage, design of surface and subsurface drainage systems.
Prerequisites: CVE372, and CVE376.

CVE 472 Statistical Techniques in Hydrology (3-0)3
Importance in Hydrology. Properties and model parameter estimation techniques. Use of discrete and continuous functions in hydrology. Point and regional frequency analysis. Applications.
Prerequisite: CVE303, and CVE376.

CVE 475 Int.to Ground Water Flow Modelling (3-0)3
Basic concepts of groundwater modeling. Fundamentals of mathematical models. Governing equations of groundwater flow. Review of modeling techniques and their comparison. Analytical models. Numerical models by finite differences. Application of selected models.
Prerequisite: CVE376.

CVE 481 Reinforced Concrete Struct. (3-0)3
General RC behavior: Moment-curvature relationship; plastic hinge, redistribution. Behavior and strength of members under combined shear and torsion: Equilibrium torsion, compatibility torsion, punching, capacity design. Repair/Strengthening Principles: Column, beam, slab repair, structural system improvement. Seismic design principles. Serviceability. Detailing.
Prerequisite: CVE382.

CVE 485 Design of Steel Structures (2-2)3
General concepts in design. Design methods, loads (dead, live, wind, snow and earthquake), codes, safety serviceability. Behavior of steel structures. Tension members, compression members, beams, beam-columns, types and behavior of connections in steel structures, bolted welded connections.
Prerequisite: CVE224.

CVE 486 Structural Design: Concrete Structures (3-0)3
One-two way slabs, joist floors, wall, individual, combined and continuous footings, mat foundations. Stairs. Structural systems: Framed, wall and combined structures, flat slabs, flat plates, and masonry. Modeling. Approximate methods of structural analysis, most unfavorable loading. Introduction to advanced methods of construction: Prefabricated pre-stressed concrete, composite structures, etc. Professional authority and responsibility.
Prerequisite: CVE382.

CVE 490 Introduction to Earthquake Resistant Design (3-0)3
Causes of earthquakes, earthquake magnitude and intensity, earthquake ground motions. Seismic response analysis of simple structures. Elastic response spectra, design spectra. Earthquake design criteria. Equivalent static lateral force procedure. Design codes, design applications.
Prerequisite: CVE222.

CVE 491-498 Special Topics in Civil Engineering (3-0)3
These code numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

NORTHERN CYPRUS CAMPUS

COMPUTER ENGINEERING PROGRAM

GENERAL INFORMATION: The Northern Cyprus Campus Computer Engineering Undergraduate Program provides professional training in Computer Engineering. The program, aimed at meeting the demand for B.S. level computer engineers in industry, business and in higher education, covers a wide range of areas in the field of computer engineering, including programming languages, computer architecture, data structures, algorithms, theory of computation, databases, software engineering, embedded systems, graphics, operating systems, and networks. It also addresses other core and supporting areas, such image processing, e-business, intelligent systems, distributed and parallel systems, knowledge engineering, etc.

The preparation of students to be successful in Computer Engineering practice is the primary objective of the program. Graduates will be able to pursue advanced studies in Computer Engineering and Computer Science on a competitive universal basis.

The focus of the first two years of the undergraduate program is on foundational courses, which provide a solid basis for some concurrent courses and most of the courses taken in the last two years which are related to the computer engineering field in general, as well as applied and advanced topics. Undergraduate students spend a total of 12 (twelve) weeks in industrial practice during the summers. As an integral part of undergraduate study, students are given numerous assignments, many of which require team work and collaboration, essential qualities for success in today's world. Assignments of this nature foster a collaborative atmosphere in and outside of class, not only between students, but also involving close interaction with the teachers and assistants.

The general aims of the METU NCC CNG Undergraduate Program are to provide:

- a significant depth and breadth of coverage of the core concepts in computing, with options for in-depth studies related to computer engineering and science disciplines.
- a basic engineering and science curriculum (mathematics, physics, and engineering).
- opportunities for students to become aware of computing profession in the context of science, society and technology.
- opportunities for students to develop design capabilities and decision-making abilities.
- a basic engineering and science curriculum as a basis for further engineering education and practice.

CAREER OPPORTUNITIES: Information technologies play a vital role in everyday life and in many sectors including communication, education, banking, health, defense, and the production industry. Therefore, graduates from the METU NCC CNG Undergraduate Program will have very good career prospects both at home and abroad in various private and public sector organizations. More specifically, our graduates will be eligible for jobs in computer centers of the large banks and multinational companies and, of course, in information technology (IT) companies. Some of our graduates will also have the opportunity of postgraduate study leading to MS and Ph.D in or outside of Turkey.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MAT	119[a]	Calculus with Analytic Geometry	(4-2)5
PHY	105	General Physics I	(3-2)4
CHM	107	General Chemistry	(3-2)4
CNG	111	Introduction to Computer Engineering Concepts	(3-2)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
CNG	100	Introduction to Information Technologies and Applications	(2-0)NC
GPC	100	First Year on Campus Seminar	(0-2)1

Second Semester

MAT	120	Calculus for Functions of Several Variables	(4-2)5
PHY	106	General Physics II	(3-2)4
CNG	140	C Programming	(3-2)4
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
MAT	260	Basic Linear Algebra	(3-0)3

SECOND YEAR

Third Semester

MAT	219	Int. to Differential Equations	(4-0)4
EEE	281	Electrical Circuits	(3-2)4
CNG	213	Data Structures	(3-0)3
CNG	223	Discrete Comput. Structures	(3-0)3
ENGL	211	Acad. Oral Pres. Skills	(3-0)3
TUR	101[b]	Turkish I	(2-0)NC

Fourth Semester

STAS	221	Statistics for Engineers I	(3-0)3
EEE	282	Int. to Digital Electronics	(3-2)4
CNG	242	Prog. Language Concepts	(3-2)4
CNG	280	Formal Lang. and Abstract Machines	(3-0)3
CNG	232	Logic Design	(3-2)4
TUR	102[b]	Turkish II	(2-0)NC

THIRD YEAR

Fifth Semester

CNG	315	Algorithms	(3-0)3
CNG	331	Computer Organization	(3-0)3
CNG	351	Data Manag. and File Structures	(3-0)3
XXX	xxx	Technical Elective	(-)3
XXX	xxx	Non-Technical Elective	(-)3
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC
ENGL	311	Advan. Communic. Skills	(3-0)3
CNG	300[d]	Summer Practice I	NC

Sixth Semester

CNG	336	Int. to Embed. Sys. Develop.	(3-2)4
CNG	334	Int. to Operating Systems	(3-0)3
CNG	384	Signals and Systems for Computer Engineers	(3-0)3
CNG	350	Software Engineering	(3-0)3
XXX	xxx	Non-technical Elective	(-)3
HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

FOURTH YEAR

Seventh Semester				Eighth Semester			
CNG	491	Senior Project and Seminar: Design	(2-0)2	CNG	492	Senior Project and Seminar: Implementation	(1-2)2
CNG	435	Data Communications and Networking	(3-0)3	XXX	xxx	Technical Elective	(-)3
XXX	xxx	Technical Elective	(-)3	XXX	xxx	Technical Elective	(-)3
XXX	xxx	Technical Elective	(-)3	XXX	xxx	Technical Elective	(-)3
XXX	xxx	Non-technical Elective	(-)3	XXX	xxx	Free Elective	(-)3
CNG	400[(d)]	Summer Practice II	NC				

[(a)] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119

[(b)] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[(c)] International students will take HST 205 and HST 206 instead of HST 201 and HST 202

[(d)] Students are expected to complete their summer training prior to registering CNG 300 and CNG 400

ELECTIVE COURSES

Some Computer Engineering courses that may be offered as electives are:

- CNG 316 Practice of Algorithms
- CNG 332 Systems Programming and Support Environments
- CNG 340 Rapid Application Development
- CNG 352 Database Management Systems
- CNG 382 Analysis of Dynamic Systems with Feedbacks
- CNG 443 Introduction to Object-Oriented Programming Languages and Systems
- CNG 444 Language Processors
- CNG 451 Information System Development
- CNG 453 Introduction to Service-Oriented Computing
- CNG 462 Artificial Intelligence
- CNG 463 Introduction to Natural Languages Processing
- CNG 465 Int. to Bioenformatics
- CNG 476 System Simulation

CNG 478 Int. to Parallel Computing

Some courses from other disciplines that may be taken as electives are:

EEE 306 Signals and Systems II

DESCRIPTION OF COURSES

CNG 100 Introduction to Information Technologies and Applications (2-0)NC
Introduction to computers, computer software and hardware, computer network, Internet applications, ethics, document processing, data analysis, and spreadsheets (OS Environment: Microsoft Windows Vista, Office Tools).

CNG 111 Introduction to Computer Engineering Concepts (3-2)4
Introduction to fundamentals of Computer systems, including Computer organization, operating systems, language processors and user interfaces. Introduction to algorithms and programming. Reasoning informally about the correctness and efficiency of programs. A functional programming language will be used for practical work.

CNG 140 C Programming (3-2)4
Advanced programming with C: storage and control structures, recursion and programming with dynamic data structures. Homeworks are required to run on Unix environment.

CNG 213 Data Structures (3-0)3
Classification of data structures, space and time considerations. Linked lists, stacks and queues. Tree structures, binary search trees. Array and pointer based implementations. Recursive applications. Sorting and searching.
Prerequisite: CNG140.

CNG 223 Discrete Computational Structures (3-0)3
Fundamentals of logic, set relations, functions, induction, graph theory, trees introduction to algebraic structures, lattices.

CNG 230 Introduction to C Programming (2-2)3
Introduction. Constants, variables, expressions, statements. Selective structures. Repetitive structures and arrays. Functions. Pointers. Multi-dimensional arrays.
(Offered to non-CNG students only).

CNG 232 Logic Design (3-2)4
Introduction to Computer architecture. Number systems. Boolean algebra. Logic Gates and flip flops. Combinational and sequential circuit design. Registers. Counters. Bus transfer. RAM, ROM units. Instruction execution and hardwired control.

CNG 242 Programming Language Concepts (3-2)4
Evolution of programming languages. Overview of language translation, virtual machines, and run-time environments. Names, bindings and scopes. Values, expressions and types. Type CNGatibility and type checking. Storage, variables, and commands. Procedural abstraction. Generic units. Overview of functional programming paradigm. Overview of object-oriented programming paradigm: Encapsulation, classes and objects, inheritance, *polymorphism, dynamic binding.*
Prerequisite: CNG111, and CNG213

CNG 280 Formal Languages and Abstract Machines (3-0)3
Introduction to strings, languages and grammars. Concept of abstract machines and language acceptance. Deterministic and non-deterministic finite state machines. Regular expressions. machines with pushdown tape. Turing Machines and recursive functions
Prerequisite: CNG223.

CNG 300 Summer Practice I NC
A minimum of six weeks (30 working days) of training in Computer centers involving observation of the Computer system and the software developed and used in the center, and discussion of various aspects of the system. The training is based on the contents of the summer practice manual.

CNG 315 Algorithms (3-0)3
Selected Computer algorithms: sorting, searching, string processing and graph algorithms. Algorithm design and analysis techniques. Time and CNGutational CNGlexities of algorithms. Introduction to NP-CNGleteness, parallelization of algorithms, linear and dynamic programming.
Prerequisite: CNG213.

CNG 316 Practice of Algorithms (3-0)3
Advanced algorithmic problems in graph theory, combinatorics, and artificial intelligence. Creative approaches to algorithm design. Efficient implementation of algorithms.
Prerequisites: CNG315

CNG 331 Computer Organization (3-0)3
Microprogramming and micro programmed control. Input and output devices, I/O interfaces. Memory hierarchy and memory management. Fast arithmetic: fast multipliers and floating point operations. Reduced instruction set Computer. Computer communications.
Prerequisite: CNG232.

CNG 332 System Programming (3-0)3

Basic System Software. Assemblers. Macro Processors. Compilers. Interpreters. Loaders and Linkers. Run-Time Support Environments. Networking Software. Network Programming. Issues of Systems Integration over Networks. Graphical User Interfaces. Windows Programming.
Prerequisite: CNG331.

CNG 334 Introduction to Operating Systems (3-0)3
Introduction to Operating Systems. Memory Management. Process Management. Concurrent Processes. Deadlocks. Processor Management. I/O and Device Management. Gile Management and File Systems. Introduction to Distributed Operating Systems. Synchronization in Distributed Systems. Distributed File Systems. Overview of contemporary OS technology.
Prerequisite: CNG331.

CNG 336 Introduction to Embedded Systems Development (3-2)4
Assembly language and controller architecture. Peripheral interfaces:A/D and D/A conversion, parallel and serial ports, interrupts and timers/counters I/O bus architectures. Sensors and actuators. Design and analysis techniques. Real time operating systems.
Prerequisite: CNG140and CNG232

CNG 340 Rapid Appl. Development (3-0)3
Overview of the base language of a Rapid Application Development (RAD) tool; object definitions, methods, properties and inheritance. Form design using visual components Application development using the libraries of an industry standard RAD tool.
Prerequisite: CNG350

CNG 350 Software Engineering (3-0)3
Software Project Management: metrics, estimation, planning. Software requirement analysis techniques. Software design techniques. Software implementation. Software quality assurance. Software testing.

CNG 351 Data Management and File Structures (3-0)3
Sequential files. Unordered sequential files. Ordered sequential files. External sorting. Heap sort. Replacement selection sort. Large memory sorting. B+tree index. Hashing. Classical hashing.
Linear hashing. Introduction to DBMSs. Relational databases. Relational query languages. Relational algebra. Relational calculus. SQL. QBE.QUEL. Implementing the join operation. Entity-Relationship data model.

CNG 352 Database Management Systems (3-0)3
Relational model of data. Relational algebra. SQL. Query optimization. Entity-Relationship data model. Normalization, physical database design. Concurrency control in DBMSs. Crash recovery. Client-server architectures. Introductions to object databases, distributed databases, web data management.
Prerequisite: CNG351.

CNG 371 Scientific Computing (3-0)3
Accuracy in numerical analysis. The sources and propagations of errors. Solution of non-linear equations. Interpolating polynomials. Solution of linear algebraic equations. Least squares curve fitting. Numerical integration.
Prerequisites: MAT120 or MAT260.

CNG 372 Numerical Computations II(3-0)3
Matrix eigenvalue problem, finite differences and numerical differentiation. Numerical solution of ordinary differential equations. Introduction to numerical solution of partial differential equations.
Prerequisites: CNG371 or MAT219.

CNG 373 Operational Mathematics (3-0)3
Introduction to partial differential equations. Laplace transforms. Convolution operator. Applications of Laplace transformations. Functions of a complex variable. The inversion integral. Fourier transforms. The Z-transform and applications.
Prerequisite: MAT219.

CNG 382 Analysis of Dynamic Systems with Feedback (3-0)3
Mathematical modelling of systems. Difference and differential equations. State-space representation. Solutions of state equations. Linear-time-invariant systems and impulse response (discrete and continuous time). Stability. Routh-Hurwitz method. Feedback. Controllability. Observability. An introduction to nonlinear systems.
Prerequisites: MAT219and MAT260 .

CNG 384 Signals and Systems for Computer Engineers (3-0)3
Linear time invariant systems; Frequency domain; Periodic and finite signals; Frequency response; Fourier series and transforms; Filtering; Finite impulse response filters; Sampling and reconstruction.
Prerequisite: MAT 219 and MAT260.

CNG 400 Summer Practice II NC

A minimum of six weeks (30 working days) of training in Computer centers involving observation of the Computer system and the software developed and used in the center, and discussion of various aspects of the system. The training is based on the contents of the summer practice manual. Students are expected to be involved in the software development projects of the Computer center.

CNG 424 Logic for Computer Sciences (3-0)3
Overview of propositional and first-order logic. Computational aspects of logic: definite clauses, resolution, unification, and clausal forms. Modal, temporal, and other non-standard logics. Applications of various logics in computer science.
Prerequisite: CNG223.

CNG 435 Data Communications and Computer Networking (3-0)3
Introduction to data communications. OSI Reference Model. Physical layer. Electrical interface and data transmission. Data Link layer. Media Access sublayer. LAN/MAN Technologies. Network layer. Inter networking. Bridging and routing. Transport layer. Introduction to upper Layers'issues.
Prerequisite: CNG334

CNG 437 Advanced Computer Architecture (3-0)3
Architectural approaches to parallelism, pipelining, vector processors, shared memory multiprocessors and interconnection networks, array processors, message passing, dataflow mechanisms.
Prerequisite: CNG331.

CNG 438 Information and Network Security (3-0)3
Introduction to security. Principles of cryptography. Software security. Operating system security techniques. Authentication. Public key infrastructure. Integrity. Access control. Security in many layers. Web and wireless security.
Prerequisites: CNG334, CNG435

CNG 443 Intr. to Object- Oriented Prog. Languages and Systems (3-0)3
Object-Oriented Programming Concepts. Exception handling. I/O Streams and Decorator Pattern. Concurrency. GUI Development. Security Issues. Objects over Networks. Database Connectivity. Serialization and Deserialization. Remote Method Calls. Introduction to Enterprise Components.
Prerequisite: CNG213

CNG 444 Language Processors (3-0)3
Formal description and classification of programming languages. Specifications syntax. The parsing problem. Top-down and bottom-up parsing. Attaching semantics to syntax. Translator writing systems. Translator writing case study

CNG 451 Information Systems Development (3-0)3
Information systems life cycle. Effective human communications. Common tools for information gathering. Some classical tools. Some structured tools. Organizational structure and personnel for information systems department. Computer systems evaluation and selection. Modeling and simulation. An information systems development methodology. A Case tool.
Prerequisites: CNG350.

CNG 452 Information System Engineering (3-0)3
Planning and estimation. Risk analysis and management. Specification techniques. Process modeling. Measurement and evaluation. Information systems development methodologies. A comparative survey. Case Technology in information systems development. Evaluating commercial case products.
Prerequisite: CNG350.

CNG 453 Introduction to Service Oriented Computing (3-0)3
Service-Oriented Computing (SOC) is the new computing paradigm that utilizes services as the basic constructs to support the development of rapid, low-cost and easy composition of distributed applications even in heterogeneous environments. This course covers the basic foundations of SOC, and discusses basic standards of web services technology that enables SOC such as SOAP, WSDL, UDDI and BPEL4WS. The course demonstrates some programming techniques for web services creation and consumption, also lays out the roadmap for future SOC research.
Prerequisite: CNG350and CNG351.

CNG 456 Scalable Web Applications (3-0)3
Http fundamentals, web browsers, web server configuration and tuning, server capacity and management, dynamic content delivery, virtual hosting and proxies, transaction processing and web servers' security.
Prerequisites: CNG352 and CNG435.

CNG 462 Artificial Intelligence (3-0)3
Basic LISP programming; picture analysis WALTZ algorithm; game playing, game trees, the mini-max rule, alpha-beta pruning technique; natural language

understanding, transformation grammar; ATN grammars, techniques used in semantics.

CNG 463 Introduction to Natural Language Processing (3-0)3
Introduction to linguistic theory and techniques used in natural language processing (NLP). Template and keyword systems. Declarative and procedural approaches to NL parsing. Phrase Structure. Unification-based grammar. Parsing algorithms. Semantics. Morphology and Lexicon.
Prerequisite: CNG 280.

CNG 465 Introduction to Bioinformatics (3-0)3
This course covers computatioanl techniques for mining the large amount of information produced by recent advances in biology, such as genome sequencing and microarray technologies. Main topics of the course include: DNA and protein sequence alignment, phylogenetic trees, protein structure prediction, motif finding, microarray data analysis, gene/protein networks.

CNG 476 System Simulation (3-0)3
Introduction to simulation as a general scientific problem solving technique. Methodology of simulation and use of computers. Classifications of simulation models. Introduction to simulation programming languages.

CNG 477 Int. to Computer Graphics (3-0)3
Hardware and software components of graphics systems. Output and filled-data primitives. Fourier analysis, convolution, sampling, quantization, aliasing. 2D and 3D geometric transformations. Two-dimensional viewing. Three-dimensional viewing: Viewing pipeline, viewing parameters, projections, viewing transformations, clipping. Visible surface detection. Introduction to illumination models and surface rendering.
Prerequisite: CNG213.

CNG 478 Int. to Parallel Computing (3-0)3
History and basic concepts of parallel computing. Classification of parallel processing systems. Organization of data and parallel storage. Design and analysis of parallel and vector algorithms. Performance and complexity of parallel algorithms. Examples and applications of some parallel algorithms.
Prerequisite: CNG140and CNG331.

CNG 483 Int.toComputerVision (3-0)3
Image formation, camera models and parameters, stereo vision, shape from stereo, shape from single image cues, apparent motion, optical flow, introduction to 3D shape representation and recognition.

CNG 491 Senior Design Project and Seminar: Design (2-0)2
Analysis, requirement specification and design phases of Project. Team setting and working as an individual. Engineering design and brainstorming. Project management, planning and scheduling.
Prerequisite: CNG350.

CNG 492 Senior Project and Seminar: Implementation (1-2)2
Implementation and test phases of a Project.Engineering and software standarts. Configuration management, revision control. Engineering ethics and legal issues. Testing and quality assurance. Final product preparation and deployment.
Prerequisite: CNG 491.

CNG 492 Senior Project and Seminar: Implementation (1-2)2
Implementation and test phases of a Project.Engineering and software standarts. Configuration management, revision control. Engineering ethics and legal issues. Testing and quality assurance. Final product preparation and deployment.
Prerequisite: CNG 491.

NORTHERN CYPRUS CAMPUS

ELECTRICAL AND ELECTRONICS ENGINEERING PROGRAM

GENERAL INFORMATION: The purpose of the METU NCC EEE Program is to provide a contemporary education opportunity in every field of Electrical and Electronics Engineering. Students, both national and international, will become engineering professionals with recognized research and leadership abilities, working creatively and effectively, and adhering to life-long learning principles. Students will not only acquire a sound knowledge of basic sciences, such as mathematics, physics and chemistry but they will also develop a firm understanding of economics, social sciences and humanities before specializing in Electrical and Electronics Engineering. Students can take advantage of the flexibility of the curriculum design, and upon building a sound background on basic sciences and engineering sciences, they may specialize in computer design, microwave and antennas, energy systems and power electronics, or control fields of Electrical and Electronic Engineering by choosing appropriate technical electives.

CAREER OPPORTUNITIES: Students graduating from the METU NCC Electrical and Electronics Engineering Program can work as engineers, researchers or managers in any public or private organization operating in areas as diverse as digital system design and communication technologies, automation and control of energy production, conveyance and distribution; bioengineering and defense applications requiring high-level technology such as intelligent control, signal processing; hardware design and software development. Graduates may also pursue academic careers in leading universities, both in Turkey or elsewhere, as a result of the broad knowledge and analytical perspective they gain through the METU NCC Electrical and Electronics Engineering Program.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MAT	119[a]	Calculus with Analytic Geometry	(4-2)5
PHY	105	General Physics I	(3-2)4
CHM	107	General Chemistry	(3-2)4
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
CNG	100	Int. to Infor.Tech.and Appl.	(2-0)NC
EEE	100	Intr.to Elec.- Electro.Eng.	(1-0)NC
GPC	100	First Year on Campus Seminar	(0-2)1

Second Semester

MAT	120	Calculus for Functions of Several Variables	(4-2)5
PHY	106	General Physics II	(3-2)4
CNG	230	Introduction to C Programming	(2-2)3
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
MAT	260	Basic Linear Algebra	(3-0)3

SECOND YEAR

Third Semester

MAT	219	Int. to Differential Equations	(4-0)4
EEE	201	Circuits Theory I	(4-2)5
XXX	xxx	Restricted Elective	(3-0)3
CNG	301	Algorithms and Data Structues	(3-0)3
ENGL	211	Acad. Oral Pres. Skills	(3-0)3
TUR	101[b]	Turkish I	(2-0)NC

Fourth Semester

EEE	202	Circuits Theory II	(4-2)5
EEE	212	Semiconductor Devices and Modeling	(3-0)3
EEE	224	Electromagnetic Theory	(4-0)4
EEE	248	Logic Design	(3-2)4
XXX	xxx	Non-technical Elective	(-)3
TUR	102[b]	Turkish II	(2-0)NC

THIRD YEAR

Fifth Semester

EEE	361	Electromechanical Energy Conversion	(3-2)4
EEE	303	Electromagnetic Waves	(3-0)3
EEE	301	Signals and Systems I	(3-0)3
EEE	311	Electronics I	(3-2)4
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC
ENGL	311	Advan. Communic. Skills	(3-0)3
EEE	300[d]	Summer Practice I	NC

Sixth Semester

EEE	347	Introduction to Microprocessors	(3-2)4
EEE	312	Electronics II	(3-2)4
EEE	302	Feedback Systems	(3-0)3
EEE	330	Probability and Random Variables	(3-0)3
XXX	xxx	Non-technical Elective	(-)3
HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

FOURTH YEAR

Seventh Semester

EEE	493	Engineering Design I	(1-2)2
XXX	xxx[€]	Technical Elective	(-)4
XXX	xxx	Technical Elective	(-)3
XXX	xxx	Technical Elective	(-)3
XXX	xxx	Non-technical Elective	(-)3
EEE	400[d]	Summer Practice II	NC

Eighth Semester

EEE	494	Engineering Design II	(1-2)2
XXX	xxx	Technical Elective	(-)3
XXX	xxx	Technical Elective	(-)3
XXX	xxx	Technical Elective	(-)3
XXX	xxx	Free Elective	(-)3

[a] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119
[b] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.
[c] International students will take HST 205 and HST 206 instead of HST 201 and HST 202
[d] Students are expected to complete their summer training prior to registering EEE 300 and EEE 400
[e] At least one technical elective courses should involve laboratory work.

ELECTIVE COURSES

Restricted electives will be chosen among available courses offered by the other engineering departments, such as MECH 203, MECH 205/CVE 224, MECH 227, CVE 241

Technical Electives: At least one of the fourth year technical elective courses should involve laboratory work. 2 of the courses should be a sequence (I and II) in one of the 5 concentration areas: Communications, Computers, Microwave/Antennas, Power Systems, Power Electronics. Up to 2 technical elective courses can be from other engineering disciplines provided that these courses are consistent with the student's core concentration goals, and are approved by the program advisor.

Communications Area core sequence: EEE 435, EEE 436 (Also recommend EEE 430).
Computers Area core sequence: EEE 445, EEE 446 (Also recommend EEE 441).
Microwave/Antennas Area core sequence: EEE 427, EEE 428 (Also recommend EEE 426, EEE 435).
Power Electronics Area core sequence: EEE 463, EEE 464 (Also recommend EEE 462).
Power Systems Area core sequence: EEE 471, EEE 472 (Also recommend EEE 463).

Some courses from interdisciplinary areas that may be taken as technical electives are:

- Computer Networks
- CNG 213 Data Structures

- CNG 330 Computer Architecture
- CNG 462 Artificial Intelligence
- CNG 476 System Simulation
- CNG 334 Operating Systems
- CNG 350 Software Engineering

DESCRIPTION OF COURSES

EEE 100 Introduction to Electrical and Electronic Engineering (1-0)NC
An orientation course aiming at introducing the student to the profession of engineering in general and Electrical and Electronics engineering in particular, with a discussion of the past, present and future of major areas. Course will benefit from external lecturers and audio-visual aids whenever applicable.

EEE 201 Circuit Theory I (4-2)5
Lumped circuits: Kirchhoff's laws, basic lumped elements, circuit graphs, circuit equations, linear and nonlinear resistive circuits, first and second order dynamic circuits. Introduction to operational amplifier circuits.
Prerequisite: MAT119

EEE 202 Circuit Theory II (4-2)5
Sinusoidal steady-state analysis. Three-phase circuits. Coupled inductors. Frequency response. Linear time-invariant dynamic circuits: state equations, natural frequencies, complex frequency domain analysis. Time-varying and nonlinear circuits.
Prerequisite: MAT219 and EEE201

EEE 209 Fundamentals of Electrical and Electronics Engineering (3-0)3
Fundamental circuit laws. Resistive circuit analysis. Sinusoidal steady-state response of circuits. Three-phase circuits. Magnetic circuits and transformers. Electromechanical energy conversion.
Semiconductor elements, transistor biasing and amplifiers. Operational amplifiers.
(Offered to non-EEE students only)
Prerequisite: PHY106

EEE 212 Semiconductor Devices and Modeling (3-0)3
Basic semiconductor concepts. Physical electronics. Physics of p-n junction diodes, bipolar junction transistors and field-effect transistors. Transistor biasing and small-signal models. Secondary effects in transistors. Dynamic models for diodes and transistors. p-n-p-n switching devices. Modeling concepts for computer-aided design, and introduction to circuit analysis with SPICE.
Prerequisite: EEE201

EEE 224 Electromagnetic Theory (4-0)4
Review of vector analysis. Electrostatic fields in vacuum and material bodies. Dielectric properties of materials. Electrostatic energy and forces. Steady electric current and conductors. Static magnetic fields in vacuum and in materials. Magnetic energy and forces. Quasistatic fields and electromagnetic induction.
Prerequisite: PHY-106 (DD) and MAT-120(DD)

EEE 230 Probability and Random Variables (3-0)3
Axiomatic definition of probability space. Combinatorial methods. Conditional probability; product spaces. Random variables; distribution and density functions; multivariate distributions; conditional distributions and densities; independent random variables. Functions of random variables; expected value, moments and characteristic functions.
Prerequisite: MAT120

EEE 248 Logic Design (3-2)4
Binary systems and Boolean Algebra. Boolean function simplification. Combinational logic. Sequential synchronous logic. Registers and counters.

EEE 281 Electrical Circuits (3-2)4
Circuit laws and basic elements. Resistive circuits, analysis methods. Network theorems. First and second order circuits. Sinusoidal steady-state analysis and power. Basic diyote and transistor circuits. (Offered to non-EEE students only).
Prerequisite: MAT120

EEE 282 Intro. to Digital Electronics (3-2)4
Semiconductor diodes. Diode characteristics. Diode circuits. Transistors, BJT, FET and integrated circuits. Inverters TTL, MOS, ECL structures. Logic Gates. Flip-flops. Bistable, astable and monostable multivibrators. Semiconductor memories. ROM, RAM structures. Programmable logic arrays.
(Offered to non- EEE students only)
Prerequisite: EEE281

EEE 300 Summer Practice I NC
Minimum four weeks (20 working days) of practical work in an organization with a sizable electrical or electronics operation. Special attention
should be given to most but not necessarily all of the following subjects: production, operation, maintenance, management and safety. A formal report as described in the Summer Practice Guide is to be submitted.

EEE 301 Signals and Systems I (3-0)3
Continuous and discrete time signals and systems classification and properties. Linear time-invariant systems: impulse response, convolution. Functions of a complex variable, complex series and integrals. Transform methods: Continuous-time Fourier series and transform, discrete-time Fourier series and transform. Frequency response. Sampling theory. Laplace and z-transforms, system functions.
Prerequisite: MAT219

EEE 302 Feedback Systems (3-0)3
Mathematical modeling: Transfer functions, state equations, block diagrams. System response; performance specifications. Stability of feedback systems: Routh-Hurwitz criterion, principle of argument, Nyquist stability criterion, gain margin and phase margin. Design of dynamic compensators. Analysis and design techniques using root-locus. State-space techniques: Controllability, observability, pole placement and estimator design. Discrete-time control systems.
Prerequisite: EEE301

EEE 303 Electromagnetic Waves (3-0)3
Maxwell's Equations in time and frequency domains. Electromagnetic energy and power. Wave equation. Uniform plane electromagnetic waves, reflection and refraction. Introduction to transmission lines, waveguides, antennas and radiation.
Prerequisite: EEE224

EEE 306 Signals and Systems II (3-0)3
Correlation of signals. Energy and power spectral densities. Hilbert transform. Principles of modulation. Stochastic processes: Characterization, correlation functions, stationarity, ergodicity, power spectral density. Transmission of random signals through linear systems. Special stochastic processes. Noise.
Prerequisite: EEE301and EEE230

EEE 311 Electronics I (3-2)4
Basic single-stage transistor amplifiers and frequency responses.Multi-stage amplifiers. Feedback in amplifiers. Differential pair stages. Current mirrors. Operational amplifiers. Power amplifiers and regulators.
Prerequisite: EEE202 and EEE 212

EEE 312 Electronics II (3-2)4
Large signal transistor models. TTL, MOS and CMOS logic gates: Inverters, input and output circuits, NAND and NOR gates; static and dynamic analyses. Regenerative circuits: Astable, monostable, bistable multivibrators and Schmitt triggers. Introduction to VLSI. Static and dynamic memories: RAM, ROM, EPROM, EEPROM, etc. A/D and D/A converters.
Prerequisite: EEE212

EEE 347 Introduction to Microprocessors (3-2)4
Microprocessor architecture; a particular microprocessor software. I/O interfacing. Interrupt processed I/O. Direct memory access. Microprocessor based communication.
Prerequisite: EEE248

EEE 361 Electromechanical Energy Conversion (3-2)4
Electromechanical energy conversion principles. DC machines, characteristics, speed control. Transformers. Principles of ac machine operation. Synchronous machines; equivalent circuit, characteristics. induction machines; equivalent circuit, characteristics, speed control. Single phase machines.
Prerequisite: EEE202 and EEE224

EEE 400 Summer Practice II NC
Minimum four weeks (20 working days) of practical work in an organization with a sizable electrical or electronics operation. Special attention should be given to most but not necessarily all of the following subjects: maintenance, production planning, management, quality control and design. A formal report as described in the Summer Practice Guide is to be submitted.

EEE 402 Discrete Time Systems (3-0)3
Importance and advantages of discrete time system models in control. Time domain analysis of discrete-time systems. Sampled data systems. Stability; translation of analog design. State space design methods: observer theory, introduction to optimal design methods. Quantization effects.
Prerequisite: EEE302

EEE 404 Nonlinear Control Systems (3-0)3
State-space analysis methods. Isocline Lienard's methods, classification of singularities. Analytic techniques of periodic phenomena: Perturbation

method. Stability definitions. Lyapunov's second method; Popov stability criterion. The method of harmonic realization: Describing functions. Dual-input describing functions. Equivalent linearization and oscillations in nonlinear feedback systems.
Prerequisite: EEE302

EEE 426 Antennas and Propagation (3-2)4
Antenna parameters. Linear antennas. Influence of earth on antenna radiation pattern and impedance. Radiation from slot and aperture antennas. Antenna arrays and the general array formula. Baluns. Receiving antenna theory. Elements of groundwave, tropospheric and ionospheric propagation.
Prerequisite: EEE 303

EEE 427 Microwaves I 4(3-2)
TEM mode transmission lines. Field and distributed circuit analysis. Frequency and time domain analysis. Waveguiding structures. Rectangular and circular waveguides. Impedance transformations and matching techniques. Scattering matrix of microwave junctions.
Prerequisite: EEE 303

EEE 428 Microwaves II 4(3-2)
Passive reciprocal and nonreciprocal devices. Electromagnetic resonators. Periodic structures and microwave filters. Microstripline structures and coupled lines. Solid state microwave devices.
Prerequisite: EEE 427

EEE 430 Digital Signal Processing (3-0)3
Discrete-time signals and systems. Discrete Fourier transform. Sampling and reconstruction. Linear time-invariant systems. Structures for discrete-time systems. Filter design techniques. Fast Fourier Transform methods. Fourier analysis of signals using discrete Fourier transform. Optimal filtering and linear prediction.
Prerequisite: EEE301

EEE 435 Telecommunications I (3-0)3
Amplitude and angle modulation techniques: Amplitude Modulation, Double Side Band, Single Side Band, Vestigial Side Band, Quadrature Amplitude Modulation, Frequency Modulation, Pulse Modulation. Phase-locked loops. Superheterodyne receivers. Frequency division multiplexing. Television. Noise in CW systems.
Prerequisite: EEE306

EEE 436 Telecommunications II (3-0)3
Pulse modulation: Sampling process, pulse-amplitude modulation, time-division multiplexing, quantization, pulse-code modulation. Line codes. Baseband pulse transmission. Digital passband transmission. Introduction to information theory and error control coding.
Prerequisite: EEE435

EEE 441 Data Structures (3-0)3
Arrays, stacks, queues, linked lists, trees, hash tables, graphs: Algorithms and efficiency of access. Searching and sorting algorithms.
Prerequisite: CNG140

EEE 445 Computer Architecture I (3-0)3
Asynchronous logic system. Algorithmic state machines. CPU organization. Construction of arithmetic logic unit. Process control architectures. Instruction modalities. Microprogramming. Bit slicing.
Prerequisite: EEE248

EEE 446 Computer Architecture II (3-2)4
Arithmetic processor design, arithmetic algorithms. Memory organization, parallel processing. Multiprocessors systems. Peripheral organization. I/O processing. I/O controllers.
Prerequisite: EEE445

EEE 462 Utilization of Elec.Energy (3-2)4
Basic operating characteristics and classification of electrical drives. Solid state DC motor control. Solid state AC motor control. Dynamic behavior of electrical machines. Electric braking. Starting of electrical machines. Intermittent loads. Drive applications. Modern methods of reactive power compensation. Electric energy saving.
Prerequisite: EEE463 and EEE361

EEE 463 Power Electronics I (3-2)4
Power switches and their characteristics. Power converter definitions, classification. VTA method. Midpoint and bridge rectifiers: non-ideal commutation, harmonics, input power factor, utility-factor, winding utilization and unbalances in rectifier transformers. Applications.
Prerequisite: EEE212 and EEE 361

EEE 464 Power Electronics II (3-0)3
Introduction to forced commutated circuits, analysis, classification of techniques. Centretap inverter. Voltage-fed inverters; waveshaping; PWM, stepped and square-waveforms, voltage regulation, harmonics. Current-fed inverters; analysis, effect of SCR turn-off time on voltage waveform, overlap. DC-DC switching converters; time-ratio control, effect of loading, parameter optimization. Device failure mechanisms. Thermal considerations, maximum ratings, protection of switching elements. Series and parallel operation of switching elements.
Prerequisite: EEE463

EEE 471 Power System Analysis I (3-0)3
Basic structure of electrical power systems. Electrical characteristics of transmission lines, transformers and generators. Representation of power systems. Per Unit System. Symmetrical three-phase faults. Symmetrical components. Unsymmetrical faults.
Prerequisite: EEE361.

EEE 472 Power System Analysis II (3-2)4
Matrix analysis of power systems networks and methods of solution. Load flow and short circuit analysis. Economic operation of power systems. Transient stability analysis.
Prerequisite: EEE471.

EEE 493 Engineering Design I (1-2)2
Fundamentals of design, project management, design tools, simulation standards, quality concepts, design experience through a team project.
Prerequisite: EEE311 and two of the following: EEE302 EEE361 EEE248

EEE 494 Engineering Design II (1-2)2
Continuation of Engineering Design I with topics covering statistics, reliability, engineering economics, ethics and completion of a team project with a final report and presentation.

EEE 495-499 Special Topics in Electrical and Electronics Engineering (3-0)3
These code numbers will be used for courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

NORTHERN CYPRUS CAMPUS

MECHANICAL ENGINEERING PROGRAM

GENERAL INFORMATION: The mission of METU NCC Mechanical Engineering Program is:

- To train individuals to become creative, inquisitive and productive in both national and international arenas, instilled with global knowledge and abilities, and able to be leaders and pioneers in their field.
- To perform research and development activities that will contribute to science and national technologies,
- To lead and to pioneer in related fields.

With this mission in mind, the graduates of the Mechanical Engineering Program of the METU NCC are engineering professionals who:

I. Are preferred because of their leadership and pioneering abilities in the fields of advanced technology and/or research and development,
II. Continue on self-development through vocational training and/or graduate studies,
III. Are responsive to individuals, society and environment in their professional practice.

The curriculum of the Mechanical Engineering program is planned to provide a balanced course schedule for students with a variety of courses in basic sciences, engineering sciences and, applications and other related areas. In the first year of the curriculum, the program includes basic fundamental science coursess; in the second year is devoted to fundamental engineering courses; in the third year includes basic fundamental mechanical engineering courses, and finally, in the fourth year courses involve applications of mechanical engineering. A variety of courses covering basic and specialized subjects in Mechanics, Design and Production, Thermal and Fluid Sciences, Theory and Dynamics of Machines are offered.

CAREER OPPORTUNITIES: Mechanical engineering is one of the most wide-ranging engineering disciplines. Mechanical engineers are educated to design, manufacture, develop and maintain systems that transform energy into motion and motion into energy. . Mechanical engineers work in almost all industries, irrespective of their main field of interest. Mechanical engineers are usually needed wherever there is production. Mechanical engineers work with energy systems and can get involved in power plants, heating-ventilating and air conditioning. They can also work in in factoriesproduction facilities related to their own field of interest, such as like automotive, and textile industries machine tools, household goods, heating-ventilating and air conditioning, textile, steel, construction and agricultural machinery, power plants and similar factories. Additionally, mechanical engineers make up a considerable portion of all the engineers working in other industries like electric and electronics, chemical, construction, and mining. Certainly, mechanical engineers work a lot in factories related to their own field of interest, like automotive, machine tools, household goods, heating-ventilating and air conditioning, textile, steel, construction and agricultural machinery, power plants and similar factories. Mechanical engineers who graduate from the METU Northern Cyprus Campus will find jobs easily in any of these varied opportunitiesareas. Graduates of the METU Northern Cyprus Campus Mechanical Engineering Program may also pursue an academic career in leading universities in Turkey or abroad, as a result of their broad knowledge and analytical perspective.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MAT	119[a]	Calc. with Analytic Geo.	(4-2)5
PHY	105	General Physics I	(3-2)4
ENGL	101	Dev. of Reading & Writing Skills I	(4-0)4
MECH	113	Computer Aided Engineering Drawing 1	(2-2)3
CNG	230	Introduction to C Programming	(2-2)3
GPC	100	First Year on Campus Sem.	(0-2)1
CNG	100	Intro. to Information Tech. and Applications	(2-0)NC

Second Semester

MAT	120	Calculus for Functions of Several Variables	(4-2)5
PHY	106	General Physics II	(3-2)4
CHM	107	General Chemistry	(3-2)4
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
MECH	114	Computer Aided Engineering Drawing II	(2-2)3
MECH	100	Introduction to Mechanical Engineering	(1-1)NC

SECOND YEAR

Third Semester

MAT	219	Introduction to Differential Equations	(4-0)4
MECH	202	Manufacturing Technologies	(3-2)4
MECH	203	Thermodynamics	(4-0)4
MECH	205	Statics	(3-0)3
MECH	227	Engineering Materials	(3-0)3
TUR	101[b]	Turkish I	(2-0)NC

Fourth Semester

MAT	210	Applied Math. for Engineers	(4-0)4
MECH	206	Strength of Materials	(4-0)4
MECH	208	Dynamics	(3-0)3
MECH	220	Mechanical Eng. Lab. I	(1-2)2
EEE	209	Fundamentals of Electrical and Electronics Engineering	(3-0)3
ENGL	211	Acad. Oral Pres. Skills	(3-0)3
TUR	102[b]	Turkish II	(2-0)NC

THIRD YEAR

Fifth Semester

ECO	280	Engineering Economy	(3-0)3
MECH	301	Theory of Machines	(4-0)4
MECH	303	Manufacturing Engineering	(3-0)3
MECH	305	Fluid Mechanics	(4-0)4
HST	201[c]	Principles of Kemal Atatürk I	(2-0)NC
XXX	xxx	Non-Technical Elective	(-)3
MECH	300[d]	Summer Practice I	NC

Sixth Semester

MECH	304	Control Systems	(3-0)3
MECH	307	Mechanical Eng. Design	(4-0)4
MECH	311	Heat Transfer	(4-0)4
MECH	320	Mech.Eng. Laboratory II	(1-2)2
XXX	xxx	Non-technical Elective	(-)3
HST	202[c]	Principles of Kemal Atatürk II	(2-0)NC

FOURTH YEAR

Seventh Semester

MECH	xxx	Technical Elective	(-)3
MECH	xxx	Technical Elective	(-)3
MECH	xxx	Technical Elective	(-)3
		Free Elective	(-)3
ENGL	311	Advan. Communic. Skills	(3-0)3
MECH	400[d]	Summer Practice II	NC

Eighth Semester

MECH	420	Mech. Eng. Laboratory III	(0-4)2
MECH	458	Graduation Design Project	(0-6)3
MECH	xxx	Technical Elective	(-)3
MECH	xxx	Technical Elective	(-)3
MECH	xxx	Technical Elective	(-)3

[a] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119

[b] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[c] International students will take HST 205 and HST 206 instead of HST 201 and HST 202

[d] Students are expected to complete their summer training prior to registering MECH 300 andMECH 400

ELECTIVE COURSES

Some courses that may be offered as electives are:

- MECH 401 Internal Combustion Engines
- MECH 402 Fluid Machinery
- MECH 403 Heating, Ventilating, Air Conditioning and Refrigeration
- MECH 405 Energy Conversion Systems
- MECH 408 Hoisting and Conveying Machinery
- MECH 411 Gas Dynamics
- MECH 413 Introduction to Finite Element Analysis
- MECH 414 System Dynamics
- MECH 415 Utilization of Geothermal Energy
- MECH 416 Tool Design
- MECH 418 Dynamics of Machinery
- MECH 421 Steam Generator and Heat Exchanger Design
- MECH 422 Heating, Ventilating, Air Conditioning and Refrigeration Sys. Design
- MECH 423 Gas Turbines and Jet Propulsion
- MECH 401 Internal Combustion Engine Design
- MECH 427 Introduction to Nuclear Engineering
- MECH 428 Nuclear Reactor Engineering
- MECH 429 Mechanical Vibrations
- MECH 431 Kinematic Synthesis of Mechanisms
- MECH 482 Acoustics and Noise Control Engineering
- MECH 433 Engineering Metrology and Quality Control
- MECH 434 Advanced Strength of Materials
- MECH 437 Pipeline Engineering
- MECH 438 Theory of Combustion
- MECH 440 Numerically Controlled Machine Tools
- MECH 442 Design of Control Systems
- MECH 444 Reliability in Engineering Design
- MECH 445 Integrated Manufacturing Systems
- MECH 450 Non-destructive Testing Methods
- MECH 451 Introduction to Composite Structures
- MECH 453 Metal Forming Technology
- MECH 455 Manufacturing of Polymeric Structures
- MECH 461 Mechatronic Components and Instrumentation
- MECH 462 Mechatronic Design
- MECH 466 Performance of Road Vehicles
- MECH 471 Production Plant Design
- MECH 476 Second Law Analysis of Engineering Systems
- MECH 478 Introduction to Solar Energy Utilization
- MECH 483 Experimental Techniques in Fluid Mechanics
- MECH 490 Special Topics in Mechanical Engineering

DESCRIPTION OF COURSES

MECH 100 Introduction to Mechanical Engineering (1-1)NC
Introduction to mechanical engineering. Demonstrations in Mechanical Engineering department laboratories. Practical work in the machine shop. Workshop safety. Lectures on ethics. Technical trips to various industrial sites.

MECH 113 Computer Aided Engineering Drawing I (2-2)3
Introduction to computer aided drawing. Geometrical constructions. Orthographic drawing and sketching. Three dimensional drawings. Dimensioning principles. Sectioning and conventions.

MECH 114 Computer Aided Engineering Drawing II (2-2)3
Working drawings, assembly drawings. Screw threads, threaded fasteners. Keys, springs, locking devices, rivets, welding, piping layouts. Gears and cams. Dimensioning and tolerances. Introduction to descriptive geometry, points, lines, planes. Piercing points, dihedral angle. Angle between line and plane. Parallelism, perpendicularly. Intersections. Developments.
Prerequisite: MECH113.

MECH 202 Manufacturing Technologies (3-2)4
Introduction. Casting. Powder metallurgy. Metal working; hot working and cold working processes. Chip removal processes. Non-traditional machining processes. Welding. Manufacturing systems and automation. Machine shop practices.

MECH 203 Thermodynamics (4-0)4
Basic concepts and definitions. Properties of a pure substance. Equations of state. Work and heat. First laws of thermodynamics. Internal energy and enthalpy. Second law of thermo-dynamics. Availability. Power and refrigeration cycles. Gas and vapor mixtures. Thermodynamic relations.

MECH 205 Statics (3-0)3
Idealizations and principles of mechanics. Important vector quantities, classification and equivalence of force systems. State of equilibrium. Elements of structures; trusses, beams, cables and chains. Friction. Elements of statics of fluids. Variational methods.

MECH 206 Strength of Materials (4-0)4
Concept of stress: normal, bearing and shear stresses. Stress and strain in simple loadings: axial loading, pure torsion and bending. Thermal stresses. Deflection of beams. Statically indeterminate members. Combined loadings: Combined stresses, Mohr's circle. Columns. Curved beams. Pressurized thin and thick walled cylinders. Contact stresses. Strain Energy and Castigliano's theorem. Stress concentration. Static design criteria. Fatigue design criteria.
Prerequisite: MECH205.

MECH 208 Dynamics (3-0)3
Kinematics and kinetics of particles and system of particles. Plane kinematics and kinetics of rigid bodies. Newton's second law of motion. Methods of work-energy and impulse-momentum.
Prerequisite: MECH205.

MECH 220 Mech. Engineering Lab. I (1-2)2
Laboratory work and its guidelines. Laboratory safety issues. Laboratory notebook keeping, report writing. Basic concepts in measurements, experiment planning, calibration, standards, experimental error and its analysis, uncertainty analysis. Data acquisition and processing. Analysis of experimental data. Displacement and area measurements. Pressure measurement. Flow measurement. Temperature measurement. Force, torque and strain measurements. The concepts of teamwork and leadership.

MECH 227 Engineering Materials (3-0)3
Structure of engineering materials. Bonding, crystals, grains, imperfections. Mechanical properties. Tensile testing, impact testing, hardness. Plastic deformation, strain hardening, solution hardening, grain size effect, recrystallization. Failure of materials, fracture, fatigue, creep. Phase and phase diagrams. Fe-C phase diagram. Steels. Heat treatment of steels. Alloy steels. Cast iron. Non-ferrous alloys. Ceramics. Polymers. Composites. Some laboratory experiments will be carried out.

MECH 300 Summer Practice I NC
Students are required to do a minimum of four weeks (twenty working days) summer practice at the shop floor of a suitable factory. The students are expected to practice on manufacturing processes such as machining, foundry work, metal forming, welding, non-traditional machining, heat treatment, finishing, etc. A report is to be submitted to reflect the work carried out personally by the student.

MECH 301 Theory of Machines (4-0)4
Basic concepts, mobility, basic types of mechanisms. Position, velocity and acceleration analysis of linkages. Gear trains. Static and dynamic force analysis of mechanisms. Virtual work method. Modeling and elements of vibratory systems. Free and forced vibrations of single degree-of-freedom systems.
Prerequisite: MECH208.

MECH 303 Manufacturing Engineering (3-0)3
Introduction. Strain hardening properties of metals. Theory of metal forming; formability, bulk deformation processes, sheet metal forming processes. Theory of metal cutting; cutting forces and energy requirement, tool life, machinability, tool materials, cutting fluids, surface quality, machining economics.
Prerequisites: MECH 202 and MECH 206

MECH 304 Control Systems (3-0)3
Introduction and basic concepts. Modeling physical systems. Control system components. Transient response. Stability. Steady state response and error. Sensitivity. Basic control actions and controllers. Frequency response. Some laboratory experiments will be carried out.
Prerequisites: MECH 208 and MAT219.

MECH 305 Fluid Mechanics (4-0)4
Introduction. Fluid statics. Kinematics of fluid flow. Integral formulation of basic equations. Bernoulli equation. Similarity. Viscous flow. Introduction to Compressible fluid flow.

MECH 307 Mechanical Engineering Design (4-0)4
Tolerances and allowances. Design of shafts. Design of permanent joints. Design of detachable joints. Design of springs. Friction, wear and lubrication. Design of sliding bearings. Antifriction bearings; types, selection criteria and calculation procedure. Power transmission. Design of gear drives; types, kinematics, spur gears, helical gears. Design of couplings, clutches and brakes. Design of belt drives; flat belts, V-belts. Design of chain drives and rope drives.
Prerequisite: MECH206.

MECH 311 Heat Transfer (4-0)4
1-D and 2-D steady heat conduction, extended surfaces. 1-D transient conduction. Dimensionless parameters, Reynolds analogy. External flow, empirical correlations. Internal flow correlations. Free convection. Forced convection. Heat exchangers. Radiative heat transfer.
Prerequisite: MECH 203

MECH 320 Mech. Engineering Lab. II (1-2)2
Review of laboratory safety issues. Statistical analysis of experimental data. Probability distribution, normal and Gaussian distribution. Chi-square test. Method of least squares. Regression analysis. Graphical analysis and curve fitting. Laboratory notebook keeping and report writing. Experimentation, data collection and treatment within the subjects of thermodynamics, fluid mechanics, heat transfer, vibrations and control. Written and oral presentation.
Prerequisite: MECH220.

MECH 400 Summer Practice II NC
Students are required to do a minimum of four weeks (twenty working days) summer practice in a suitable factory, a power station, or an engineering design and consultancy office. They are expected to get acquainted with a real business environment by studying various managerial and engineering practices through active participation. A report is to be submitted to reflect the students' contributions.

MECH 401 Internal Combustion Engines (3-0)3
Thermodynamic cycle analysis of gas exchange, compression, expansion and combustion processes with dissociation. Mechanism of combustion. Fuel and additive characteristics. Real cycles. Performance characteristics. Brief analysis of the fuel metering and ignition systems, exhaust emissions and control systems, heat transfer, friction and lubrication systems.
Prerequisite: MECH203.

MECH 403 Heating, Ventilation, Air Cond. and Refrigeration (3-0)3
Psychrometrics and elementary psychrometric processes. Simultaneous heat and mass transfer in external flows. Direct contact transfer devices. Heating and cooling coils-compact heat exchangers. Thermal comfort. Warm water heating systems. Cooling load calculations. Vapor compression refrigiration cycles.

MECH 405 Energy Conversion Systems (3-0)3
Energy demand and available resources in the world and in Turkey. Renewable sources: wind, wave, tide, geothermal, biogas and solar energy. Fossil fuels, combustion and combustion equipment. Steam generators. Atomic structure, nuclear reactions; decay, fusion and fission. Reactors. Environmental effects.
Prerequisite: MECH 203 and MECH 311.

MECH 408 Hoisting and Conveying Machinery (3-0)3
Introduction to material handling. Bulk and unit load concepts. Cranes: overhead traveling cranes; FEM rules, calculation method for bridge girders and carriages, drive and hoist mechanisms and related equipment; jib cranes; gantry cranes. Feeders and conveyors, roller conveyor, pneumatic conveyors, vibrating conveyors, screw conveyor.
Prerequisite: MECH 307

MECH 413 Introduction to Finite Element Analysis (3-0)3
Review of basic laws of continuum. Variational and weighted residual methods. Element type. Interpolation function. Boundary conditions. Transformation and assembly of element matrices. Solution methods and accuracy. Examples from solid mechanics, heat transfer and fluid mechanics.
Prerequisite: MAT 210

MECH 418 Dynamics of Machinery (3-0)3
Kinematic influence coefficients. Equation of motion and dynamic response of single degree-of-freedom machines: analytical and numerical solution methods. Shaking forces and moments. Balancing of a four-bar linkage. Dynamically equivalent mass systems. Analysis of unbalance in multi-cylinder engines. Kinetostatics: effects of dry friction, power flow in simple and planetary gear trains. Jump phenomenon in rigid cam-follower systems.
Prerequisite: MECH 301.

MECH 420 Mech. Engineering Lab. III (0-4)2
Experiments on a number of engineering systems. Preferably interdisciplinary team work. Report writing. Written and oral presentation.
Prerequisite: MECH320.

MECH 422 Heating, Ventilating, Air Cond. & Refrig. Sys. Design (3-0)3
District heating systems-steam and hot water. Psychrometric analysis of summer air conditioning systems. Air cleaning and filtering. Analysis and design of a year-round air conditioning unit. Ducting and air distribution. Refrigeration equipment in HVAC & R systems. Control equipment and systems in HVAC & R applications.
Prerequisite: MECH403.

MECH 433 Engineering Metrology & Quality Control (3-0)3
Analysis of errors. Calibration. Linear, angular measurement. Geometric tolerances and their measurement. Measurement of surface roughness. Measurements of threads and gears. Testing of machine tools. Gage design. Quality assurance systems: ISO 9000 series of standards. Acceptance sampling. Design of sampling plans and control charts. Process capability analysis.

MECH 451 Introduction to Composite Structures (3-0)3
Composite materials and their structural properties. Composite systems. Principles of manufacturing. Structural mechanics of laminated composites. Generalized Hooke's law. Classical lamination theory. Plane stress problems. Engineering applications. Design principles. Failure criteria and damage tolerance.
Prerequisite: MECH 206.

MECH 453 Metal Forming Technology (3-0)3
Classification of forming processes. Bulk and sheet metal forming processes. Working spaces of various processes. Product spectrum and properties, materials suitable for forming processes. Forming force and forming work computations. Design of forming tools: punches and dies, tool materials. Forming sequences. Process procedures: heat treatments, raw material preparation, lubrication, environmental issues. Principles of forming machines: hammers, mechanical presses and hydraulic presses, selection of forming machines. Economical aspects. *Prerequisite: MECH303.*

MECH 458 Graduation Design Project (0-6)3
This course acquaints students with all the phases of the design process through a term project with a final report and oral presentation.

MECH 466 Performance of Road Vehicles (3-0)3
Vehicle performance: engine characteristics, resistances to motion, maximum speed, acceleration performance, gradability. Calculation of fuel consumption. Power train: clutch, gearbox, gear ratios, propeller shaft, universal and constant velocity joints, differential, differential ratio, drive shafts. Brakes: basic requirements, directional stability, weight transfer, brake force distribution.
Prerequisite: MECH 208.

MECH 468 Microfluidics (3-0)3
Basic concepts in microfluidics and lab-on-a-chip technology, electrokinetic transport of fluids and particles inside microchannels and its application to microfluidics systems, fabrication techniques for microfluidic devices, fluid flow and heat transfer modeling at microscale, convective heat transfer in microchannels.

MECH 471 Production Plant Design (3-0)3
Fundamentals and design of production systems. Group technology, FMS and CIM. Market survey and plant location analysis. Types of plant layout. Process analysis. Quantity and quality planning and controlling for production. Machine selection. Materials handling. Storages. Safety rules and regulations. Computer applications. Evaluation of design alternatives. A complete design of a production plant as a guided term paper.
Prerequisite: MECH 303

MECH 478 Introduction to Solar Energy Utilization (3-0)3
Nature of solar radiation. Calculation and measurement of insolation on horizontal and tilted planes. Transmission of solar radiation through glass and plastics. Flat-plate collector theory and performance of concentrating type collectors. Heat storage, use of solar energy for power production. Miscellaneous uses such as distillation, cooking, cooling. Laboratory practice on solar radiation.

MECH 485 Computational Fluid Dynamics Using Finite Vol. Method (3-0)3
Conservation laws and boundary conditions, finite volume method for diffusion problems, finite volume method for convection-diffusion problems, solution algorithms for pressure-velocity coupling in steady flows, solution of discretization equations, finite volume method for unsteady flows, implementation of boundary conditions.

MECH 490-498 Special Topics in Mechanical Engineering (3-0)3
These course numbers will be used for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

NORTHERN CYPRUS CAMPUS

PETROLEUM AND NATURAL GAS ENGINEERING PROGRAM

GENERAL INFORMATION: Petroleum and Natural Gas Engineering Program provides education to help students gain knowledge about the fundamentals of petroleum and natural gas engineering, find solutions for national, international, social and environmental issues related to the petroleum industry, other aspects of the engineering of underground fluid resources (drilling, production, reservoir engineering and geothermal energy). It is aimed that, in addition to technical ability, graduates adapt principles of lifetime learning, environmental responsibility and ethical awareness, and that they have sufficient knowledge about the health and safety of employees. Summer practices give students the opportunity to establish the link between theoretical knowledge and practical applications, as well as the recognition of work conditions.
The main content of Petroleum and Natural Gas Engineering education can be summarized as follows:

- Fundamental and natural sciences, engineering topics,
- The physical and chemical properties of petroleum and natural gas,
- The rock properties of petroleum and natural gas,
- The drilling and production of petroleum and natural gas,
- The economical and effective management of petroleum and natural gas reserves

CAREER OPPORTUNITIES: Petroleum and Natural Gas Engineering graduates will have acquired the necessary education to work in the domains of exploration, drilling, production, transportation, storage and management of petroleum, natural gas and geothermal energy. These graduates work in national and international petroleum, natural gas, geothermal energy and pipeline transportation companies.

UNDERGRADUATE CURRICULUM

FIRST YEAR

First Semester

MAT	119[a]	Calculus with Analytic Geometry	(4-2)5
PHY	105	General Physics I	(3-2)4
CHM	111	General Chemistry I	(3-2)4
MECH	113	Computer Aided Engineering Drawing I	(2-2)3
ENGL	101	Development of Reading and Writing Skills I	(4-0)4
CNG	100	Introduction to Information Technologies and Applications	(2-0)NC

Second Semester

MAT	120	Calculus for Functions of Several Variables	(4-2)5
PHY	106	General Physics II	(3-2)4
CHM	112	General Chemistry II	(3-2)4
ENGL	102	Development of Reading and Writing Skills II	(4-0)4
PNGE	110	Intro. to Petroleum Eng.	(2-0)2
GPC	100	First Year on Campus Seminar	(0-2)1

SECOND YEAR

Third Semester

MAT	219	Int. to Differential Equations	(4-0)4
ECO	280	Engineering Economy	(3-0)3
CHME	204	Thermodynamics I	(3-0)3
MECH	205	Statics	(3-0)3
PNGE	201	General Geology	(3-2)4
HST	201[a]	Principles of Kemal Atatürk I	(2-0)NC

Fourth Semester

CNG	230	Int. to C Programming	(2-2)3
PNGE	211	Int. to Fluid Mechanics	(3-2)4
CVE	224	Mechanics of Materials	(3-0)3
MAT	210	Applied Math. for Engineers	(4-0)4
ENGL	211	Acad. Oral Present. Skills	(3-0)3
PNGE	216	Res.Rock and Fluid Propert.	(3-2)4
HST	202 [a]	Principles Kemal Atatürk II	(2-0)NC

THIRD YEAR

Fifth Semester

PNGE	301	Petroleum Geology	(2-2)3
PNGE	321	Drilling Engineering I	(3-2)4
PNGE	331	Petroleum Production Eng. I	(3-0)3
PNGE	343	Petroleum Reservoir Eng. I	(3-0)3
TUR	101[(b)]	Turkish I	(2-0)NC
XXX	xxx	Non-Technical Elec.	(-)3
PNGE	300[(c)]	Summer Practice I	NC

Sixth Semester

CVE	303	Prob.and Stat. for Civil Eng.	(3-0)3
PNGE	322	Drilling Engineering II	(3-0)3
PNGE	332	Petroleum Production Eng. II	(3-0)3
PNGE	344	Petroleum Reservoir Eng. II	(3-0)3
PNGE	352	Well Logging	(3-0)3
XXX	xxx	Non-Technical Elective	(-)3
TUR	102[(b)]	Turkish II	(2-0)NC

FOURTH YEAR

Seventh Semester

PNGE	417	Petroleum Eng. Design I	(2-0)2
PNGE	411	Petroleum Prop. Valuation	(3-0)3
PNGE	461	Natural Gas Engineering	(3-0)3
PNGE	xxx	Technical Elective	(-)3
PNGE	xxx	Technical Elective	(-)3
PNGE	400[(c)]	Summer Practice II	NC

Eighth Semester

PNGE	418	Petroleum Eng. Design II	(1-4)3
PNGE	xxx	Technical Elective	(-)3
PNGE	xxx	Technical Elective	(-)3
PNGE	xxx	Technical Elective	(-)3
ENGL	311	Advan. Communic. Skills	(3-0)3

[(a)] Students who are unable to achieve the minimum required passing grade in the Mathematics Proficiency Exam are required to take MAT 100 before MAT 119

[(b)] International students will take TUR 201 and TUR 202, which may be taken in the first year by the consent of the advisor.

[(c)] International students will take HST 205 and HST 206 instead of HST 201 and HST 202

[(d)] Students are expected to complete their summer training prior to registering PNGE 300 and PNGE 400

ELECTIVE COURSES

PNGE 414 International Petroleum Economics and Politics
PNGE 422 Pressure Control
PNGE 424 Special Operations in Drilling
PNGE 426 Drilling Fluid Engineering
PNGE 432 Production Optimization by Nodal System Analysis
PNGE 434 Well Stimulation
PNGE 436 Reservoir Characterization
PNGE 440 Well Test Analysis
PNGE 443 Enhanced Oil Recovery Methods
PNGE 444 Mathematical Modelling of Hydrocarbon Reservoirs
PNGE 445 Transport Phenomena in Geosystems
PNGE 446 Thermal Recovery Methods
PNGE 448 Miscible EOR Processes
PNGE 450 Introduction to Geothermal Reservoir Engineering
PNGE 460 Natural Gas Technology
PNGE 462 Underground Gas Storage
PNGE 490 Petroleum Engineering Research
PNGE 491-498Special Topics in Petroleum Engineering

DESCRIPTION OF COURSES

PNGE 110 Introduction to Petroleum Engineering (2-0)2

A course designed to acquaint the students with the basic concepts of petroleum industries. Historical background, sources, world supply and demand, chemical and physical properties of petroleum. Introduction to petroleum exploration, reservoir types and engineering concepts, production methods, refining and transportation of natural hydrocarbons.

PNGE 201 General Geology (3-2)4
Structure of the Earth. Elements, minerals, and rocks of the Earth's crust. Igneous and metamorphic processes. Weathering. Sedimentary processes. Geological external processes. Rock formation. Earth's dynamic processes and rock deformation. Map studies. (For Petroleum Engineering students only).

PNGE 211 Introduction to Fluid Mechanics (3-2)4
Definitions and fluid properties. Fluid statics. Fluid-flow phenomena. The Bernoulli equation. Laminar and turbulent pipe flows. Transportation and metering of fluids.

PNGE 216 Reservoir Rock and Fluid Properties (3-2)4
Fundamental properties of fluid-permeated rocks; porosity, permeability, saturation and electrical properties; properties of porous media with multiple fluid saturations; wettability, capillarity and relative permeability. PVT relationships of hydrocarbon gas and liquid systems. Reservoir fluid characteristics of hydrocarbons and formation waters.
Prerequisite: CHME204.

PNGE 300 Summer Practice I NC
A minimum of four weeks (20 working days) of Summer Practice is obligatory to fulfill the requirements for the B.Sc. degree. The first practice is preferred to be in drilling operations after the second year. The training is based on the content of the summer practice manual.

PNGE 301 Petroleum Geology (2-2)3
Physical and chemical properties of oil and gas; generation and accumulation of oil; traps; Regional distribution of oil; reservoir mechanics; subsurface exploration techniques. Geodynamic evolution of the major tectonic units.

PNGE 321 Drilling Engineering I (3-2)4
Drilling machinery: hole and equipment. Drilling fluids and hydraulics. Cementing and hydraulics. Drill off tests (bit performances). Pressure control.
Prerequisite: CVE224and PNGE211.

PNGE 322 Drilling Engineering II (3-0)3
Directional drilling (Tangential, ROC and Minimum Curvature Methods). Drill string design (neutral point of tension and compression, neutral point of bending, Lubinski's stresses, margin of over pull). Casing design (biaxial, triaxial). Casing setting (buckling and well head loads).
Prerequisite: PNGE321.

PNGE 331 Petroleum Production Engineering I (3-0)3
Drill stem testing, well completion methods, completion fluids and sand control. Perforating, well head equipment and flow control devices, production packers, oil and gas separators. Flowing well performance, sucker rod pumping, submersible electrical centrifugal pumping, well stimulation techniques; acidizing, hydraulic fracturing.

PNGE 332 Petroleum Production Engineering II (3-0)3
Methods of artificial lift. Selection of and artificial-lift method. Preparation of tubing intake curves for artificial lift systems. Design of electric submersible, hydraulic, jet, beam and screw pumps. Pumping methods for unloading of gas wells.
Prerequisite: PNGE331.

PNGE 343 Petroleum Reservoir Engineering I (3-0)3
Estimation of hydrocarbon pore volume and recovery factor. Classification of oil reservoirs. Reservoir performance prediction for solution gas drive, water drive, gas-cap drive, drainage and combination drive reservoirs using material balance approach. Water influx theory. Water and gas coning in oil producing formations. Characterization of fractured reservoirs. Decline Curve Analysis.
Prerequisite: PNGE216and MAT219.

PNGE 344 Petroleum Reservoir Engineering II (3-0)3
Steady and unsteady state single phase flow equations through porous media, steady and unsteady superposition. Multiphase flow through porous media. Reservoir characterization in homogeneous and heterogeneous reservoirs by pressure and tracer testing.
Prerequisite: PNGE343.

PNGE 352 Well Logging (3-0)3
Principles and operation of gamma ray, self potential, caliper, resistivity (micro and focused), density neutron, sonic, cement bond and variable density, dipmeter and production well logging tools. Interpretation of well log and their crossplotting techniques. Determination of formation properties such as porosity, hydrocarbon saturation, lithology, zone thickness, shaliness, etc. Guidelines to select proper logs in given field conditions.
Prerequisite: PNGE216.

PNGE 400 Summer Practice II NC
A minimum of four weeks (20 working days) of summer practice is obligatory to fulfill the requirements for the B.S. degree. The second practice is for production and/or reservoir

engineering after the third year of undergraduate education. The training is based on the content of the summer practice manual.

PNGE 411 Petroleum Property Valuation (3-0)3

Estimation of reserves. Optimization of production rate. Maximizing the oil recovery within economic limits. Investment required for exploration and development of oil gas fields. Investment required for improved recovery processes. Operating cost. Taxes, prices and depreciation. Profit analysis.

PNGE 414 International Petroleum Economics and Politics (3-0)3

Review of petroleum industry from l859 when it was discovered by Drake in Pennsylvania, USA, up to and including early 1980's when the world economic structure survived the "second oil price shock." Role of oil in international economics and politics, its vital importance in the Middle East and North Africa for the Western and Eastern economical and political systems. Economical and political results of developments. A brief survey of the structure of oil market.

PNGE 417 Petroleum Engineering Design I (2-0)2

Development and use of design methodology, formulation of design problem statements and specifications, consideration of alternate solutions, feasibility considerations. Development of student creativity by using open ended problems. Project engineering and management of engineering projects. Case studies in Petroleum Engineering. A term project is assigned to each student in which proper engineering design approach is the prime requirement.

Prerequisite: At least three of the following four courses:PNGE322,PNGE331, PNGE343, PNGE352

PNGE 418 Petroleum Engineering Design II (1-4)3

Continuation of PNGE 417.

Prerequisite: PNGE417.

PNGE 422 Pressure Control (3-0)3

Origin and detection of abnormal formation pressures. Principles of pressure control: behavior of gas in drilling fluids, mechanics of bubble rise. Pressure control methods: driller, engineer, concurement and low choke pressure methods. Prediction methods for fracture pressure gradient. Drilling and completion concepts in overpressured formations. Pressure control equipments. Special problems.

PNGE 424 Special Operations in Drilling (3-0)3

Coring; core barrel types. Fishing; differential sticking, freepoint detection, string-shot back-off taps and die collars, spears and overshots, washover pipe, cutters. Measurement while drilling.

PNGE 426 Drilling Fluid Engineering (3-0)3

Clay mineralogy and colloid chemistry of muds. Rheology and filtration properties of drilling fluids. Annual performance calculations. Composition of water base muds. Inhibitive and low solid muds. Theory of emulsion and foam. Composition of oil base and pneumatic drilling fluids. Solids control. Hole stability. Problems related to drilling fluids. Differential sticking, lost circulation and corrosion.

PNGE 432 Production Optimization by Nodal System Analysis (3-0)3

Solution procedure for oil wells and injection wells. Nodal analysis as applied to gas wells, gravel-packed oil and gas wells and a standard perforated well. Special pipeline problems. Production optimization for a complete ocean-floor optimization. Applying production optimization to a complete field integrated oil-production system.

PNGE 434 Well Stimulation (3-0)3

Acidizing: carbonate and sandstone acidizing. Diverting agents: history and application. Fracturing; principles of hydraulic fracturing, planning a fracturing treatment (data gathering), fluid design, perforation design, breakdown design, design of a fracturing treatment, post-job evaluation. Re-fracturing. Fracture acidizing.

PNGE 436 Reservoir Characterization (3-0)3

Definition of petroleum reservoir heterogeneity using conventional methods and possible improvements to these methods. Review of basic statistical concepts and methods. Reservoir Rock and Fluid Property Evaluation by Statistical Methods. Scale-up and Simulator Data Preparation. Emerging Methods in Petroleum Reservoir Characterization. Case studies from oil industry.

PNGE 440 Well Test Analysis (3-0)3

Analytical solution to diffusivity equation and basis for pressure transient test analysis. Skin and wellbore storage concepts. Pressure buildup and flow tests. Estimating average drainage area pressure. Type curves as diagnostic tools and as an analysis technique. Analysis of well tests in hydraulically fractured wells. Well test behavior in naturally fractured reservoirs. Multiple well testing, interference and pulse tests. Well test design.

PNGE 443 Enhanced Oil Recovery Methods (3-0)3
Immiscible fluid displacement mechanisms. The fractional flow formula. The rate of advance formula. Stabilized zone concept. Mechanisms and performance calculations of waterflooding and immiscible gas injection. Improved waterflooding methods. Miscible injection methods. Thermal methods: Hot water, steam and in-situ combustion. Field design parameters.

PNGE 444 Mathematical Modeling of Hydrocarbon Reservoirs (3-0)3
Basic principles of mathematical modeling. Finite difference/finite element form of equations that govern single and multiphase flow through porous media. Characteristics of finite difference/finite element equations. Solution strategy techniques of originating matrix problems. Data evaluation in simulation problems. Case studies.

PNGE 445 Transport Phenomena in Geosystems (3-0)3
Applications of mass, heat and momentum balances to fluid flow problems. Shell balances. Non-Newtonian fluids. Transport processes in porous media.

PNGE 446 Thermal Recovery Methods (3-0)3
Fluid flow and heat transport through porous media. Definition of thermal EOR methods. Hot water injection, steam injection, steam override, steam additives, case histories. Insitu combustion, wet combustion, superwet combustion. Combustion reaction in porous media. Case histories.

PNGE 448 Miscible EOR Processes (3-0)3
Definition of miscibility in hydrocarbon reservoirs. Phase behavior and miscibility, ternary diagrams, methods of determining miscibility conditions. Condensing gas drive, vaporizing gas drive processes. Design considerations and predictive methods.

PNGE 450 Introduction to Geothermal Reservoir Engineering (3-0)3
Classification of geothermal reservoirs, distribution and characteristics of geothermal resources. Physical aspects of hydrothermal systems. Assessment of geothermal resources. Well completion and warm-up, measurements during drilling; temperature log, the completion tests, pressure log. Flow testing. Well performance.

PNGE 460 Natural Gas Technology (3-0)3
The origin and characteristics of natural gas. The purification and liquefaction of natural gas. Natural gas transmission and distribution.

PNGE 461 Natural Gas Engineering (3-0)3
Properties of natural gases, hydrate formation. Estimation of gas reserves. Gas well testing. Estimation of gas deliverability. Gas flow measurement. Natural gas deliverability. Natural gas transmission, design of gathering systems. Field treating and processing of natural gas. Compressor horsepower requirement

PNGE 462 Underground Gas Storage (3-0)3
Aspects of energy related to gas storage, degree day concept, base load, peak load. Properties of gas storage reservoirs, aquifer storage, salt cavern storage. Design, development and operation of storage fields.

PNGE 490 Petroleum Engineering Research (1-2)2
Fundamentals of problem solving and decision making. Research experience, report writing and presentation techniques through a team project.

PNGE 491-498 Special Topics in Petroleum Engineering (3-0)3
These code numbers will be for technical elective courses which are not listed regularly in the catalog. The course contents will be announced before the semester commences.

DESCRIPTION OF SERVICE COURSES

ARCHITECTURE

ARC 344 Environment and Man: Cause and Effect (3-0)3
How Environment and Man relate. Basic phenomena of their domains. Conditions of their co-existance: interrelationships and interactions. Concepts and manifestations of `shelter`. The continuum of time and space. Needs, activities, and responses. Activity locations and boundaries. Attributes of Man: Anthropometrics and ergonometrics. Space and the built environment: Definitions and attributes. Environmental information for Man`s continued survival.

BIOLOGY

BIOL 106 General Biology (3-0)3
The course aims to provide knowledge in essential concepts of Biology such as the structure and

function of cells with emphasis on eukaryotic systems, metabolism, genetics, ecology and evolution. A condensed (one semester) course for non-biology students.

CHEMISTRY

CHM 107 General Chemistry (3-2)4
Introduction to atomic and electronic structure, chemical bonding, molecular structure and bonding theories, properties of liquids, solids and solutions, chemical equilibrium, kinetics, thermodynamics, metal complexes, organic compounds and nuclear chemistry.

CHM 111 General Chemistry I (3-2)4
A basic course emphasizing the metric system, introduction to stoichiometry, the structural and physical properties of matter, i.e., electronic structure of atoms, chemical binding, molecular geometry, hybridization and molecular orbitals.

CHM 112 General Chemistry II (3-2)4
Discussion of physical properties of solutions in aqueous solution, chemical kinetics, chemical equilibrium, chemical thermodynamics and electrochemistry.

CHM 230 Analytic Chemistry for Engineers (3-2)4
Fundamentals and theories of analytical chemistry. Data evaluation, errors. Theory and applications of volumetry. Molecular spectroscopy, electroanalytical chemistry, potentiometry and chromatography.

CHM 237 Organic Chemistry I (3-2)4
Introduction to organic chemistry. A new mechanistic approach to the study of chemical reactions and survey of hydrocarbons, alcohols, esters, aldehydes, ketones, carboxylic acids (and their derivatives), amines. The course emphasizes the fundamental properties of organic compounds.

CHM 238 Organic Chemistry II (3-0)3
Continuation of CHM-237.
Prerequisite: CHM237.

CHM 351 Physical Chemistry (3-2)4
This course covers an extensive application of physicochemical topics such as kinetics of elementary and complex reactions, molecular reaction dynamics, electrochemical systems and problems related to the topics.
Prerequisite: CHME 204

MATHEMATICS

MAT 100 Precalculus (1-2)2
MAT 100 is a preparatory course for calculus courses. Topics include: Functions and their inverses, operations with functions and graphing techniques, polynomial functions, rational functions, exponential and logarithmic functions, trigonometric functions, trigonometric identities and trigonometric equations, inequalities and solving techniques.

MAT 119 Calculus with Analytic Geometry (4-2)5
Functions, limits, continuity and derivatives. Applications. Extreme values, the Mean value Theorem and its applications. Graphing. The definite integral. Area and volume as integrals. The indefinite integral. Transcendental functions and their derivatives. L`Hopital`s rule. Techniques of integration. Improper integrals. Applications.
Prerequisite: MAT100.

MAT 120 Calculus for Functions of Several Variables (4-2)5
Sequences, infinite series, power series, Taylor series. Vectors, lines and planes in space. Functions of several variables: Limit, continuity, partial derivatives, the chain rule, directional derivatives, tangent plane approximation and differentials extreme values, Lagrange multipliers. Double integrals with applications. The line integral.
Prerequisite: MAT119.

MAT 210 Applied Mathematics for Engineers (4-0)4
Introduction. Vector differential and integral calculus. Matrices. Determinant. Systems of linear equations. Characteristic values and characteristic vectors of matrices. Introduction to numerical methods.
Prerequisite: MAT120 .

MAT 219 Introduction to Differential Equations (4-0)4
First order equations and various applications. Higher order linear differential equations. Power series solutions. The Laplace Transform; solution of initial value problems. Systems of linear differential equations. Introduction to partial differential equations.
Prerequisites: MAT120.

MAT 260 Basic Linear Algebra (3-0)3
Matrices, determinants and systems of linear equations. Vector spaces, the Euclidian space, inner product spaces, linear transformations. Eigenvalues, diagonalization.

PHYSICS

PHY 105 General Physics I (3-2)4
Vectors; kinematics; particle dynamics work and energy; conservation of energy; system of particles; collisions; rotational motion; oscillations.

PHY 106 General Physics II (3-2)4
Electric charge; electric field; Gauss' law, electric potential; capacitance; current and resistance; circuits; magnetic field; Ampere's law; Faraday's law of induction; electro-magnetic oscillations; alternating currents.

STATISTICS

STAS 221 Statistics for Engineers I (3-0)3
Introduction to probability. Finite sample spaces. Conditional probability and independence. Discrete and continuous random variables. Random sample and statistics. Statistical inference, estimation and tests of hypotheses. Simple linear regression.
Prerequisite: MAT 120.

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NORTHERN CYPRUS CAMPUS
GRADUATE PROGRAMS

NORTHERN CYPRUS CAMPUS

M.S. PROGRAM IN POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

The *Masters Program in Political Science and International Relations* provides an advanced and comprehensive understanding of the transformation of global politics and society. The challenges that these transformations pose both to individual states and to global society as a whole is at the heart of this master programme.

The Masters programme will enable students to address the big issues facing global decision-makers: from regional integration to democratic transformation; from the politics of intervention to the politics of reconciliation; from labour market regulation to migration management; from human security to military alliances; from the complexities of environmental degradation to the social consequences of inequality; from international law to human rights.

Those who work at the highest levels in business, government, or the non-governmental and 'third' sector, increasingly need to tackle these problems in a systematic and interdisciplinary manner, and the *Masters in Political Science and International Relations* programme offers students the opportunity to do so.

GRADUATE PROGRAM COMMITTEE

SAURIN Jochaim Julian, V. Assoc. Prof. Dr., ***Coordinator***; B.A., Ph.D., University of Southampton

AYDIN Zülküf, Prof. Dr.*;* B.A., Ankara University; Ankara Yüksek Öğretmenlik Okulu Certificate; Ph.D., Durham University

KILINÇOĞLU Deniz Taner, Instr. Dr., *Economic;* B.S., M.S., METU; Ph.D., Princeton University

ÖZDEMİR Yonca, Assist. Prof. Dr., *Political Science and International Relations*; B.A., METU; M.A., University of Delaware; Ph.D., University of Pittsburgh

SÖZER Hande, Instr. Dr. *Political Science and International Relations;* B.S., METU; M.A., Boğaziçi University; Ph.D, University of Pittsburgh

REQUIRED COURSES:

PSIR	501	Social and Political Theory	(3-0)3
PSIR	503	International Relations in History and Theory	(3-0)3
PSIR	505	Research Methods for Social and Political Sciences	(3-0)3
PSIR	502	Comparative Political Development	(3-0)3
PSIR	504	Global Political Economy	(3-0)3
PSIR	506	International Human Rights in Conflict	(3-0)3
PSIR	508	Ethnic Conflict in the Eastern Mediterranean	(3-0)3
PSIR	590	Research Seminar	(0-2)NC
PSIR	500	M.S. Thesis	NC

DESCRIPTION OF GRADUATE COURSES

PSIR 501 Social and Political Theory (3-0)3

Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

PSIR 502 Comparative Political Development (3-0)3

Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

PSIR 503 International Relations in History andTheory (3-0)3

Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

PSIR 504 Global Political Economy (3-0)3

Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

PSIR 505 Research Methods for Social and Political Sciences (3-0)3

Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

PSIR 506 International Human Rights in Conflict (3-0)3

Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

PSIR 508 Ethnic Conflict in the Eastern Mediterranean (3-0)3

Students will form preferably interdisciplinary groups and will prepare a paper on a research or policy issue. Each group will be supervised by one or two instructors. In addition to the final report at the end of the semester, the group will be required to submit a minimum of 1 progress report halfway through the semester.

NORTHERN CYPRUS CAMPUS

M.S. PROGRAM IN SUSTAINABLE ENVIRONMENT AND ENERGY SYSTEMS

There is no question that reinstating our world in a sustainable path will require new experts with fresh ideas, analytical approaches, interdisciplinary research and development skills, and intimate awareness of the "Vital Triad": Environment, Energy, and Water Resources. The *Masters Program in Sustainable Environment and Energy Systems* has been designed to educate and raise leaders to drive the generation of comprehensive interdisciplinary solutions to these fundamental problems, which cannot be effectively addressed through independent disciplinary approaches.

The mission of the program is to excel in state-of-the-art interdisciplinary research and education of sustainable environment and energy systems; to graduate scientists, managers, and leaders, who produce high quality designs and services for a sustainable environment using scientific data, and to advance social awareness and sensitivity in the area.

The program has the following specific goals:

- Focus research on scientific environmental audits, technology, system design, and policy development in critical interdisciplinary areas;
- Provide engineers, architects, policy makers, lawyers, business managers, with theoretical knowledge and practical skills required to be successful in delivering goods and services through sustainable means,
- Develop community awareness programs and centers through collaborations with local communities,
- Deliver high quality solutions to complex problems through interdisciplinary collaboration by conducting thesis research under interdisciplinary supervision.

GRADUATE PROGRAM COMMITTEE

MUHTAROĞLU Ali, Assoc. Prof. Dr., ***Coordinator***, *Electrical and Electronics Engineering*; B.S., University of Rochester; M.S., Cornell University; Ph.D., Oregon State University

AKINTUĞ Bertuğ, Assist. Prof. Dr.; B.S., M.S., Eastern Mediterranean University; Ph.D., University of Manitoba

ESAT Volkan, Assist. Prof. Dr., *Mechanical Engineering;* B.S., Gazi University; M.S., METU; Ph.D., Loughborough University

SAURIN Jochaim Julian, V. Assoc. Prof. Dr., B.A., Ph.D., University of Southampton

UZGÖREN MERZİFONLUOĞLU Yasemin, V. Assist. Prof. Dr.; B.S., Bilkent University; M.S., Ph.D., University of Florida

REQUIRED COURSES:

Mandatory Courses:

SEES 501	Political Economy and Law in Sustainability	(3-0)3
SEES 502	Energy Systems and Sustainability	(3-0)3
SEES 503	Sustainable Water Resources	(3-0)3
SEES 591	Research Seminar I	NC
SEES 592	Research Seminar II	NC
SEES 500	M.S. Thesis	NC

ELECTIVE COURSES:

Four elective courses are to be taken from *Social Sciences* or *Natural and Applied Sciences and Engineering* categories; at least one elective being from the alternate category. Electives can be graduate courses from the METU Catalog, or newly designed interdisciplinary courses, such as:

SEES 505 Numerical Solutions of Ordinary Differential Equations (3-0)3
SEES 509 Energy Policy and Finance (3-0)3
SEES 510 Renewable Energy and Climate Change (3-0)3
SEES 572 Environmental Impact Assessment (3-0)3
SEES 593 Special Topics in Environment (3-0)3
SEES 594 Special Topics in Data Analysis (3-0)3

Typical thesis topics are targeted to produce solutions to contemporary problems, which are impossible to solve through traditional single-discipline approaches. As a graduate student enrolled in the SEES program, you will deliver high quality research in technology, product, service, and regulatory development, economic analyses, planning; social awareness building associated with one of the following focus areas:

- Environmentally friendly conventional and renewable energy production technologies
- Efficient energy distribution and use
- Waste management
- Water supplies
- Ecological assessment
- Sustainable production and construction
- Climate change

DESCRIPTION OF GRADUATE COURSES

SEES 501 Political Economy and Law in Sustainability (3-0)3
This course introduces the principal concepts and principles from political economy and law (especially international law) which have come to inform sustainability strategies and sustainable development. These concepts and principles have their origins across the natural and social sciences and include, but are not limited to, such notions as ecological crisis; metabolic rate; thermodynamics; discount rates; environmental Kuznets curve; market failure and market absence; transaction costs and public goods; tragedy of the commons; common property resources; moral hazard; socialization of risk; intergenerational equity; the precautionary principle; the polluter pays principle; liability; prior informed consent; and many others, as well as sustainability itself.

SEES 502 Energy Systems and Sustainability (3-0)3
Interdisciplinary exploration of environmental, scientific, economic, social, and political opportunities and impacts associated with energy systems. Main fuel technologies such as fossil, hydroelectric, nuclear, photovoltaic, wind, and biomass. The supply and use of energy systems with emphasis on sustainability. Qualitative and quantitative analysis of energy resources, combustion, conversion, distribution processes in terms of environmental, social, and economic impacts. Emerging portfolios of energy systems. Investigation of local and global options. A term paper on a topic outside thesis research area. A local field trip.

SEES 503 Sustainable Water Resources (3-0)3
Introduction to Hydrology: Hydrologic cycle, precipitation, evaporation, and stream flow; Extreme events: Floods and droughts; Water uses and quantities; Water characteristics and quality; Fresh water and sea water pollution; Groundwater use and contamination; Sewage and wastewater treatment and reuse; Effects of climate change on water resources; Hydroelectric power; Sustainable water resources development: Environmental, economic and social sectors.

SEES 505 Numerical Solution of Ordinary Differential Equations (3-0)3
Approximation of functions: function space, continuous and discrete least square approximations; spline functions; Fourier methods: complex Fourier series, discrete Fourier transform, Fourier integrals; numerical solutions of ordinary differential equations in initial and boundary value problems: error propagation, control of step size.

SEES 509 Energy Policy and Finance (3-0)3
Energy markets, game theory and strategic interaction, imperfections and regulation. World

energy markets as alternative investment areas, price movements, international trade and finance, macroeconomics impacts of energy price shocks. Renewable energy policy, evaluating energy projects and energy project financing policy appraisal.

SEES 510 Renewable Energy and Climate Change (3-0)3

Scientific data on global warming and climate change. Mitigation through renewable energy use. Conversion processes, materials and costs, planning and design, economics and ecology associated with: Photovoltaics, solar thermal systems, and wind. Socio-economic assessment of the energy supply systems, transmission and storage options. Technical and economic issues around integrating renewable energy to power systems. A term project on renewable energy on a topic outside the thesis research.

SEES 572 Environmental Impact Assessment (3-0)3

Historical evolution of EIA; techniques in surveys, auditing and footprinting, techniques in project cost-benefit analysis, assessing programmes and policies.

NORTHERN CYPRUS CAMPUS

M.A. PROGRAM IN ENGLISH LANGUAGE TEACHING

The MA Program in English Language Teaching aims to provide students with a firm foundation in the cultural, theoretical, and applied aspects of English Language Teaching. The program is designed around three major academic objectives: to foster cultural and contextual knowledge of English Language Teaching and English language learners; to instruct students in advanced English Language Teaching pedagogies and practices; and to improve interactive English language instruction across diverse instructional mediums. Graduates will develop their capabilities as adaptive and creative thinkers and be equipped with strong academic research skills and superior theoretical and practical knowledge of English Language Teaching.

This program addresses the intellectual and contextual needs of an English language teacher and researcher in contemporary societies. Current and future teachers of English will benefit from the program's focus on developing their theoretical and practical experience enabling them to enhance their career opportunities.

GRADUATE PROGRAM COMMITTEE

BOYD Scott, Assist. Prof. Dr., ***Coordinator***; B.A., M.A., University of South Florida; Ph.D., Ohio University

ERKMEN Besime, Instr. Dr., *Teaching English as a Foreign Language;* B.A., Eastern Mediterranean University; M.A., University of Warwick; Ph.D., University of Nottingham

HATİPOĞLU Çiler, Assoc. Prof. Dr., *Teaching English as a Foreign Language;* B.A., M.A., Boğaziçi University; Ph.D., UWE, Bristol (*From METU-Ankara*)

ÖZBİLGİN GEZGİN Alev, Instr. Dr., *Teaching English as a Foreign Language*; B.A., Hacettepe University; M.A., Bilkent University; Ph.D., Indiana University of Pennsylvania

WALTER Mary Ann, Assist. Prof. Dr., *Teaching English as a Foreign Language*; B.A., Harvard University; Ph.D., Massachusetts Institute of Technology

REQUIRED COURSES:

ENLT	508	Contemporary Issues in English Language Teaching	(3-0)3
ENLT	525	Research Methods for English Language Teaching	(3-0)3
ENLT	590	Seminar in English Language Teaching	(3-0)3
ENLT	599	M.S. Thesis	NC

ELECTIVE COURSES:

ENLT	506	Second Language Acquisition	(3-0)3
ENLT	507	Curriculum Development for English Language Teaching	(3-0)3
ENLT	509	Teaching English with Literature	(3-0)3
ENLT	513	Linguistics for English Language Teaching	(3-0)3
ENLT	514	Teaching Young Learners	(3-0)3
ENLT	517	Materials Evaluation and Development in ELT	(3-0)3
ENLT	518	English Language Testing	(3-0)3
ENLT	520	English-Turkish Contrastive Analysis	(3-0)3
ENLT	521	Cultural Aspects of Language Teaching	(3-0)3
ENLT	524	Language Teacher Development	(3-0)3
ENLT	526	Approaches, Methods and Techniques in ELT	(3-0)3
ENLT	527	Teaching Practicum	(3-0)3
ENLT	528	Instructional Technology in ELT	(3-0)3
ENLT	529	Global English: Political, Economic and Ethical Considerations	(3-0)3

ENLT 506 Second Language Acquisition (3-0)3

Surveying current research in language acquisition with special emphasis on similarities and differences between child and adult language and between native and foreign language acquisition.

ENLT 507 Curriculum Development for ELT (3-0)3

Curriculum development and course design as applied to ELT; language functions, notions, and speech acts; principles of functional /notional or communicative syllabus strategies and techniques; designing structural interviews and questionnaires; and discourse analysis and teacher training for ELT.

ENLT 509 Teaching English with Literature (3-0)3

Analyzing current academic research, scholarship, and debates in broad areas of English language teaching. These areas include, but are not limited to, teaching English to Turkish speakers, linguistics, language acquisition, the Turkish educational system, technology and language instruction, and global Englishes.

ENLT 513 Linguistics for English Language Teaching (3-0)3

Examining contributions of linguistics to the field of foreign language teaching, including current approaches to the linguistic analysis of English.

ENLT 514 Teaching Young Learners (3-0)3

Teaching English as a foreign language to young learners from both theoretical and practical standpoints. Topics include understanding young learners, classroom management, techniques of teaching language skills and elements, group dynamics, lesson planning, and assessment.

ENLT 517 Material Evaluation and Development in ELT (3-0)3

Reviewing methods of evaluating language teaching materials and adaptation techniques and applying evaluation and adaptation criteria to materials currently employed. Determining appropriate discovery procedures for developing effective language teaching materials through applied research.

ENLT 518 English Language Testing (3-0)3

Major aspects of English language testing including item analysis and interpretation of test scores; subjective and objective tests; procedures in preparing different kinds of test items appropriate for testing different language skills; and practice in item writing and statistical methods.

ENLT 520 English-Turkish Contrastive Analysis (3-0)3

Introducing current approaches to contrastive analysis. Comparing and contrasting English and Turkish in the areas of phonetics and phonology, syntax and semantics, and with special emphasis on problem areas in language teaching and learning.

ENLT 521 Cultural Aspects of Language Teaching (3-0)3

Providing language teachers with a basis for introducing a cultural component into their teaching; significance of culture in teaching English as a foreign language; perspectives on how language and culture interact; and distinctions between understanding and participating in cultures.

ENLT 524 Language Teacher Development (3-0)3

Examining how language teachers develop professionally; includes key concepts in teacher education; distinction between language teacher education, training and development; teacher cognition and knowledge; teacher beliefs about language teaching and learning; reflective practice and action research; and observation and feedback on teaching.

ENLT 525 Research Methods for ELT (3-0)3

Reviews most widespread methods of carrying out research in ELT and language acquisition, with focus on experimental design and implementation, data collection and analysis, and standards of data reporting. Topics also include ethical standards in research and basic statistical analysis and software packages. This course prepares students for conducting their own term project/thesis work, and enables them to understand and evaluate ELT research during their academic and subsequent careers.

ENLT 526 Approaches, Methods and Techniques in ELT (3-0)3

Analyzing major approaches, methods, and techniques of English language teaching. Including the linguistic and psychological theories behind them and practical applications of techniques for teaching various language skills, including listening and speaking, grammar, vocabulary, and reading and writing.

ENLT 527 Teaching Practicum (3-0)3

This seminar covers different topics related to classroom teaching and classroom-centered research, including instructional observation, practice teaching, and in-class data collection and analysis. Projects based on these topics will be assigned during the semester.

ENLT 528 Teaching Practicum (3-0)3

Examining current developments in the use of instructional technology in language teaching; use of computers, interactive video, television and video in language teaching; and approaches to the design, evaluation, development and application of English language teaching course-ware by using instructional technology.

ENLT 529 Global English: Political, Economic, and Ethical Considerations (3-0)3

Explores the role and nature of the English language in a global context, focusing on political, economic, and ethical implications. This may include analysis of language standards, speech communities, linguistic identities, literacy practices, and language planning impacting contemporary English language teaching. Contextual issues include the implications of decolonization, diaspora communities, the Internet, and globalization for diversifying the structure, norms, and usage of the English language.

ENLT 590 Seminar in English Language Teaching (3-0)3

Preparation towards M.A. thesis proposal through prescribed readings; written or oral presentation of the work developed.