Department of Electrical & Electronic Engineering

Eastern Mediterranean University

Electronics & Communication Engineering (Undergraduate Program)

Spring 2021- 2022

EASTERN MEDITERRANEAN UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

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ELECTRONICS & COMMUNICATION ENGINEERING UNDERGRADUATE CATALOGUE

INTRODUCTION

The Electronics & Communication Engineering is one of the undergraduate programs offered by the Department of Electrical and Electronic Engineering. The department was one of the first departments to be established in the University. It has its own site on the University campus, with modern buildings and well-equipped laboratories. The Department aims at providing contemporary training in various fields of Electrical and Electronic Engineering as well as Information Systems Engineering. It offers programs of study leading to degrees of Bachelor of Science (BS), in Electrical and Electronic Engineering, Biomedical Engineering, Information Systems Engineering, and Electronics and Communications Engineering, and also Master of Science (MS), and Doctor of Philosophy (PhD) in Electrical and Electronic Engineering.

Electronics and Communication Engineering is an engineering field consisting of electronics, communication, computer, general engineering, physics, mathematics and chemistry disciplines. In the fast-developing electronics and communication industry, the Electronics and Communication Engineering Program aims to increase the success chance of the graduates in business life by focusing on more specific areas and to develop engineers with their own unique features of the field of Electronics and Communication Engineering with the help of specially designed curriculum, experiments and design projects, teaching and learning environment, laboratory and other application fields.

The Department offers a wide range of facilities for training and research in Electronics & Communication Engineering. The University Library provides the most recent publications as well as the classical textbooks and reference books. It has a good collection of the major international periodicals in almost all fields of Electrical, Electronic and Information Engineering.

Research interests of the department include: Network and system theory; mobile communications, indoor wireless local area networks, optimal and inverse optimal control, digital communications, digital signal processing, image processing, adaptive filtering; robotics and control systems, solar energy conversion; computer networks, wireless mobile multimedia systems, software engineering, distance learning; optoelectronics, laser theory, linear systems theory; circuits and systems; microwaves, antennas, numerical electromagnetics, satellite communication systems, modeling of physical systems, power electronics, power systems , renewable energy , robotics and artificial intelligence.

VISION STATEMENT

We envision a department that is one of the best in the region with a diverse and stimulating intellectual environment that provides leadership in the field through its education and research agenda.

MISSION STATEMENT

Our mission is to serve society through excellence in education, research, and public service. We aspire to instill in our students the attitudes, values, and vision that will prepare them for professionalism and life-long learning. We strive to generate new knowledge and technology and aim to educate our graduates for following technological and theoretical developments, and use them to serve the society.

EDUCATIONAL OBJECTIVES

The Educational Objectives of the Electronics & Communication Engineering (ECOM) Program represent major accomplishments that we expect our graduates to have achieved three to five years after graduation. More specifically our graduates are expected:

1. to excel in industrial or graduate work in information engineering and allied fields,
2. to practice their professions conforming to ethical values and environmentally friendly policies,
3. to work in international and multi-disciplinary environments,
4. to successfully adapt to evolving technologies and stay current with their professions.

STUDENT OUTCOMES

The students in the Information Systems Engineering (INFE) Program should attain the following outcomes:

1) Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.
2) An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.
3) An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.
4) Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.
5) Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.
6) Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.
7) Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to

prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.

8) Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.
9) To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.
10) Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.
11) Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.

ACADEMIC STAFF MEMBERS

ABOU RAJAB Hasan, Assistant Professor, BSc, MSc, PhD, Middle East Technical University.
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His current research interests are digital communication systems, coding theory and coded modulation techniques.

AMCA Hasan, Professor, BEng, Higher Technological Institute (EMU), MSc, University of Essex; PhD, Bradford University.
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His research interests include indoor and outdoor mobile communications, telephony, multi user detection of CDMA, Multi-carrier systems, digital signal processing, adaptive equalization, radio and TV broadcasting, information technology.

AZIZI ALIKAMAR Shahla, Assistant Professor, BSc and MSc, Amirkabir University of Technology, PhD, Tehran University of Medical Science.
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Her current research interests are biomedical engineering, neuroscience, neurorehabilitation, signal and image processing.

DEMİREL Hasan, Professor [Vice Rector], BSc, Eastern Mediterranean University, MSc, King's College London, PhD and DIC Imperial College London.
Ext. No: 1580, e-mail: hasan.demirel@emu.edu.tr
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His current research interests include; resolution enhancement in images/video, facial expression recognition, pattern recognition, facial image processing, feature detection, tracking, segmentation and recognition.

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His current research interests include wireless communication, channel and source coding, detection and estimation theory, CDMA, multi-user detection, spectral estimation, adaptive filtering.

İNCE Erhan, Professor, BSc and MSc, University of Bucknell, PhD, University of Bradford.
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Web Page: http://faraday.ee.emu.edu.tr/eaince
His research interests include channel coding, multi-carrier techniques, WiMAX/LTE/LTE-A/LTE-Pro, image and video processing, and statistical signal processing.

KÜKRER Osman, Professor, BSc, MSc, PhD, Middle East Technical University.
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His research interests include feedback control of single phase and three phase inverters, uninterruptible power supplies, PWM ac/dc converters, high power factor rectifiers, ac and dc drivers, adaptive filtering.

ÖZKARAMANLI Hüseyin, Professor [Dean], BSc, MSc, PhD, Tufts University.
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In the area of Digital Signal Processing: Construction of M-Band wavelet basis, multiple wavelets, Sub-band transforms and their applications in data/image compression and signal denoising. In the area of VLSI: Signal integrity problems associated with the different interconnect technologies in ultra high speed integrated circuits.

RUNYI Yu, Professor, BSc, Shanxi University, MSc, PhD, Beijing University of Aeronautics and Astronautics.
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His current research interests include singular systems, sampled-data control, filter bank theory and design, wavelet transforms and their applications in signal/image processing.

SIRJANI Reza, Associate Professor [Vice Chair]**,** BSc, KNToosi University of Technology, MSc, Tehran Science and Research Branch of Islamic Azad University, PhD, The National University of Malaysia.
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His research interests include electric power systems, optimization techniques, power transmission lines, reactive power compensation, renewable energy, power quality improvement.

SOLYALI Davut, Associate Professor [Vice Dean]**,** BSc, Eastern Mediterranean University, MSc, PhD, University of Bath.
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His research interests include electrical demand, generation, transmission and its interaction with renewable energy technologies.

UYGUROĞLU Mustafa K., Professor, BEng, Higher Technical Institute (EMU), MS, PhD Eastern Mediterranean University.
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He is conducting research in the field of robotics, mechatronics and mathematical modeling.

UYGUROĞLU Rasime, Associate Professor [Chair], BEng, Higher Technical Institute (EMU), MS, PhD, Eastern Mediterranean University.
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Her research interests are Computational methods in electromagnetics, FDTD analysis of microstrip antennas, Rotman Lens antennas, implantable and wearable antennas for biomedical applications

UYSAL Şener, Professor, BEng, Higher Technical Institute (EMU); MSc, PhD, University of London.
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His research interests are microwave integrated circuits, design of microwave antennas, radar.

ADMINISTRATIVE STAFF MEMBERS

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CENGİZ Cem, Lab. Technician	Ext.:2783	e-mail: cem.cengiz@emu.edu.tr

LABORATORIES

Basic Circuits Laboratory

Intended to familiarize students with the fundamental laboratory procedures of electrical measurements. In addition to demonstrating the uses of voltmeters, ammeters, watt-meters, signal generators and oscilloscopes, experiments are designed to illustrate basic electrical circuit theory concepts for linear and non-linear DC circuits, simple time-invariant circuits, and single-phase and three-phase linear AC circuits.

Instrumentation and Measurement Laboratory

Facilities for undergraduate education and training in electrical and electronic measurements and instrumentation.

Telecommunications Laboratory

Equipped with analogue and digital communication kits, measuring instruments, signal generators and analyzers for undergraduate courses. There are also many HF to UHF frequency range transmitters and receivers.

Control Systems Laboratory

Provides experimental facilities to help students grasp the theory and applications of feedback control systems. The equipment includes electro-pneumatic sets, electro-hydraulic sets, servo systems, a computer based servo fundamental training system, DC servo mechanism and other electronic apparatus that can be used as basic elements to construct open- or closed-loop systems of various orders. The set-up allows for a number of experiments to demonstrate techniques of system modeling, analysis and design in control engineering.

Electronics Laboratory

Well equipped for undergraduate electronics experiments, this laboratory is used to familiarize students with electronic devices, amplifiers and analogue and digital electronic circuits. It also provides facilities for undergraduate and graduate research projects.

Electrical Machines and Power Electronics Laboratory

Equipped for experiments on all types of rotating AC and DC machines, stepper motors, universal motors and single and three-phase transformers. Facilities are available for testing and measuring motor characteristics. Several types of generalized machine sets are available for undergraduate and graduate research studies. This laboratory is also equipped with several sets and rectifier/inverter units suitable for undergraduate power electronics experiments.

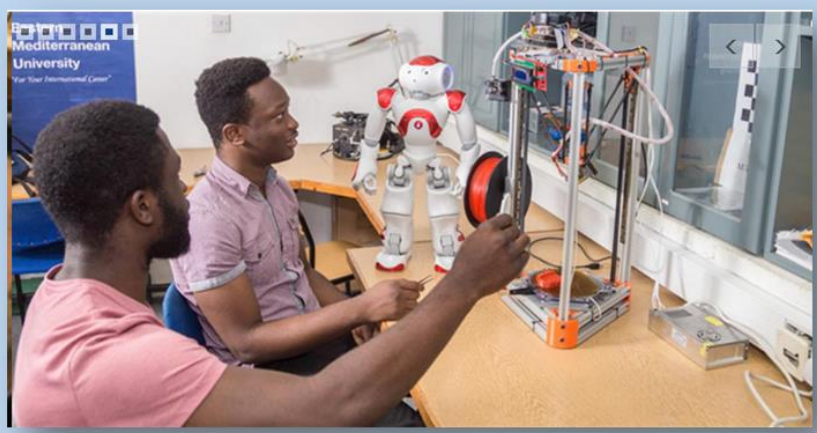
Microprocessor Laboratory

Provides facilities for performing experiments on microprocessors and single-board microcomputers. The equipments include microprocessor development and training sets based on the true 16-bit 8086 microprocessor. The training sets incorporate RS232 serial port, two programmable peripheral interface (PPI), programmable interval timer (PIT) and

programmable interrupt controller (PIC) chips. Application boards can be connected to the microprocessor training boards to provide real time interfacing by using the following I/O units: optical fiber receiver/transmitter, optical speed/position sensor, numerical keypad, heater/temperature sensor, dc motor, LED displays and speakers.

Logic Circuit Design Laboratory

Intended for teaching the fundamentals of combinational and sequential logic circuits. The equipment includes a logic analyzer, several boards with power supplies, clock generators and LED displays.



Microwave and Antenna Laboratory

Equipped with microwave and antenna training sets including gun oscillators, waveguide and wave propagation equipment sets, waveguide matching, lecher lines, transmitting antenna, receiving antenna and complex antenna systems for undergraduate courses.

Undergraduate Computer Laboratories

There are two general purpose undergraduate computer labs housing a total of 50 PC based networked systems. These workstations allow access to the Departmental Lab and student server machine. A variety of engineering software is accessible from these workstations. Internet access is available from all workstations. A networked printing facility is also available. Lab classes or individual student study are available using these facilities. Late opening of these facilities is provided.

Computer Networks Research and UNIX Laboratory

A laboratory/research facility intended to support graduate computer network studies and provide a platform for research and development in these areas. Several networking simulation software including OPNET is available in this laboratory for teaching and research. It also has 10 PC based Linux systems for UNIX and networking undergraduate laboratory studies.

Simulation Computer Laboratory

A separate computer based simulation laboratory is provided which provides a platform consisting of 25 networked PCs for student based term projects as well as formal teaching of Integrated Circuit Design courses. A number of engineering software is available including the Xilinx Software for VLSI Design.

Multimedia Enabled Teaching Laboratories (MMETL)

There are two general-purpose multimedia enabled teaching laboratories with a total of 52 networked multimedia PCs. A platform for Internet access and data projection system is available for technology based teaching to undergraduate and graduate classes.

Undergraduate Project Laboratory

This is a new facility made available for student graduation projects. It houses number of equipment including testing, measurement, prototyping (breadboards) and PC based interfacing for project implementation.

Graduate Computer Research Laboratory

Housing the departmental local area network servers and the Unix server, this laboratory is intended to provide a general purpose research center with wider computational facilities. It also incorporates 3 Unix workstations, 10 fast Pentium and other PCs including some with CD-ROM devices and two laser printers.

DSP and Multimedia Laboratory

The DSP laboratory is intended to serve the undergraduate students in their courses and project related work. The lab is designed to provide services to students in three groups. These are the Signals and Systems course, which is a core course, Introduction to Digital Signal Processing, which is a technical elective and any multimedia systems related technical electives. The Lab will enable the students in these classes to acquire data (image, speech etc.) in digital format and provide them with the means to process their data using software tools such as MATLAB ® or C programming language. TI based TMS320 DSP hardware platforms are also available for practical implementations.

High Voltage Laboratory

High Voltage Laboratory serves as independent, non-industrial, university center for high voltage engineering. The mission of the Laboratory includes research, evaluation, testing and education activities. The laboratory is equipped with 100 kV, 5 kVA test transformer, 100 kV, 5 kVA, 50 Hz AC test set, 140 kV, 20 mA DC test set.

OTHER FACILITIES

IEEE Student Branch

IEEE EMU student branch was established in January 1995 and currently has approximately 100 members from the Departments of Electrical and Electronic Engineering and Department of Computer Engineering as well as other related disciplines. It is the center of the information exchange between members of the Institute of Electrical and Electronics Engineering students in Eastern Mediterranean University.

Electronic Club

The electronic club is established by the students in the department in order to share knowledge, experience and enthusiasm. The club has a dedicated office, which contains books, electronic parts and testing and monitoring equipment for the practical works of the students. The club creates an environment where the students can get together to talk about their profession and exchange views on different projects.

EESTEC (Electrical Engineering Students' European Association)

The Electrical Engineering STudents' European assoCiation (EESTEC) is an organization of and for electrical engineering and computer science students from universities, institutes or technical schools in Europe that award an engineering degree. It was founded in Eindhoven,

the Netherlands in 1986. Since 1995 it is a recognized association seated in Zürich, Switzerland. From year 2002 the EESTEC seat returned to the Netherlands, but now in Delft. A Local Committee is a local branch of EESTEC International. Currently there are 39 LCs in more than 20 countries with over 1700 members.

Student Representatives Office

Through a democratic election system the students elect their representatives in the department. The student representatives are given opportunities to reflect the problems and requests of the students to the departmental administration. The student representations' Office is allocated for the use of the student representatives and all the students.

Departmental Library

This is a Departmental Library is managed by the IEEE Student Branch in collaboration with the department and houses IEEE periodicals as well as a limited number of books. It has a photo copying facility and an internet enabled PC for Library search operations. It also provides a quiet area for individual study.

Multimedia Enabled Classrooms (MMEC)

The department has 5 MMECs that use the latest instructional technology.

EEE Amphitheater (Seminar/Conference Hall)

A fully equipped modern amphitheater is available within the departmental building. This facility seats 150 people and is used mainly in seminar courses as well as seminar/conferences.

THE BACHELOR OF SCIENCE (BS) PROGRAM IN ELECTRONICS & COMMUNICATION ENGINEERING

The curriculum and the courses offered in the Electronics and Communications program are divided into four main categories: Basic sciences cover about one fourth, fundamental engineering sciences cover almost one fourth, humanities and social sciences cover about one eight and professional sciences about three eighth of the program. More than one quarter of the professional science courses are offered as technical electives during the final year to enable students to advance their knowledge in specific fields of engineering. These fields are:

1) Wireless Communications,
2) Microwaves, Antennas and Propagation,
3) Coding and Information Theory,
4) Integrated Circuits.
5) Electronics

Students are required to successfully complete forty courses including compulsory Graduation Design Project Proposal (ECOM405) and Graduation Design Project (ECOM406) in their last two semesters. Furthermore, they are required to complete at least forty working days of summer training in industry. The courses are distributed in eight semesters through four academic years and core courses are taught at the rate of seventy hours per course, where about a quarter of this time is spent in laboratories. Successful candidates are awarded the degree of Bachelor of Science (B.S.) in Electrical and Electronic Engineering.

Credit Rating: Each course is assigned a credit rating, e.g. (4,1) 4; where the first digit represent the weekly number of lecture hours, the second digit the weekly number of laboratory or tutorial hours the course entails and the final digit the number of credit hours allocated to the course for the semester.

CURRICULUM

The Electronics & Communication Engineering **(ECOM)** curriculum is based on the sound foundations of the ABET accreditation obtained by the Electrical and Electronic Engineering curriculum in its basic engineering approach. The ECOM curriculum is designed for anyone desiring to qualify in the field of Information Systems Engineering. The ECOM curriculum, which is prepared in accordance with the ABET criteria, is given in the proceeding section.

ELECTRONICS & COMMUNICATION ENGINEERING CURRICULUM

First Year: Fall Semester					
			Credit		
R. Code	Crs.Code	English Course Name	Lect.	Lab/Tut	Credit
2H111	CHEM101	General Chemistry	4	1	4
2H112	PHYS101	Physics I	4	1	4
2H113	MATH106	Linear Algebra	3	1	3
2H114	MATH151	Calculus I	4	1	4
2H115	ENGL181	Academic English – I	5	1	3
	ENGL191	Communication in English – I	3		
			Sem. Cr. Total:18		
First Year: Spring Semester					
2H121	ECOM102	Intro. to Elec. & Comm. Eng.	1	0	0
2H122	PHYS102	Physics II	4	1	4
2H123	EENG112	Introduction to Programming	4	1	4
2H124	MATH152	Calculus II	4	1	4
2H125	ENGL182	Academic English – II	5	1	3
	ENGL192	Communication in English II	3	0	
2H126	MATH207	Differential Equations	4	1	4
			Sem. Cr. Total:19		
Second Year: Fall Semester					
2H131	EENG115	Introduction to Logic Design	4	1	4
2H132	CMPE211	Object Oriented Programming	4	1	4
	CMP231	Data Structures	4	1	4
	EENG212	Algorithms and Data Structures	4	1	4
2H133	EENG223	Circuit Theory I	4	1	4
2H134	MATH252	Mathematical Methods for Eng.	4	1	4
2H135	TUSL181	Turkish as a Second Language	2	0	2
	HIST280	History of Turkish Reforms			
			Sem. Cr. Total:18		

Second Year: Spring Semester					
2H141	CMPE224	Digital Logic Systems	4	1	4
2H142	EENG224	Circuit Theory II	4	1	4
2H143	EENG226	Signals and Systems	4	0	4
2H144	EENG245	Physical Electronics	4	1	4
2H145	MATH322	Prob. and Statistical Methods	3	1	3
			Sem. Cr. Total:19		
Third Year: Fall Semester					
2H151	EENG320	Control Systems	4	1	4
2H152	EENG232	Electromagnetics I	4	1	3
2H153	EENG341	Electronics I	4	1	4
2H154	EENG360	Communications Systems-I	4	1	4
2H155	UE01	University Elective – I	3	0	3
			Sem. Cr. Total:18		
Third Year: Spring Semester					
2H161	EENG342	Electronics II	4	1	4
2H162	EENG461	Communications Systems II	4	1	4
2H163	EENG420	Digital Signal Processing	4	1	4
2H164	EENG331	Electromagnetics II	3	0	3
2H165	ENGL201	Communication Skills	3	1	3
			Sem. Cr. Total:18		
Fourth Year: Fall Semester					
2H171	ECOM405	Grad. Design Project Proposal	1	0	1
2H172	ECOM403	Summer Training	0	0	0
2H173	UE02	IENG355: Ethics in Engineering	3	0	3
2H174	EENG432	Microwave Theory and Design	4	1	4
2H175	AE01 †	Area Elective – I	3	0	3/4
2H176	AE02 †	Area Elective – II	3	0	3/4
2H177	ECOM442	Communication Electronics	4	1	4
			Sem. Cr. Total: 18/19/20		

Fourth Year: Spring Semester					
2H181	ECOM406	Graduate Design Project	3	0	3
2H182	AE03 †	Area Elective – III	3	0	3/4
2H183	AE04 †	Area Elective – IV	3	0	3/4
2H184	UE03	ECON101: Introduction to Economics IENG420: Engineering Economy IENG450: Industrial Management	3	0	3
2H185	ECOM413	Fundamentals of Telecommunication Networks	4	1	4
	EENG412	Data Communications and Computer Networks	4	1	4
	CMPE344	Computer Networks	4	1	4
			Sem. Cr. Total: 16/17/18		
			Cum. Cr. Total:143-148		

† : Area Elective Courses (AE). There are 4 AE courses, which are technical electives offered by the Information Systems Engineering Program or Computer Engineering Department.

A. Electives

i. University Elective (UE) Courses

The ECOM Program requires students to take four University Elective courses, which are Humanities/Art/Social Sciences Electives. These courses may be chosen based on the student's personal interests. The courses are chosen from the global list of University Electives according to the ABET guidelines satisfying the humanities and/or arts, and social sciences requirements. The list of available UE courses which are within the ABET guidelines is declared at the beginning of each registration period. One of the UE courses (UE03) is selected among the Economics, Finance, and Management courses offered by the departments of Business, Economy and Industrial Engineering.

ii. Area Elective Courses (AE)

The Area Elective Courses are grouped for various areas of specialized study. Further specialized courses may be added as required. The Department generally announces which courses will be offered at the beginning of each semester. The following streams are offered to the students, provided that the students take the related courses presented in the following list:

1) Wireless Communications,
2) Microwaves, Antennas and Propagation,
3) Coding and Information Theory,
4) Integrated Circuits.
5) Electronics.

The table below gives the list of the AE courses available.

Semesters 7-8: Area Electives (4 courses)

Course Code	Course Title	Credit				Stream Title (Leave blank if no stream is intended)
		Lec	Lab	Tut	Tot	
ECOM465	**Fundamentals of Satellite Communication Systems**	4	0	1	4	Communications
EENG469	**Introduction to Image Processing**	4	1	0	4	Communications
EENG468	**Signal Compression for Mobile Communications**	4	0	1	4	Communications
EENG467	**Information Theory**	4	0	1	4	Communications
EENG466	**Fiberoptic Communications**	4	0	1	4	Communications
EENG464	**Wireless Communications**	4	0	1	4	Communications
EENG463	**Antenna Theory**	4	1	0	4	Communications
EENG434	**Biomedical Imaging**	4	0	1	4	Communications
EENG433	**Microwave Applications**	4	1	0	4	Communications
EENG410	**Microprocessors I**	4	1	0	4	Electronics
EENG441	**Industrial and Power Electronics**	4	1	0	4	Electronics
EENG442	**Industrial Electronics Systems**	4	1	0	4	Electronics
EENG444	**CMOS Integrated Circuits & Systems**	4	1	0	4	Electronics
EENG445	**Opto-electronics**	**4**	1	0	**4**	Electronics
CMPE423	**Embedded Systems**	**4**	1	0	**4**	Electronics
EENG449	**Digital Systems Design**	**4**	1	0	**4**	Electronics
EENG447	**Digital Integrated Circuit Design**	**4**	1	0	**4**	Electronics

B. Final Year Project (ECOM405/406)

Students are required to do a practical design project in their final year of study. ECOM405 and ECOM406 are two consecutive courses that involve the introductory study, the practical implementation, testing and analysis of the project. The projects are assessed on the bases of a project proposal submitted to project supervisor, project report and the presentation of the project before a departmental jury.

i. ECOM405: Graduation Design Project Proposal

This is a one-credit course that can be taken in the 7th academic semester. It forms a preparation phase for the INFE406. Students are expected to familiarize with their projects, carry out literature survey and prepare materials, study components and relevant standards before the implementation phase in the following semester.

ii. ECOM406: Graduation Design Project

Design and practical works oriented projects will be given to students with an aim to stimulate application of theoretical knowledge to practical situations. ECOM406 can be taken in the 8th academic semester. It provides experience in designing and implementing systems within multiple realistic constraints using conventional materials, components, equipments and software. Projects should be implemented conforming to relevant standards, ethical issues and environmental policies. (Prerequisite: ECOM405)

C. Additional Requirements

Further academic rules and regulations can be obtained through the departmental web page (http://www.ee.emu.edu.tr) and university's "Rules and Regulations" web page (http://mevzuat.emu.edu.tr/).

D. Summer Training (ECOM403)

In partial fulfillment of graduation requirements, each student is required to complete 40 working days of training during the summer vacations, normally at the end of the junior year, in accordance with rules and regulations set by the Department. Summer training involves full-time work experience in industry in the area of student career interest. A formal report and evaluation by work supervisor required. Prerequisite: Junior standing and consent of department

E. Transfer

Students may transfer to the department from other universities (external transfer) or from other departments within the EMU (internal transfer). Transfer applications are made to the

F. Short Course Descriptions

ECOM102 Introduction to Electronics and Communications Engineering

A series of seminars are held in current topics and areas of specialization in Electronics and Communications Engineering. Speakers are invited from different departments of EMU or other International Universities, Industry and Consulting firms, to deliver seminars in all aspects of biomedical engineering that are not normally covered in lectures. These include, safety at work, standards, quality control, engineering ethics, etc

Credits: (0,1,0) ***0*** *Prerequisites: None*

EENG112 Introduction to Programming

Internal data representation, integers, reals, characters. Problem solving and algorithm design. Program structures. Sequencing, selection and iteration. Pseudo-code, flow-charts and other techniques. High-level programming environments. Variables, expressions and assignments. Introducing C programming. Structured programming; sequential, selective and repetitive structures. Function definition and function calls. Prototypes and header files. Recursive functions. Arrays and pointers. Dynamic memory management. Parameter passing conventions. Multi-dimensional arrays. Conditional compilation, modular programming and multi-file programs. Exception handling. File processing. Formatted I/O. Random file access. Index structures and file organization.

Credits: (4,1,0) ***4*** *Prerequisites: None*

EENG115 Introduction to Logic Design

Variables and functions. Boolean algebra and truth tables. Logic gates, Karnaugh maps. Incompletely specified functions, Multilevel logic circuits. Tabular minimization. Number representation. Arithmetic circuits. Binary codes. Programmable logic devices. Multiplexers, decoders and encoders. Synchronous sequential circuits, flip-flops, synchronous counters.

Credits: (4,1,0) ***4*** *Prerequisites: None*

EENG212 Algorithms and Data Structures

Structures and unions. Storage structures and memory allocations. Primitive data structures. Data abstraction and Abstract Data Types. Array and record structures. Sorting algorithms and quick sort. Linear & binary search. Complexity of algorithms. String processing. Stacks & queues; stack operations, implementation of recursion, polish notation and arithmetic expressions. Queues and implementation methods. Dequeues & priority queues. Linked storage representation and linked-lists. Doubly linked lists and circular lists. Binary trees. Tree traversal algorithms. Tree searching. General trees. Graphs; terminology, operations on graphs and traversing algorithms.

Credits: (4,1,0) ***4*** *Prerequisites: EENG112*

EENG223 Circuit Theory I

Definitions and units. Experimental laws and simple circuits. Techniques of circuit analysis. Inductance and capacitance. Source-free RL and RC circuits. Applications. The Unit-step

forcing function. RLC circuits.

Credits: (4,1,0) ***4*** *Prerequisite: MATH151*

EENG224 Circuit Theory II

Sinusoidal Sources and Phasors. AC Steady-State Analysis. AC Steady-State Power. Three-Phase Circuits. The Laplace Transforms. Circuit Analysis in the s-domain. Frequency Response. Mutual Inductance and Transformers. Two-port Circuits.

Credits: (4,1,0) ***4*** *Prerequisites: EENG223*

EENG226 Signals and Systems

Continuous-time and discrete-time signals and systems. Linear time-invariant (LTI) systems: system properties, convolution sum and the convolution integral representation, system properties, LTI systems described by differential and difference equations. Fourier series: Representation of periodic continuous-time and discrete-time signals and filtering. Continuous time Fourier transform and its properties: Time and frequency shifting, conjugation, differentiation and integration, scaling, convolution, and the Parseval's relation. Representation of aperiodic signals and the Discrete-time Fourier transform. Properties of the discrete-time Fourier transform.

Credits: (4,1,0) ***4*** *Prerequisites: INFE221*

EENG232 Electromagnetics I

Review of vector calculus. Electrostatics in vacuum. Coulomb's and Gauss's laws. Electrostatic potential. Poison's and Laplace's equations. Conductors in the presence of electrostatic fields. Method of images. Dielectrics; polarization. Dielectric boundary conditions. Capacitance. Electrostatic forces by the virtual work principle. Steady currents. Ohm's and Joule's laws. Resistance calculations. Magnetostatics in vacuum. Ampere's force law. Biot-Savart law. Magnetic vector potential, Ampere's circuital law. Magnetic boundary conditions. Magnetic dipole. Magnetization. Hysteresis curve. Self and mutual inductance. Magnetic stored energy. Magnetic forces by the virtual work principle.

Credits: (4,0,1) ***4*** *Prerequisites: MATH152, PHYS102*

EENG245 Physical Electronics

Crystal structures, energy levels in crystals. Electronic transport in metals. A short account on superconductivity. Semiconductors; impurities; carrier transport in semiconductors; generation and recombination of minority carriers. The P-N junction diode and Schottky diode; the bipolar junction transistor (BJT); current flow in diodes, BJT's and MOSFETs.

Credits: (4,1,0) 4 *Prerequisite: CHEM101*

EENG331 Electromagnetics II

Electromagnetic induction; Faraday's and Lenz's laws; transformer and motional electromotive force; induction heating; transformer; displacement current; time-varying fields; Maxwell's equations; wave equations; time-harmonic fields; complex Phasors; scalar and vector potential functions; plane waves in vacuum; plane waves in dielectrics and conductors; polarization; skin effect; electromagnetic energy and power; Poynting's theorem; reflection and refraction of plane waves at dielectric interfaces; Snell's laws; Fresnel formulas; critical angle; total internal reflection; total transmission; Brewster's angle; standing waves; transmission line theory; TEM waves; transmission line parameters; lossy and lossless lines; matching of transmission lines to their loads.

Credits: (3,0,1) ***3*** *Prerequisites: EENG232*

EENG341 Electronics I

Diodes; diode circuits and applications. BJT, MOSFET and JFET structures, modes of operation, biasing, small-signal modelling and analysis. Multistage amplifiers; operational amplifiers; output stages.

Credits: (4,1,0) ***4*** *Prerequisites: EENG224 & EENG245*

EENG342 Electronics II

Feedback amplifiers. Applications of operational amplifiers. Active filters. Logarithmic and exponential amplifiers. Analog multipliers. Comparators and the Schmitt trigger. Voltage-Controlled-Oscillators. Multivibrators. Data conversion circuits. Sinusoidal oscillators.

Credits: (4,1,0) ***4*** *Prerequisites: EENG341*

EENG360 Communication Systems I

Review of Fourier transform and its properties. Transmission of signals through linear systems. Power spectral density and autocorrelation function. The sampling theorem and the Nyquist rate, aliasing distortion. Non-ideal sampling: Pulse amplitude modulation (PAM) and flat-top PAM and equalization. Digital signalling: quantisation, encoding and pulse code modulation (PCM), line codes and their spectra, regenerative repeaters. Pulse transmission: Intersymbol interference (ISI), Nyquist method for zero ISI, time division multiplexing (TDM), pulse-time modulation techniques. Complex envelope representation of bandpass and modulated signals. RF circuits: limiters, converters, multipliers, detectors, PLL circuits and etc. Analog modulation techniques: AM, DSB-SC, SSB etc. Binary modulation techniques: ASK, BPSK, FSK.

Credits: (4,1,0) ***4*** *Prerequisites: EENG226*

ECOM403 Summer Training

In partial fulfilment of graduation requirements, each student is required to complete 40 continuous working days of training during the summer vacations, normally at the end of the junior year, in accordance with rules and regulations set by the Department. Special attention should be given to most but not necessarily all of the following areas of training: production, operation, maintenance, management and safety. A formal report describing the projects the student was involved in is to be submitted.

Credits: (0,0,0) ***0*** *Prerequisites: Dept. Consent*

ECOM405 **Graduation Design Project Proposal**

This is a course that can be taken in the 7th academic semester. It forms a preparation phase for the BIOM406 Graduation Design Project and it involves a design project proposal. Students are expected to familiarize themselves with their projects, carry out literature survey and prepare materials, study components and relevant standards before the implementation phase in the following semester.

Credits: (1,1,0) ***1*** *Prerequisites: Dept. Consent*

ECOM406 **Graduation Design Project**

Design and practical works-oriented projects will be given to students with an aim to stimulate application of theoretical knowledge to practical situations. The Graduation Design Project can be taken in the 8th academic semester. It provides experience in designing and implementing systems within multiple realistic constraints using conventional materials, components, equipments and software. Projects should be implemented conforming to relevant standards, ethical issues and environmental policies.

Credits: (1,4,0) ***3*** *Prerequisites: EENG405 & Dept. Consent*

EENG412 **Data Communications and Computer Networks**

Principles of data communications; information transfer, computer networks and their applications. Network structures, architectures and protocols. Open systems and the OSI reference model; services and network standardization. Communication systems: transmission media, analog and digital transmission. PSTN, modems, PCM, encoding and digital interface. Transmission and switching: FDM, TDM, modulation, circuit, packet and message switching. The store and forward concept. Networking characteristics. Storage, delay, multiplexing, bandwidth sharing and dynamic bandwidth management, QoS. Channel organization, framing, channel access control. PSPDN and integrated digital network concept: ISDN. LANs, MANs and WANs. ATM and gigabit networking. Communication models. De-facto standards. The Internet open architecture and the protocol suite. Modern applications of networking.

Credits: *(4,1,0)* ***4*** *Prerequisites*: EENG212

ECOM413 **Fundamentals of Telecommunication Networks**

Principles of data communications: voice digitization, digital transmission, transmission impairments; Channel capacity; Guided transmission media and wireless transmission; OSI Reference Model and Physical Layer; Flow Control, error detection and error control; Communication architecture and transport protocols (UDP, TCP/IP); Multiplexing: TDM, FDM; Switching Networks: circuit switching, packet switching; Call Processing in Digital Circuit-switching Systems; Local Area Networks (LANs): Wired LANs: Ethernet, Wireless LANs: 802.11; Multiple access: Random access protocols, Controlled-access protocols and Channelization protocols; Traffic Analysis: introduction to Queueing Theory and Stochastic Tele-traffic Models.

Credits: *(4,1,0)* ***4*** *Prerequisites*: MATH322

EENG420 Digital Signal Processing

Overview of digital signals and systems. Frequency and time representation of sampling, decimation, interpolation. Z-transform: Evaluation, region of convergence (ROC) and properties. Discrete time system structures: tapped delay line and lattice structures. Fast Fourier Transform (FFT). Digital filter design: Finite impulse response (FIR), infinite impulse response (IIR), windowing, Hilbert transform.

Credits: (4,1,0) ***4*** *Prerequisites: EENG226*

EENG432 Microwave Theory & Design

Definition of microwaves. Basic properties. Application areas. Historical perspectives. Circuit viewpoint TEM transmission lines in sinusoidal steady state and in transient regime. Smith chart. Impedance matching. Single and double stub matching. Field analysis of transmission lines and waveguides. TEM, TM and TE Waves. Parallel plate and rectangular waveguides. Waveguides modes of a coaxial line. Dielectric slab waveguides, surface waves. Stripline. Planar guiding structures: microstrip, coplanar lines, fin lines, etc. Microwave network analysis. Impedance and admittance matrices. Scattering parameters. ABCD matrix. Two-port networks.

Credits: (4,1,0) ***4*** *Prerequisites: EENG331*

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ECOM442 Communication Electronics

Communication systems overview. System blocks; transmitters and receivers, modulation and modulator circuits. Oscillators, filters and Phase Lock Loop (PLL) circuits, frequency synthesizer and amplifier design for communication systems of a broad range of frequencies. Design of communications circuits and/or sub-circuits. High frequency circuits (1 MHz to 2 GHz) and the corresponding measurement techniques.

Credits: *(4,1,0)* ***4*** *Prerequisites*: *EENG360*

EENG449 Digital System Design

An Introduction to digital system design, the principles of programmable logic devices (PLDs, PLAs, FPGAs), the implementation of combinational and sequential circuits, and the principles of hardware design using VHDL/Verilog, a state-of-the-art hardware description language with a focus on FPGAs. The architectural aspects of a VHDL/Verilog: entity, architecture, process, package, types, operators, libraries, hierarchy, test benches and synthesisable VHDL/Verilog. Introduction to synthesis tools which map VHDL/Verilog architecture to FPGAs and consider how to get the best performance from these tools. Design of complex controllers with Finite State Machines, design of sequential blocks, overview of implementation technologies with emphasis on advances in FPGAs.

Credits: (4,1,0) 4 *Prerequisites: EENG115*

EENG461 Communication Systems II

Review of probability and random variables. Random processes, stationarity, correlation, covariance and ergodicity concepts. Transmission of random processes through linear filters, power spectral density. Gaussian random processes, white noise, filtered noise and narrowband noise. Baseband pulse transmission and optimal (matched filter) receiver. Probability of error for pulse transmission. Nyquist criterion for distortionless binary

transmission, partial response signalling, multi-level signalling and tapped delay line equalization. Geometric interpretation of signals, coherent detection of signals in noise. Digital modulation techniques such as PSK, FSK, QPSK etc. Detection of the digitally modulated signals.

Credits: (4,1,0) ***4*** *Prerequisites: EENG360 & MATH322*

ECOM465 Fundamentals of Satellite Communication Systems

Satellite Systems in relation to other terrestrial communication systems; Satellite orbital mechanics and satellite launching techniques; earth segment and space segment components; Satellite link analysis, design and planning; overview of digital modulation, coding and multiple access techniques applicable for satellite communications; digital audio/video broadcasting for satellite communications; satellite personal communication systems; satellite networking.

Credits: (4, 0,1) ***4*** *Prerequisites:* EENG360/ *None*

CHEM101 General Chemistry

Atoms, molecules and ions. Mass relations in chemistry. Gasses. The ideal gas law, partial pressures, mole fractions, kinetic theory of gases, electronic structure and periodic table. Thermochemistry, calorimetry, entalpy. The first law of thermodynamics. Liquids and solids. Solutions. Acids and bases. Organic chemistry.

Credits: (4,1,0) ***4*** *Prerequisites: None*

PHYS101 Physics I

Physical quantities and units. Vectors kinematics of motion. Newton's laws of motion and their application. Work-energy theorem. Impulse and momentum. Rotational kinematics and dynamics. Static equilibrium.

Credits: (4,1,0) ***4*** *Prerequisites: None*

PHYS102 Physics II

Kinetic theory of ideal gases. Equipartition of energy. Heat, heat transfer and heat conduction. Laws of thermodynamics, applications to heat engine cycles, Coulombs law and electrostatic fields. Gauss's law. Electric potential. Magnetic fields. Amperes law. Faraday's law.

Credits: (4,0,1) 4 *Prerequisites: PHYS101*

ECON101 Introduction to Economy

This course introduces students to the basic concepts and theories of economics. This course examines the relationship between economic knowledge as a social science discipline and other branches of science; market economy, supply and demand balance, price mechanism, consumer and producer theories, profit maximization in full and incomplete competitive environments, factor markets and income distribution are discussed at the entry level.

Credits: (3, 0 , 0) ***3*** *Prerequisites: None*

MATH106 Linear Algebra

Matrices and a method for finding A^{-1}, Further Results on Systems of Equations and Inevitability, Diagonal, Triangular and Symmetric Matrices, The Determinant Function, Evaluating Determinants by Row Reduction, Properties of the Determinant Function, Cofactor Expansion; Cramer's Rule, Euclidean n-space, Linear Transformation R^n to R^n,

Properties of Linear Transformations from R^n to R^n, Real Vector Spaces, Subspaces, Linear Independence, Basis and Dimension, Row Space, Column Space and Nullspace, Rank and Nullity, Inner Products, Angle and Orthogonality in Inner product Spaces , Orthogonal Bases; Gram-Schmidt Process, Eigenvalues and Eigenvectors, Diagonalization.

Credits: (3,1,0) ***3*** *Prerequisites: None*

MATH151 Calculus – I

Limits and continuity. Derivatives. Rules of differentiation. Higher order derivatives. Chain rule. Related rates. Rolle's and the mean value theorem. Critical Points. Asymptotes. Curve sketching. Integrals. Fundamental Theorem. Techniques of integration. Definite integrals. Applications of integrals. Indeterminate forms. L'Hospital's Rule. Improper integrals.

Credits: (4,0,1) ***4*** *Prerequisites: None*

MATH152 Calculus II

Vectors in R3. Lines and Planes. Functions of several variables. Limit and continuity. Partial differentiation. Chain rule. Tangent plane. Critical Points. Global and local extrema. Lagrange multipliers. Directional derivative. Gradient, Divergence and Curl. Multiple integrals with applications. Triple integrals with applications. Triple integral in cylindrical and spherical coordinates. Line, surface and volume integrals. Independence of path. Green's Theorem. Conservative vector fields. Divergence Theorem. Stokes' Theorem.

Credits: (4,0,1) 4 *Prerequisites: MATH151*

TUSL181 Turkish as a Second Language

TUSL181 is a basic Turkish course introducing the Turkish language. It incorporates all four language skills and provides an introduction to basic grammar structures. Students will be encouraged to develop their writing skills through a variety of tasks. The aim of this course is for students to be able to understand and communicate in everyday situations, both in the classroom and in a Turkish speaking environment.

Credits: (2, 0 ,0) ***2*** *Prerequisite: None*

ENGL191 Communication in English I

ENGL 191 is a first semester freshman academic English course. It is designed to help students improve the level of their English to B1 level, as specified in the Common European Framework of Reference for Languages. The course connects critical thinking with language skills and incorporates learning technologies such as Moodle. The purpose of the course is to consolidate students' knowledge and awareness of academic discourse, language structures and lexis. The main focus will be on the development of productive (writing and speaking) and receptive (reading) skills in academic settings.

Credits: (3,0,1) ***3*** *Prerequisites: None*

ENGL192 Communication in English II

This course is designed to further help students improve their English to B2 level, as specified in the Common European Framework of References for Languages. The course aims to reconsolidate and develop students? knowledge and awareness of academic discourse, language structures, and critical thinking. The course also incorporates use of technologies such as MOODLE. The course will focus on reading, writing, listening,

speaking and introducing documentation, and will also focus on presentation skills in academic settings.

Credits: (3,1,0) ***3*** *Prerequisites: ENGL191*

ENGL201 Communication Skills

ENGL 201 is a Communication Skills course for students at the Faculty of Engineering. The course aims to introduce a range of skills, including effective written and oral communication, research skills and study skills. Throughout the course the students will be involved in project work, intended to help them in their immediate and future academic and professional life. This will include library research, technical report writing and an oral presentation. By investigating a topic of their own choice students will develop an understanding of independent research skills. During the report writing process, students will improve their writing and develop the ability to produce organized, cohesive work. The oral presentation aims to enhance spoken fluency and accuracy and provide training in the components of a good presentation.

Credits: (3,1,0) ***3*** *Prerequisites: ENGL192*

MATH207 Differential Equations

First order ordinary differential equations. Higher order homogeneous linear differential equations. Solution space. Linear differential equations with constant coefficients. Non - homogeneous linear equations; variation of parameters, operator methods. Systems of linear differential equations with constant coefficients. Laplace Transforms. Power series solutions. Orthogonal functions and Fourier expansions. Introduction to partial differential equations. First and second order linear partial differential equations. Separation of variables. Heat and wave equations.

Credits: (4,0,1) ***4*** *Prerequisites: MATH151*

CMPE211 Object Oriented Programming

Basics of C++ and Control structures. Program design, Object-Oriented programming and its specific features. Layout of a simple C++ program (elementary C++ programming. Fundamental types, scope. Overview of selection and iteration structures of C and C++ languages. Examples of C++ programs. Functions and Arrays. Review of functions and arrays. Prototypes (declarations), function definition, function overloading, inline functions, scope resolution operator (::), call-by-value, call-by-reference (reference parameters), default arguments, array declarations, operations on arrays, using arrays as function arguments. Pointers, C strings and C++ strings. Pointer variables, declaration and initialization. Use of pointers in call-by-reference function calls, returning a reference, arrays of pointers, pointers to arrays, pointers to functions, dynamic memory allocation with C++ operators new and delete, C-strings, input/output operations, standard C-string functions, formatted and unformatted input /output, C++ string type (the standard string class). Classes and Data abstraction. Structure definition, accessing members of structures, class declarations, constructors, constructor initialization lists. Class destructor, member access specifiers public and private, const member functions, friend functions and classes, static data and function members. Operator Overloading. Fundamentals and restrictions of operator overloading, this pointer, overloading unary and binary operators. Revision of the material discussed in the course.

Credits: (4,0,1) ***4*** *Prerequisites: CMPE112*

CMPE224 Digital Logic Systems

This course presents the basic tools for the design of synchronous sequential circuits and covers methods and procedures suitable for a variety of digital design applications in computers, control systems, data communications, etc.. Concentration will be on widely-used design methods for synchronous sequential circuits together with their analysis and simulation in VHDL.

Credits: (4,0,1) ***4*** *Prerequisites: EENG115*

MATH322 Probability and Statistical Methods

Introduction to probability and statistics. Operations on sets. Counting problems. Conditional probability and total probability formula, Bayes' theorem. Introduction to random variables, density and distribution functions. Expectation, variance and covariance. Basic distributions. Joint density and distribution function. Descriptive statistics.

Credits: (3,0,1) ***3*** *Prerequisites: MATH151*

CMPE344 Computer Networks

Basic concepts of data transmission. Overview of networks. The layered network architecture, ISO reference model. Circuit switching, packet switching. Physical layer. Communication techniques. Frequency and time division multiplexing, modulation, modems, error detecting. Data link layer. Data link protocols. Network layer. Routing and congestion. Local area networks. Other layers. Examples of commonly used networks and their protocols. Basics of LANs, wireless LANs, new trends in computer communication and computer networks.

Credits: (4,1,0) ***4*** *Prerequisites: MATH322*

MATH252 Mathematical Methods for Engineers

Complex numbers. Algebra of complex numbers. Polar representation. Complex functions. Limits and continuity. Analyticity. Analytic functions. Cauchy-Riemann equations. Line integrals. Cauchy integral formula. Isolated singularities. Residue theorem. Numerical error. Solution of nonlinear equations. Convergence. Solution of linear systems of equations: direct and iterative methods. Interpolation. Curve fitting. Numerical differentiation and integration.

Credits: (4,0,1) ***4*** *Prerequisites: MATH106 & MATH152*

HIST280 History of Turkish Reforms

This course is for Turkish students only. The aim of the course is to introduce the Ottoman Empire's situation at the 19. Century, Trablus and Balkan Wars, I. World War and it's consequences, Turkish Independence War, Mudanya Treaty, Lausanne Treaty, and Principles of Ataturk.

Credits: (2 , 0 , 0) ***2*** *Prerequisites: None*

IENG355 Ethics in Engineering

This course is designed to introduce moral rights and responsibilities of engineers in relation to society, employers, colleagues and clients. Analysis of ethical and value conflict in modern engineering practice. Importance of intellectual property rights and conflicting interests. Ethical aspects in engineering design, manufacturing and operations. Cost benefit-risk analysis, safety and occupational hazard considerations.

Credits: (3 , 0 , 1) 3 *Prerequisites: None*

IENG420 Engineering Economics

In this course, economic design will be introduced to make decisions in engineering design, manufacturing, manufacturing equipment and industrial projects. The value of your money depends on the time. Cash flow analysis. Cost of capital. Investment return. Items of cost and cost estimation. Profitability analysis. Deciding between options. The effects of depreciation. Taxes. Change analysis. Inflation.

Credits: (3 , 0 , 1) ***3*** *Prerequisites: None*

IENG450 Industrial Management

This course is designed for other engineering students outside industry / business engineering. The aim of the course; The students are to prepare the engineers to work as managers of the industry. The subject of this derste; historical development of industrial management, introduction to business management, functions of technology management, management of technological change, management of engineering projects, and management of engineering career.

Credits: (3 ,0 ,1) ***3*** *Prerequisites: None*

G. Scholastic Status

(a) Satisfactory Students

A student is considered successful at the end of a semester, if the Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) are at least 2.00 out of 4.00.

(b) Honor and High Honor Students

Students registered to the normal course load of a program in a department and scores a GPA between 3.00 and 3.49 is designated an 'Honor', if the GPA is between 3.50 and 4.00 is designated a 'High Honor'.

(c) Success for Undergraduate Programs (registered after 2007-08)

Students enrolled in an undergraduate program whose CGPA's are specified below are considered as 'successful', 'on probation' or 'unsuccessful'.

End of Academic Term (**EAT**)	**Successful** Student	Students **On Probation**	**Unsuccessful** Student
1st EAT	-	-	-
2nd EAT	CGPA ≥1.50	1.00 ≤ CGPA< 1.50	CGPA< 1.00
3nd EAT	CGPA ≥1.50	1.00 ≤ CGPA< 1.50	CGPA< 1.00
4th EAT	CGPA ≥1.50	1.00 ≤ CGPA< 1.50	***
5th EAT	CGPA ≥1.80	1.50 ≤ CGPA< 1.80	CGPA< 1.50
6th EAT	CGPA ≥1.80	1.50 ≤ CGPA< 1.80	CGPA< 1.50
7th EAT	CGPA ≥1.80	1.50 ≤ CGPA< 1.80	CGPA< 1.50
8th and more EAT	CGPA ≥2.00	1.80 ≤ CGPA< 2.00	CGPA< 1.80

*** Students who completed a minimum of 4 academic semesters (if the fourth semester is Spring Semester, then at the end of the Summer School) and who have a CGPA below 1.00 are dismissed from the program.

(d) Registration of Students on "Probation"

Students who are "on probation" are obliged to repeat failed courses before registering for the new ones. The students are allowed to register for two new courses at most, on the condition that they do not exceed normal course load. (Students who wish to register in summer school or who have the part-time status are allowed to register only for one new course).

(e) Registration of "Unsuccessful" Students

Students who are with "unsatisfactory" status are not allowed to register for a new course. During registration, these students must first register in the courses from which they received the grades: F, NG or D-. However, in the case that the courses from which (F), (NG) or (D-) grades were obtained are not offered, or the student's course

load being under the specified limit, the student can repeat courses from which a (D), (D+) or (C-) grade was obtained until the normal course load is met. Courses with (W) grades are considered as new and cannot be registered.

(f) Course Withdrawal

In a semester, a student is allowed to withdraw from two registered courses at most, provided that the student does not get into part-time status. Course withdrawal should be done between the set dates specified on the academic calendar. The course instructor should be informed and recommendation of the academic advisor and the approval of the Department Chair or School Director are necessary. A student who withdraws from a course will receive the grade 'W'. This grade is not taken into consideration during the calculation of the CGPA and the GPA, but appears on the transcript.

(g) The Letter Grades

Performance of a student for each course registered, is evaluated by the Course Instructor as a letter grade given below.

Grade	Grade Point Equivalent	Description
A	4.0	Pass
A-	3.7	Pass
B+	3.3	Pass
B	3.0	Pass
B-	2.7	Pass
C+	2.3	Pass
C	2.0	Pass
C-	1.7	Conditional Pass
D+	1.3	Conditional Pass
D	1.0	Conditional Pass
D-	0.7	Failure
F	0.0	Failure
NG	0.0	Nil Grade
S	-	Satisfactory
U	-	Unsatisfactory
I	-	Incomplete
W	-	Withdrawal

A student who receives A, A-, B+, B, B-, C+, C, C-, D+, D or S from a course is considered to have succeeded in that course.