Department of Electrical & Electronic Engineering

Eastern Mediterranean University

Electrical and Electronic Engineering (Undergraduate Program)

Spring 2021 - 2022

EASTERN MEDITERRANEAN UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

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UNDERGRADUATE CATALOGUE

INTRODUCTION

The Department of Electrical and Electronic Engineering 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, and it offers programs of study leading to degrees of Bachelor of Science (B.S.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.). The undergraduate programs in the department are the Electrical and Electronic Engineering Program, Biomedical Engineering Program, Information Systems Engineering Program and Electronics and Communications Engineering Program.

The undergraduate Electrical and Electronic Engineering Program is designed to train students in basic and engineering sciences, convey up-to-date professional knowledge, as well as to encourage individuals to develop confidence in engineering practice. Graduates of the program become a part of highly demanded class of professionals in their native countries. They may choose to continue their studies in the graduate programs of our department or other prominent international universities or pursue a broad range of careers in the field.

The Department offers a wide range of facilities for training and research in Electrical and Electronic 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 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; opto-electronics, 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 Electrical and Electronic Engineering (EENG) 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 EENG 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 Electrical and Electronic Engineering Program should attain the following outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics,
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors,
3. an ability to communicate effectively with a range of audiences,
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts,
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives,
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions,
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

In addition, the students should attain an ability to communicate in a bi-lingual environment.

ACADEMIC STAFF MEMBERS

ABOU RAJAB Hasan, Assistant Professor, BSc, MSc, PhD, Middle East Technical University.
Ext. No: 1498, e-mail: hassan.rajab@emu.edu.tr

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.
Ext. No: 1500, e-mail: hasan.amca@emu.edu.tr
Web Page: http://www.emu.edu.tr/amca
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.
Ext. No: 1440, e-mail: shahla.alikamar@emu.edu.tr

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
Web Page: http://faraday.ee.emu.edu.tr/hdemirel
His current research interests include; resolution enhancement in images/video, facial expression recognition, pattern recognition, facial image processing, feature detection, tracking, segmentation and recognition.

HOCANIN Aykut, Professor [Rector], BSEE, Rice University, MEng Texas A&M University, PhD Boğaziçi University.
Ext. No: 1201, e-mail: aykut.hocanin@emu.edu.tr
Web Page: http://faraday.ee.emu.edu.tr/hocanin
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.
Ext. No: 2778, e-mail: erhan.ince@emu.edu.tr
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.
Ext. No: 1304, e-mail: osman.kukrer@emu.edu.tr
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.
Ext.No: 1381/2776, e-mail: huseyin.ozkaramanli@emu.edu.tr
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.
Ext. No: 1436/2197, e-mail: reza.sirjani@emu.edu.tr
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.
Ext. No: 1300, e-mail: rasime.uyguroglu@emu.edu.tr
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

NAKIŞÇI Yeliz, Departmental Secretary	Ext.:1301	e-mail: yeliz.nakisci@emu.edu.tr
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.

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.

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.

Electrical Machines and Power Electronics Laboratory

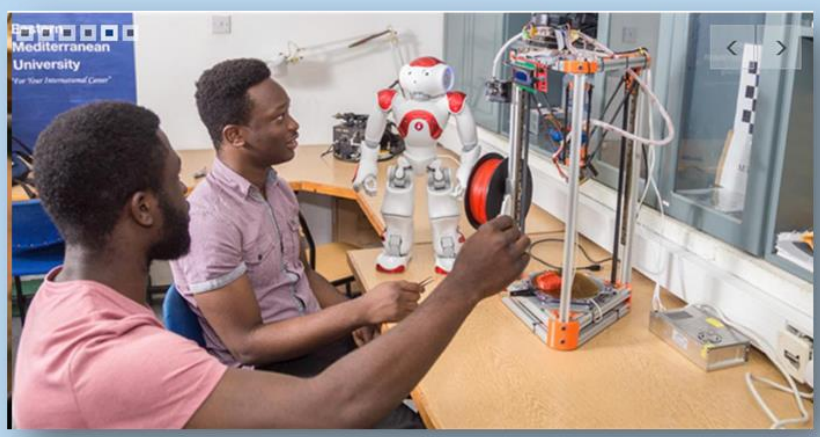
Equipped for experiments on all types of rotating AC and DC machines, stepper motors, universal motors and single and three-phase transformers. Facilities are available for testing and measuring motor characteristics. Several types of generalized machine sets are available for undergraduate and graduate 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.

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.

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.

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.

Multimedia Enabled Classrooms (MMEC)

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

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.

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 (B.S.) PROGRAM IN ELECTRICAL AND ELECTRONIC ENGINEERING

The curriculum and the courses offered in the department 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 Communication Systems, Electromagnetic Theory and Antennas, Control Systems, Power Systems, Electrical Machines, Electronics, Computer Hardware and Software, Optoelectronics and Mechatronics.

Students are required to successfully complete forty courses including an optional graduation project, and 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

Having the mission of becoming a centre of excellence in the Electrical and Electronic Engineering education, the department has to updated the curriculum of the Electrical and Electronic Engineering Program according to ABET (Accreditation Board of Engineering and Technology) EC2000 criteria. The current curriculum has been operational since fall 2009-10.

ELECTRICAL AND ELECTRONIC ENGINEERING CURRICULUM

First Year: Fall Semester					
R. Code	**Crs.Code**	**English Course Name**	**Lect.**	**Lab/Tut**	**Cr**
27711	EENG115	Introduction to Logic Design	4	1	4
27712	CHEM101	General Chemistry	4	1	4
27713	PHYS101	Physics I	4	1	4
27714	MATH151	Calculus I	4	1	4
27715	ENGL181	Academic English – I	5	1	3
	ENGL191	Communication in English – I	3		
			Sem. Cr. Total:		**19**

First Year: Spring Semester					
27721	EENG112	Introduction To Programming	4	1	4
27722	EENG102	Introduction to Elec. & Electronic Eng.	1	0	0
27723	MATH106	Linear Algebra	3	1	3
27724	MATH152	Calculus II	4	1	4
27725	PHYS102	Physics II	4	1	4
27726	ENGL182	Academic English – II	5	1	3
	ENGL192	Communication in English II	3	0	
			Sem. Cr. Total:		**18**

Second Year: Fall Semester					
27731	EENG212	Algorithms and Data Structures	4	1	4
27732	EENG223	Circuit Theory I	4	1	4
27733	MATH207	Differential Equations	4	1	4
27734	CIVL211	Statics	4	0	¾
	MENG286	Material Science	3	1	
	MENG244	Fundamentals of Thermodynamics	3	0	
27735	MATH252	Mathematical Methods for Engineers	4	1	4
			Sem. Cr. Total:		**19/20**

Second Year: Spring Semester					
27741	TUSL181	Turkish as a Second Language	2	0	2
	HIST280	History of Turkish Reforms			
27742	EENG245	Physical Electronics	4	1	4
27743	EENG224	Circuit Theory II	4	1	4
27744	EENG226	Signals and Systems	4	0	4
27745	EENG232	Electromagnetics I	4	1	4
			Sem. Cr. Total:		**18**

Third Year: Fall Semester					
27751	EENG331	Electromagnetics II	4	1	3
27752	EENG341	Electronics I	4	1	4
27753	SCC-I *	Selective Core Course - I	4	1	4
27754	MATH322	Probability and Statistical Methods	3	1	3
27755	UE01	University Elective – I	3	0	3
			Sem. Cr. Total:		**17**

Third Year: Spring Semester					
27761	EENG342	Electronics II	4	1	4
27762	SCC-II *	Selective Core Course II	4	1	4
27763	SCC-III *	Selective Core Course III	4	1	4
27764	UE02	University Elective – II	3	0	3
27765	ENGL201	Communication Skills	3	1	3
			Sem. Cr. Total:		**18**

Fourth Year: Fall Semester					
27771	EENG405	Graduate Design Project Proposal	1	0	1
27772	EENG403	Summer Training	0	0	0
27773	SCC-IV *	Selective Core Course IV	4	1	4
27774	SCC-V *	Selective Core Course V	4	1	4
27775	AE01 †	Area Elective – I	3	0	3/4
27776	AE02 †	Area Elective – II	3	0	3/4
27777	ECON101	Introduction to Economics - I	3	1	3
	IENG420	Engineering Economy	3	0	
	IENG450	Industrial Management	3	0	
			Sem. Cr. Total:		**18/19/20**

Fourth Year: Spring Semester					
27781	EENG406	Graduate Design Project	3	0	3
27782	AE03 †	Area Elective – III	3	0	3/4
27783	AE04 †	Area Elective – IV	3	0	3/4
27784	UE04	University Elective – IV	3	0	3
27785	PHIL401	Ethics in Professional Life	3	0	3
	IENG355	Ethics in Engineering			
			Sem. Cr. Total:		**15/16/17**
			Cum. Cr. Total:		**142-147**

* : Selective Core Courses (SCC). There are 5 required courses where the semester of each course is to be determined by the student.

† : Area Elective Courses (AE). There are 4 AE courses, which are technical electives offered by the department.

A. Selective Core Courses (SCC)

Students are required to register to following courses, at semesters, most appropriate to their choice of option. A total of 5 SCC courses must be taken in semesters 5, 6 and 7. These courses are:

EENG350	Electromechanical Energy Conversion	(4,1)4
EENG360	Communication Systems 1	(4,1)4
EENG410	Microprocessors I	(4,1)4
EENG320	Control Systems I	(4,1)4
EENG420	Digital Signal Processing	(4,1)4

B. Electives

i. University Elective (UE) Courses

The EENG 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 (AE) Courses

The Area Elective Courses listed below 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.

C. Options based on AE Courses

The technological progress in many fields of Electrical and Electronic Engineering puts a heavy responsibility on educational organizations for preparing students to have such skills that will cover all the professional demands. The department therefore, tries to guide students towards various general options that will help solve this problem. In an effort to answer these expectations, the department offers specialization in the optional fields further to a broad-based Electrical and Electronic Engineering education. This allows students to delve deeper into the specific areas of their interest. The course (field) requirements of the options are indicated in the table below:

OPTIONS	Required Field(s) of AE Courses
COMMUNICATIONS ENGINEERING	Communications / Electromagnetics (3) *
COMPUTERS	Computer (3)
INFORMATION ENGINEERING	Computer / Communications (3) *
INTEGRATED CIRCUITS	Integrated Circuits (3)
POWER/CONTROL ENGINEERING	Power / Control (3) *
POWER ENGINEERING	Power (3)

(*) – At least one of the AE courses must be from either of the two fields.

Students successfully completing any option requirements are awarded with a certificate granted by the department at graduation showing their areas of specialisation. However, students may fulfill graduation requirements without specialising in any option. Such students are not granted a specialisation certificate.

D. Final Year Project (EENG405/406)

Students are required to do a practical design project in their final year of study. EEE405 and EEE406 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. EENG405: 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 EENG406. 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. EENG406: 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. EENG406 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: EENG405)

E. 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/).

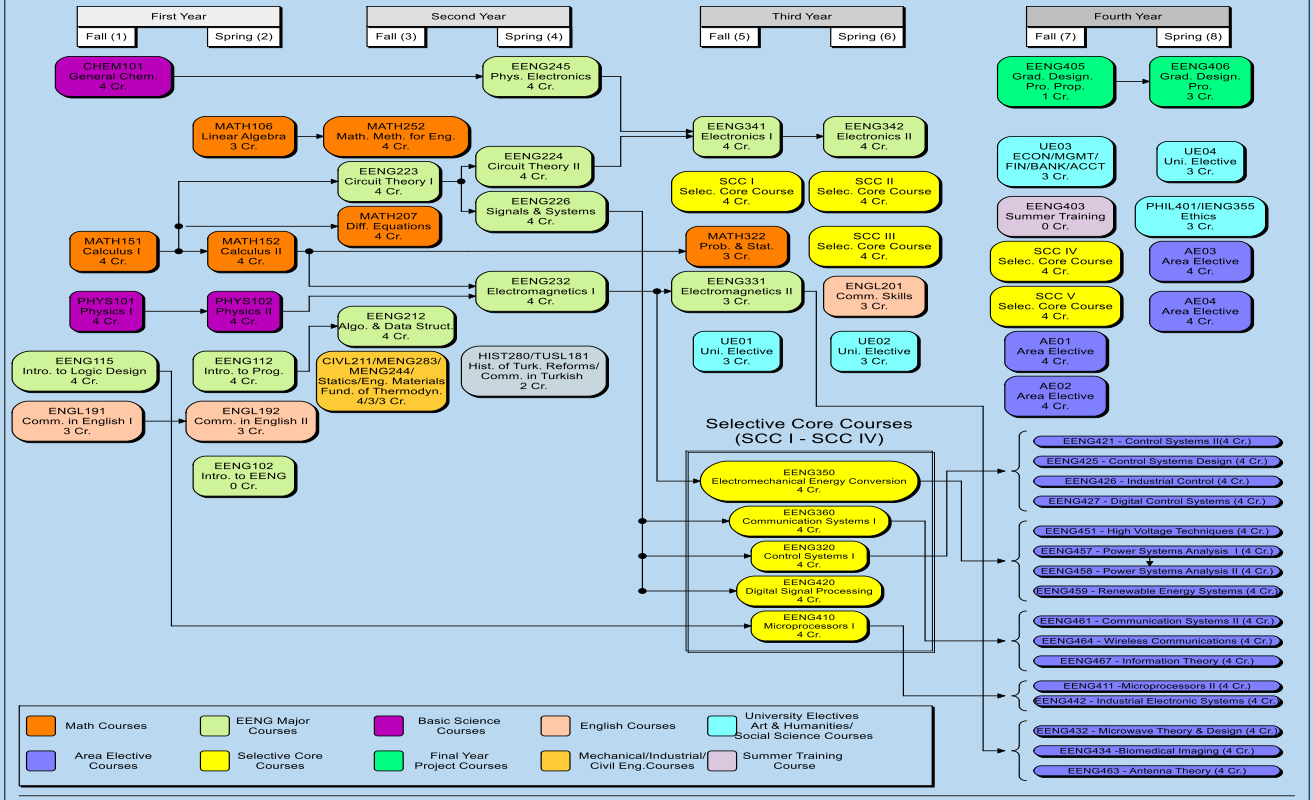
F. Summer Training (EENG403)

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

G. 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 Transfer Committee of the department through the EMU Registrar's Office.

Eastern Mediterranean University
Electrical and Electronic Engineering Program
Prerequisite Chain Flowgraph



Credits:	**19**	**18**	**19/20**	**18**	**17**	**18**	**18/19/20**	**15/16/17**	**= 142-147**
Cum. Cr:	**19**	**37**	**56/57**	**74/75**	**91/92**	**109/110**	**127-130**	**142-147**	

Semesters 6-7-8: Area Electives (4 courses)

Opt.		Field	C .code	Course name	C. hour	Prerequisite
Power/Control Engineering		Control	EENG421	Control Systems II	(4,1)4	EENG320
			EENG425	Control Systems Design	(4,1)4	EENG320
			EENG426	Industrial Control	(4,1)4	EENG320
			EENG427	Digital Control Systems	(4,1)4	EENG320
			EENG428	Introduction to Robotics	(4,1)4	Math 106
		Power	EENG451	High Voltage Techniques	(4,1)4	EENG224,EENG350
			EENG456	Power Generation and Distribution	(4,1)4	EENG245
			EENG457	Power Systems Analysis I	(4,1)4	EENG350
			EENG458	Power Systems Analysis II	(4,1)4	EENG457
			EENG459	Renewable Energy Systems	(4,1)4	EENG350
Integrated Circuit		Integrated Circuits	EENG441	Industrial & Power Electronics	(4,1)4	EENG342
			EENG442	Industrial Electronic Systems	(4,1)4	EENG410 EENG441
			EENG444	CMOS Integrated Circuits and Sys.	(4,1)4	EENG115,EENG341
			EENG445	Optoelectronics	(4,1)4	EENG245
			EENG447	Digital Integrated Circuit Design	(4,1)4	EENG115,EENG341
Information Engineering	Communications Engineering	Electromagnetics	EENG431	Computational Methods in Electrodynamics	(4,1)4	EENG331
			EENG432	Microwave Theory & Design	(4,1)4	EENG331
			EENG433	Microwave Applications	(4,1)4	EENG331
			EENG434	Biomedical Imaging	(4,1)4	EENG331
		Communications	EENG461	Communication Systems II	(4,1)4	EENG360 MATH322
			EENG462	Laser Theory and Applications	(4,1)4	PHYS101
			EENG463	Antenna Theory	(4,1)4	EENG331
			EENG464	Wireless Communications	(4,1)4	EENG360 MATH322
			EENG466	Fiber-optic Communications	(4,1)4	EENG331
			EENG467	Information Theory	(4,1)4	EENG360, MATH322
			EENG468	Source Compression for Mobile Communications	(4,1)4	EENG360 MATH322
			EENG469	Introduction to Image Processing	(4,1)4	EENG226
	Computers	Computer	EENG411	Microprocessors II	(4,1)4	EENG410
			EENG412	Comp. Comm. & Networks	(4,1)4	EENG212
			EENG471	Information Management	(4,1)4	EENG212
			EENG472	Client Server Computing	(4,1)4	EENG112
			EENG473	Computer Simulation	(4,1)4	MATH322, EENG212
			EENG474	Software Engineering	(4,1)4	EENG212
			EENG475	Object Oriented Mod. & Design	(4,1)4	EENG212
			EENG476	Computing Systems	(4,1)4	EENG212
			EENG477	Object Oriented Programming	(4,1)4	EENG212
			EENG478	User Interface Programming	(4,1)4	EENG212

I. Short Course Descriptions

EENG102: Introduction to Electrical &Electronic Eng. (1,0)0

A series of seminars are held in current topics and areas of specialisation in Electrical, Electronic, and Information Engineering. Speakers are invited from different departments of EMU or other International Universities, Industry and Consulting firms, to deliver seminars in all aspects of engineering that are not normally covered in the lecture courses. These include, safety at work, standards, quality control, engineering ethics, etc.

EENG115: Introduction to Logic Design (4,1)4

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. . (Prerequisite: Non)

EENG112: Introduction to Programming (4,1)4

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. Structures and unions. Conditional compilation, modular programming and multi-file programs. Exception handling. File processing. Formatted I/O. Random file access. Index structures and file organization. (Prerequisite: Non)

EENG212: Algorithms & Data Structures (4,1)4

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 their implementations. 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, Operation on graphs and traversing algorithms. (Prerequisite: EENG112)

EENG223: Circuit Theory I (4,1)4

Circuit variables, circuit elements. Simple resistive circuits. Techniques of circuit analysis. Topology in circuit analysis. Inductance and capacitance. State variables and state equations. Response of first-order RL, RC circuits. Natural and step responses of second-order RLC circuits. (Prerequisite: MATH 151)

EENG224: Circuit Theory II (4,1)4

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. (Prerequisite: EENG223)

EENG226: Signals and Systems (4,1)4

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. (Prerequisite: EENG223, Co-requisite: MATH252)

EENG232: Electromagnetics I (4,1)4

Review of vector calculus. Electrostatics in vacuum. Coulomb's and Gauss's laws. Electrostatic potential. Poisson's and Laplace's equations. Conductors in the presence of electrostatic fields. Method of images. Dielectrics; polarization. Dielectric boundary conditions. Capacitance. Electrostatic energy. 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. (Prerequisite: MATH 152, PHYS 102)

EENG245: Physical Electronics (4,1)4

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 (Prerequisite: CHEM 101).

EENG320: Control Systems I (4,1)4

Introduction to control: open-loop and closed loop control. Modelling: transfer function, block diagram, signal flow graph, state equations. Feedback control system characteristics: sensitivity, disturbance rejection, steady-state error. Performance specifications: second-order system, dominant roots, steady-state error of feedback systems. Stability: Routh-Hurwitz criterion, relative stability. The root locus method. Frequency response methods: Bode diagram, performance in the frequency domain, Nyquist stability criterion, gain margin and phase margin, Nichols chart. (Prerequisite: EENG226)

EENG331: Electromagnetics II (3,1)3

Electromagnetic induction; Faraday's and Lenz's laws; transformer and motional electromotive force; induction heating; 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. (Prerequisite: EENG232)

EENG341: Electronics I (4,1)4

Diode circuits, Zener diodes, rectifiers, filters. BJT, MOSFET and JFET amplifier design including biasing, small signal analysis and frequency response. Design of multistage amplifiers. Differential and operational amplifier design. Output stages. (Prerequisite: EENG224, EENG245).

EENG342: Electronics II (4,1)4

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 (Prerequisite: EENG341).

EENG350: Electromechanical Energy Conversion (4,1)4

Magnetic circuits and materials; Single-phase transformers, auto-transformers, measurement transformers, three-phase transformers; Electromechanical energy conversion principles; Synchronous motors and generators; Dc motors and generators; Induction motors; Speed control principles. (Prerequisite: EENG232)

EENG360: Communication Systems I (4,1)4

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. (Prerequisite: EENG226)

EENG 405: Graduation Design Project Proposal (0,1)1

This is a one-credit course that can be taken in the 7th academic semester. It forms a preparation phase for the EENG406. 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. (Prerequisite: Departmental Consent)

EENG 406: Graduation Design Project (0,3)3

Design and practical works oriented projects will be given to students with an aim to stimulate application of theoretical knowledge to practical situations. EENG406 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: EENG405)

EENG410: Microprocessors I (4,1)4

Basic computer organization and introductory microprocessor architecture. Introduction to assembly language programming: basic instructions, program segments, registers and memory. Control transfer instructions; arithmetic, logic instructions; rotate instructions and bitwise operations in assembly language. Basic computer architecture: pin definitions and supporting chips. Memory and memory interfacing. Basic I/O and device interfacing: I/O programming in assembly and programmable peripheral interface (PPI). Interfacing the parallel and serial ports. (Prerequisite: EENG115).

EENG411: Microprocessors II (4,1)4

Programmable interface adapter devices (PIA). Multiplexed displays. A/D, D/A converters and their interfacing to the MPU. Subroutines. Utilization of the microprocessor stack. Interrupts. Interrupt based I/O, interrupt controllers. Serial I/O. Communications interface adapters, modems. Direct memory access. DMA controller devices. Comparison of DMA techniques. (Prerequisite: EENG410)

EENG412: Computer Communication & Networks (4,1)4

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. (Prerequisite: EENG212)

EENG420: Digital Signal Processing (4,1)4

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. (Prerequisite: EENG226)

EENG421: Control Systems II (4,1)4

Background and preview. State-space representation. A review of matrix algebra and vector spaces. Analysis of linear time-invariant systems, modal decomposition. Controllability and observability. Relationship between transfer function and state equations, realizations. Pole assignment: state feedback and output feedback, observer design. (Prerequisite: EENG320)

EENG425: Control Systems Design (4,1)4

Design considerations and specifications; phase-lead and phase-lag compensator design on root-locus and Bode plots, PID control, loop shaping, robust control, state-space design, implementation issues. (Prerequisite: EENG320)

EENG426: Industrial Control (4,1)4

Building blocks of industrial control and automation systems: sensors, actuators, signal conditioners, computing units and networks. Control systems configurations: feed-forward and cascade. Characteristics of physical variables: temperature, flow, pressure, level, motion. Industrial controllers: PID controllers and on-line tuning, PLC, networked control.(Prerequisite: EENG320)

EENG427: Digital Control Systems (4,1)4

Introduction. Linear systems and the sampling process. Difference equations, sampling and holding. Discrete systems modelling: z-transforms, state variables description, digital computer transfer functions. Tem responses. Stability of discrete time systems: bilinear transformation, Jury's stability test. Discrete transform analysis. Digital control-system implementation. Compensation techniques. (Prerequisite: EENG320)

EENG428: Introduction to Robotics (4,1)4

Components of robot systems; coordinate frames, homogeneous transformations, kinematics for manipulator, inverse kinematics; manipulator dynamics, Jacobians: velocities and static forces, control of manipulator and robotic programming. (Prerequisite: Math 106)

EENG431: Computational Methods in Electrodynamics (4,1)4

A review of basic numerical methods in electrodynamics. Method of Moments. Finite–Difference Method. Finite-Difference Time-Domain Method. Variational and related methods. Finite-Element Method. Mode Matching Method. Spectral Analysis.(Prerequisite: EENG331).

EENG432: Microwave Theory & Design (4,1)4

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. (Prerequisite: EENG331).

EENG433: Microwave Applications (4,1)4

Basic passive microwave components. Attenuators, phase shifters, directional couplers, T-junctions, hybrids, power dividers, magic T, circulators. Microwave Resonators. Cavity resonators. Rectangular and circular cavities. Excitation of cavity resonators. Dielectric resonators. Series and parallel resonant circuits. Transmission line resonators. Microwave Filters. Filter Design by the Insertion Loss Method. Filter transformations. Impedance and frequency scaling. Filter implementation. Active Microwave Circuits. Noise in microwave circuits. Transistor amplifier design. Oscillator design. Microwave sources. Solid-state and tube sources. Ferrite components. Ferrite isolators, phase shifters, circulators. .(Prerequisite: EENG331).

EENG434: Biomedical Imaging (4,1)4

Fundamentals of X-ray. Interactions between X-rays and matter. Generation and detection of X-rays. X-ray diagnostic methods. Conventional X-ray radiography. Computed tomography. X-ray image characteristics. Fundamentals of acoustic propagation. Generation and detection of ultrasound. Ultrasonic diagnostic methods. Ultrasonic transmission methods and transmission tomography. Fundamentals of nuclear medicine. Generation and detection of nuclear emission. Radionuclide generators. Radionuclide imaging systems. Fundamentals of nuclear magnetic resonance. Generation and detection of NMR signal. The magnet, magnetic field gradients, the NMR coil / probe. Data acquisition. Imaging methods. Slice selection, frequency encoding, phase encoding, spin-echo imaging. Biological effects of magnetic fields. (Prerequisite: EENG331)

EENG441: Industrial & Power Electronics (4,1)4

Power semiconductor devices; Drive circuits; Snubbers. Controlled and uncontrolled ac/dc converters; Harmonics and input filters; Power factor correction; PWM ac/dc converters; Control of ac/dc converters; Ac voltage controllers; Forced commutation for thyristors; Dc-dc converters and choppers; Switch mode power supplies; Voltage-source and current-source inverters; PWM control of inverters; Resonant converters; Zero-current and zero-voltage switching. (Prerequisite : EENG342)

EENG442: Industrial Electronic Systems (4,1)4

Introduction to micro controllers and DSP controllers, applications in power electronics and industrial electrical drives; PWM control; V/f control of ac machines; Introduction to vector control of ac machines; Dc drives; Various control and instrumentation issues in industrial electronics; Measurement and processing of feedback signals; Industrial power conditioning systems. (Prerequisite : EENG410, EEE441)

EENG444: CMOS Integrated Circuits & Systems (4,1)4

Analysis, design and optimisation of digital and analog CMOS integrated circuits. Device and circuit modelling. Transistor level design techniques and methodologies for implementing specific digital and analog circuit functions. Logic and memory subsystem considerations. Circuit performance evaluation by means of simple approximations and computer aided circuit analysis. The impact of scaling, deep submicron effects, interconnect, signal integrity, power distribution and consumption, and timing. (Prerequisite: EENG 115, EENG341)

EENG445: Opto-electronics (4,1)4

Opto-electronic Devices: optical absorption in a semiconductor, photocurrent in a p-n diode, photoconductive detection, p-i-n detector, avalanche photo detector, phototransistor, Schottky detectors. Opto-electronic light emitters: light emitting diode and its performance, advanced LED structures, semiconductor lasers design-operation-structures. Optical communications: optical communication systems, information content and channel capacity, optical fibers, advanced devices. (Prerequisite: EENG245)

EENG447: Digital Integrated Circuit Design (4,1)4

The fundamental concepts of modern digital VLSI circuit design using CMOS technology with an emphasis on “hands-on” IC design using CAD tools. An overview of CMOS technology, simple and extended circuit models for NMOS and PMOS transistors.

Combinatorial and sequential logic circuits including transistor level design of logic gates at the device and layout level. Static and dynamic clocking methods. Memory design and memory decode logic. Digital IC design flow. Hardware Description Languages (VHDL/Verilog), architectural aspects of a VHDL, synthesised VHDL on physical hardware. Alternative low-power logic families such as DCVS and adiabatic Logic and discuss the implications of modern methods on circuit design. Chip level design methodologies (full-custom, semi-custom and standard cell) exploration. (Prerequisites: EENG115, EENG341).

EENG451: High Voltage Techniques (4,1)4

Electrical Field Analysis: experimental and computational methods, electrical breakdown in gases, Townsend's breakdown criterion, Paschen's law, Streaner-Kanal mechanisms, breakdown in non-uniform field and corona, electrical breakdown of dielectric liquids and solids, insulating materials, dielectric measurements, generation and measurement of high AC, DC and impulse voltages and currents, electrostatic generators, testing transformers and series resonant circuits, impulse voltage and current generator circuits, sphere and uniform field gaps, electrostatic generating and peak voltage measuring voltmeters. (Pre-requisites: EENG224, EENG350)

EENG453: Advanced Electromechanical Energy Conv. (4,1)4

Transient analysis of ac and dc machines and transformers; Single-phase induction motors; Stepper motors; Brushless dc motors; Shaded-pole motors; Universal motors; Speed control using Programmable Logic Controllers; Condition monitoring using Labview graphical programming. (Prerequisite: EENG350).

EENG454: Electrical Engineering Design & Illumination (4,1)4

Review on Electromagnetism, Inductance, Static Electricity, DC and AC Circuits; Voltage drop calculations, Cable selection and Current ratings based on IEE regulations; Distribution of low and medium voltage supplies; Fundamentals of Wiring Techniques, Conduits and Trunkings; DC and AC Motors and starting methods, DOL, Star-Delta and Auto-transformer Systems; Transformers and transformer regulations; Power-Factor improvement, Compensation systems; Earthing and Earth-Leakage protection and applications; Testing of polarity, insulation, earth continuity and ring continuity; Light, lighting concepts, measuring illumination intensity, illumination requirements and quality, lighting regulations and circuits; Communication systems and equipment, fire and burglar alarms. (Prerequisites: EENG224, EENG350)

EENG455: Renewable Energy: Photovoltaics (4,1)4

Introduction to renewable energy resources with main emphasis on photovoltaic energy conversion. Solar insulation. Short review of semiconductor properties. Generation, recombination and the basic equations of the device physics. P-n junction and silicone solar cell. Efficiency limits, losses, and measurements. Current fabrication technologies. Design of cells and modules. Other materials. Applications. (Prerequisite: EENG245)

EENG456: Power Generation and Distribution (4,1)4

Introduction to electric energy generation, power plants and electric economy, frequency and voltage control, protection co-ordination. Calculations of voltage drop in medium and low voltage distribution systems. Selection criteria of cross-section of lines and cables.

Compensation. Network faults and short circuit current calculations. (Prerequisite: EENG350)

EENG457: Power System Analysis I (4,1)4

Per-unit system; Review of three-phase circuits, transformers and synchronous machines; Modelling of transmission lines; Short, medium-length and long transmission lines; Transmission line transients; Network impedance and admittance models; Network calculations; Power flow solutions. (Prerequisite: EENG350)

EENG458: Power System Analysis II (4,1)4

Economic operation of power systems; Symmetrical three-phase fault analysis; Symmetrical component theory; Unsymmetrical fault analysis; Fault analysis using bus admittance matrix method; Protection systems, over current, directional, ratio, differential, distance and pilot relays; Stability analysis of power systems. (Prerequisite: EENG457)

EENG459: Renewable Energy Systems (4,1)4

Physical and technological principles behind producing power from direct solar (solar thermal and photovoltaic), indirect solar (biomass, hydro, wind, and wave) and non-solar (tidal and geothermal) energy sources. Environmental impacts, economics, and future developments of renewable energy technologies. Real world applications and recent innovations. Renewable energy project development in the context of feasibility study, energy capacity and efficiency calculations, use of technical and economical parameters, and payback calculations. (Prerequisite: EENG350)

EENG461: Communication Systems II (4,1)4

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 and etc. Detection of the digitally modulated signals. (Prerequisite: EENG360, MATH322)

EENG462: Laser Theory & Applications (4,1)4

Brief historical development and present situation. Wave motion. Monochromaticity. Atomic basis. Absorption and emission. Light Amplification by stimulated emission. Optical resonator. Active medium and laser output. Line-width and broadening mechanism. Modes and mode selection. Gain saturation and Lamb-Dip, Q-Switching and mode locking. Selected examples of lasers. (Prerequisite: Phys 201)

EENG463: Antenna Theory (4,1)4

Brief review of electromagnetic theory. Radiation; retarded potentials. Hertzian dipole. Near and far fields. Antenna parameters. Radar equation. Friis transmission formula. Receiving antennas; effective area, polarization mismatch factor. Linear antennas. Antenna matching. Array theory; pattern multiplication. Uniform and nonuniform arrays. Aperture antenna theory. Horn and reflector antennas. Propagation. Basic modes of propagation. Ground and surface waves. Ionosphere wave propagation. (Prerequisite: EENG331)

EENG464: Wireless Communications (4,1)4

Introduction to wireless communication systems. The cellular concept and system design fundamentals: frequency reuse, interference and system capacity. Radio propagation and large-scale path loss. Small-scale fading and multipath propagation: Doppler shift, mobile multipath channel parameters such as coherence bandwidth and coherence time. Diversity techniques and diversity combining. Spread spectrum communication techniques. Multiple access techniques: TDMA, FDMA, CDMA, SDMA. Current and future wireless systems and standards. (Prerequisite: EENG360, MATH 322)

EENG466: Fiberoptic Communications (4,1)4

Review of optics: Ray theory, imaging, diffraction, etc. Lightwave fundamentals: polarization, dispersion, critical angle reflections. Dielectric waveguides: Slaab waveguides, modes and coupling, integrated optic components. Optic fiber waveguides: Step-index fiber, Graded-index fiber, attenuation modes, pulse distortion, construction of optic fibres. Light sources: LED, laser principles, laser diodes, optical amplifiers, fiber laser. Light detectors, couplers connectors: Photo detection, splice connectors, source coupling. Distribution networks and fiber components: Couplers, switches, attenuators, circulators, polarizer, etc. Light modulation formats and optic heterodyne receivers. (Prerequisite: EENG331)

EENG467: Information Theory (4,1)4

Modelling of information sources and measure of information. Joint and conditional entropy. Source Coding: Huffman, Lempel Ziv coding and arithmetic coding. The Rate distortion theory. Modelling of communication channel and the Channel Capacity Theorem. Scalar and vector quantisation and Transform coding. Coding of discrete information sources: Block codes, cyclic codes, convolutional codes. Combined modulation and coding, trellis coded modulation (TCM). (Prerequisite: EENG360, MATH322)

EENG468: Signal Compression for Mobile Communications (4,1)4

Introduction to speech and video signal. Quantisation and encoding. Advanced quantisation by way of pattern matching called vector quantisation. Design of vector quantisation and its types. Speech coding principles and standards. Complexity reduction techniques. Video coding principles and standards. Application of speech and video services in mobile communications. Parameter sensitivity studies. Built in error protection. (Prerequisite: EENG360, MATH322)

EENG469: Introduction to Image Processing (4,1)4

Introduction to topics such as: image geometry, sampling and quantization. Image transforms. Image enhancement: spatial domain and frequency domain methods. Color image processing: RGB and HSI images. Image restoration: degradation model, inverse filtering and Wiener filter. Image compression: error-free compression, lossy compression, compression methods such as JPEG and MPEG. Image segmentation. Image representation and description techniques. (Prerequisite: EENG226)

EENG471: Information Management (4,1)4

Database systems; components of database systems, DBMS functions, database architecture and data independence, hypertext, hypermedia and multimedia. Data modelling. Entity-relationship model. Object-oriented model. Relational data model. Entity and referential integrity. Relational algebra and relational calculus. Relational database design. Functional

dependency and normal forms. Transaction processing. Distributed databases. Physical database design; storage and file structures, indexed files, hashed files, B-trees, files with dense index, files with variable length records. (Prerequisite: EENG212)

EENG472: Client-Server Computing (4,1)4

The seven-layer reference model; physical, data link, network, transport, session, presentation and application. Host name resolution and the domain name service. Public-key cryptography. The WEB as an example client server computing; designing clients and servers. Technologies of the web; URLs, HTML, HTTP, applets etc. Communication and networking; protocol suites, streams and datagrams, remote procedure calls, internetworking and routing. Distributed object systems; serializing objects, distributed object frameworks. COM and DCOM. Collaboration technology and groupware. Distributed operating systems. (Prerequisite: EENG112)

EENG473: Computer Simulation (4,1)4

Introduction to simulation as an important modelling and decision tool in order to design and analyse complicated real-life systems for which there is no analytical solution. Simulation methodology and model building. Simulation languages. Continuous, Monte-Carlo and Discrete Event simulation. Basic issues in the design, verification and validation of simulation models. Statistical analysis of simulation output data. Use of simulation for estimation and optimization of performance. Application to queuing systems and computer networks. (Prerequisite: MATH 322, EENG212)

EENG474: Software Engineering (4,1)4

The software life cycle. Requirements analysis and specification of requirements. Software design and selection. Initial design, modularity, structure charts and partitioning. Detailed design and notations. Data modelling and design. The Relational database model. Software testing, documentation and maintenance. Object modelling and principles of OO analysis.(Prerequisite: EENG212)

EENG475: Object Oriented Modelling and Design (4,1)4

Object oriented approach. Modelling concepts. Object modelling and methodologies. Advanced object modelling. The Unified Modelling Language (UML). Dynamic and functional modelling. Design methodologies: methodology review, OMT, analysis, system design. Design of objects. Comparison of methodologies. Case studies. (Prerequisite: EENG212)

EENG476: Computing Systems (4,1)4

Machine level representation of data. Assembly level machine organization. Memory system organization. I/O and communication. CPU implementation. Operating system principles. Concurrency. Scheduling and dispatch; preemptive and non-preemptive scheduling. Process and threads. Physical memory and memory management hardware. Virtual memory; paging and segmentation. Memory mapped files. Device management. Characteristics of serial or parallel devices. Buffering strategies. Servers and interrupts. Security and protection; security methods and devices. Protection, access and authentication. Encryption. (Prerequisite: EENG115, EENG212)

EENG477: Object Oriented Programming (4,1)4

Object oriented concepts. Data typing, data encapsulation and the abstract data type. Object identity, inheritance, reusability, polymorphism. Object oriented programming languages. Classes, functions references. Object declarations and data types. Expressions and statements. Dynamic storage management. Operators, overloading and friends. Derived classes, initialisation, inheritance, I/O libraries. Building generic libraries. Error handling in libraries. (Prerequisite: EENG212)

EENG478: User Interface Programming (4,1)4

Basics of user interface. Event-driven programming and messages. Message queues, message loop and dispatch functions. Examples of win32 messages. Windows programming environment. Basic user interface elements and controls; Common child win controls. Resources; menus, icons, dialog boxes. Multitask and multithread programming. Priority and scheduling. Syncronisation; critical sections, wait functions, mutexes, semaphores and events. Interprocess communication; handle sharing, mail slots and pipes. Microsoft foundation classes and MFC programming. OLE, COM and ActiveX. Database support, ODBC and data access objects. Network, communication, MAPI & TAPI programming. Multimedia and graphics. DirectX. (Prerequisite: EENG212)

CHEM101: General Chemistry (4,1)4

Atoms molecules and ions; mass relations in Chemistry; stoichiometry. Gases, the ideal gas law, partial pressures, mole fractions, kinetic theory of gases. Electronic structure and the periodic table. Thermochemistry, calorimetry, enthalpy, The First Law of Thermodynamics. Liquids and Solids. Solutions. Acids and Bases. Organic Chemistry.

ENGL191: English I (3,1) 3

ENGL191 is a first semester Basic Academic English course for students at the Faculty of Engineering. The purpose of the course is to introduce students to writing, reading, speaking and listening in academic settings as well as provide an introduction to appropriate study skills.

ENGL192: English II (3,1) 3

ENGL192 is a second semester Basic Academic English course for students at the Faculty of Engineering. The purpose of the course is to further develop students' writing, reading, speaking and listening skills in academic settings and to improve their study skills.

ENGL201: Communications Skills (3,0) 3

ENGL201 is a second year English course for students at the Faculty of Engineering. This course is intended for students with an upper intermediate level of English. The course aims to enhance 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. In addition to the project work, students will work on their job search skills by writing a curriculum vitae (CV) and an application cover letter.

PHYS101: Physics I (4,1) 4

Families of physical quantities having different dimensions, units and rules of mathematics. Vector mathematics and calculus, their applications to motion. Newton's laws. Integrals of the second law, work-energy, impulse-momentum, conservation of energy and momentum, applications. Rotations. Static equilibrium.

PHYS102: Physics II (4,1) 4

Heat, heat transfer and heat conduction. Kinetic theory of ideal gases, equipartition of energy. The laws of thermodynamics, applications to engine cycles, Coulombs law and electrostatic fields. Gauss's law, symmetry. Electric potential. Magnetic fields. Amperes law. Faradays law (Prerequisite: PHYS101).

PHYS201: Physics III (4,1) 4

Special Relativity. Blackbody radiation, photoelectric effect, early quantum theory and Bohrs model of the atom. Equation of motion for waves on a string, boundary value problems. Superposition. Group velocity, de Broglie's hypothesis, Davisson-Germer experiment. Heisenbergs uncertainty principle. Wave particle duality. Schroedinge's equation, applications to particle in a box, particle, harmonic oscillator and hydrogen atom.

MATH106: Linear Algebra (3,0) 3

Systems of linear equations: elementary row operations, echelon forms, Gaussian elimination method; Matrices: elementary matrices, invertible matrices, symmetric matrices, quadratic forms and Law of Inertia; Determinants: adjoint and inverse matrices, Cramer's rule. Vector spaces: linear independence, basis and dimensions, Euclidean spaces. Linear mappings: matrix representations, changes of bases; Inner product spaces: Cauchy-Schwarz inequality, Gram-Schmidt orthogonalization; Eigenvalues and eigenvectors: characteristic polynomials, Cayley-Hamilton Theorem, Diagonalizations, basic ideas of Jordan forms.

MATH151: Calculus I (4,1) 4

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. Application to geometry and science. Indeterminate forms. L'Hospital's Rule. Improper integrals. Infinite series. Geometric series. Power series. Taylor series and binomial series.

MATH152: Calculus II (4,1) 4

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 (Prerequisite: MATH151).

MATH207: Ordinary Differential Equations (4,1) 4

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. (Prerequisite: MATH106 and MATH151).

MATH322: Probability and Statistical Methods (3,1) 3

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. Estimation of parameters, maximum likelihood estimator. Hypothesis testing (Prerequisite: MATH152).

MATH252: Mathematical Methods for Engineers (4,0) 4

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 (Prerequisite: MATH106 and MATH152).

TUSL181: Communication in Turkish (2,0)2

This course is a course aims to develop students' ability to use the Turkish language to an intermediate level. The course emphasizes development of vocabulary, grammar and sentence structure, through intensive drills and practice in writing as well as conversation.

HIST280: History of Turkish Reforms (2,0)2

The aim of this course is to teach students under what conditions the Republic of Turkey was established; to make students understand the principles of Ataturk’s reforms; the phases of the Reforms; Ataturk as a military hero and a statesman; Ataturk’s concept of nationalism that defies racism; Ataturk’s attempts to maintain global peace based on causes and effects; the relations between the Turkish Republic and the establishment of the Turkish Republic of Northern Cyprus; Turkish Cypriot years of national strife. This is a general education course

IENG420: Engineering Economy (3,0) 3

An introduction to the basics of economic analysis for decisions in engineering design, in manufacturing, in manufacturing equipment, and in industrial projects. Time value of money. Cash flow analysis. Cost of capital. Return on investment. Elements of cost and cost estimation. Break-even analysis. Decision making among alternatives. Effects of depreciation. Taxes. Replacement analysis. Inflation. Prerequisite: senior standing, [Offered only to non-IE Engineering students]

IENG450: Industrial Management (3,0) 3

This is a service course offered to senior non-IE engineering students. The aim is to prepare the engineering graduates to assume positions in industry as engineering managers. The topics covered include the historical development of industrial management, functions of technology management, managing technological change, managing engineering projects, and managing the engineering career. Prerequisite: senior standing, [Offered only to non-IE engineering students]

IENG355: Ethics (3,1) 3

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 and safety and occupational hazard considerations. Prerequisite: consent of instructor [Offered also as a service course to non-IE engineering students]

EENG 225: Fundamentals of Electrical Engineering (3,1)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 (Prerequisite: PHYS102).

J. 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. Vertical transfer

(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.

E. Double Major

Eastern Mediterranean bylaws allow the outstanding Electrical and Electronic Engineering (EENG) students to get a second undergraduate diploma by applying to the Double Major Programs.

EENG students can apply to do Double Major in the following programs:

- Biomedical Engineering
- Information Systems Engineering
- Mechatronics Engineering

Details of the rules and regulations regarding the Double Major Programs can be accessed through the following hyperlink.
http://mevzuat.emu.edu.tr/5-1-7-Rules-Doublemajorprgs.htm