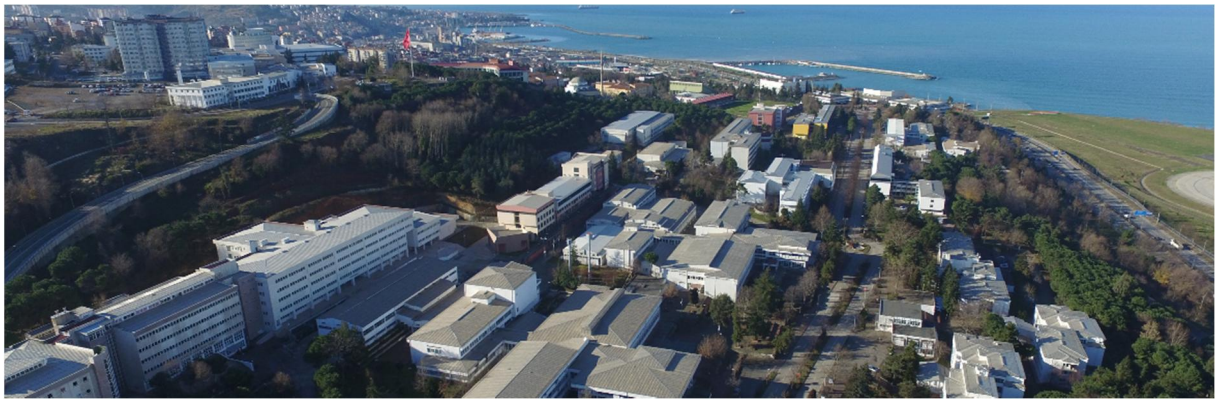
KTU
1955 Karadeniz Technical University

Faculty of Engineering

Department of
Electrical and Electronics Engineering

100% English Program

Course Catalog



August 2021, Trabzon

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1. GENERAL INFORMATION

1. 1. Foundation History

Karadeniz Technical University (KTU) has been established in 1955 as the first university outside Ankara and İstanbul. KTU is the fourth university in Turkey according to the date of establishment. After settlement of the university, Faculty of Engineering and some of the engineering departments have been set up in 1963 including the Department of Electrical and Electronics Engineering (DEEE). The students have been studying hard to turn their ideas to reality since 1969, which is the date of first student admission. There have been thousands of graduates since then. The graduates of the Department of Electrical end Electronics Engineering are awarded with a bachelor's degree in the field of Electrical end Electronics Engineering. They work in both government organizations and prestigious national and international private companies as design engineers, operative engineers, unit or corporate managers. They work in universities as academics and researchers, too. Many of them have their own company, as well.

The department is constructed over a 14 719 m^2 area. 3 832 m^2 of the total area is reserved for laboratories. There are 12 classrooms, 2 seminar saloons and 1 meeting room. There is also a Lecture Hall, which is named after Halis Duman who is one of the founders of the department. Halis Duman Lecture Hall, all classrooms, the seminar room, and the meeting room are equipped with a computer and projection device for presentations. Equipments in laboratories are renewed approximately in every five years. There are two computer labs with 25 PCs each. Required software for electrical and electronics engineering students are available computer labs. Students can also have access to some design and analysis software through internet using their e-mail address with the extension @ogr.ktu.edu.tr

The Department of Electrical and Electronics Engineering at Karadeniz Technical University has Master of Science and Philosophy of Doctorate graduate programs in both Electrical and Electronic areas. Approximately 50 Master of Science and 10 PhD students join to the graduate programs every year. They use research laboratories to study and realize their research projects, which are usually funded by The Scientific and Technological Research Council of Turkey (TUBITAK) or the Scientific Research Projects Program (BAP) at Karadeniz Technical University.

The department has seven sub-divisions as listed below.

I. Electrical Machines
II. Electrical Power Systems
III. Control and Automation
IV. Circuits and Systems
V. Electronics
VI. Telecommunication
VII. Biomedical

After getting the core courses, the students are free to select elective courses in order to improve their knowledge in one of the above areas. The curriculum enables students to get base knowledge for all areas and then decide their future aims by technical elective courses in fourth year. Students have to design a project in a compulsory course called "Engineering Design" and then develop a prototype of their design in the course called "Graduation Project". The students usually work as groups to complete these project works.

The students are being urged and guided to apply TUBITAK in order to get financial support for their projects. At the end of the fourth year, the students present their projects to all attendees in a Graduation Project Exhibition called "Graduation Project Exhibition from dream to reality."

1.2. Student Admission

In order to be accepted, the students must have a high school diploma, a sufficient grade from national university entrance exam done by Student Selection and Placement Center (ÖSYM), and an English Language Certificate showing the qualification to attend courses in English.

Students who do not have sufficient English are admitted to the English Preparatory Program for one year at the School of Foreign Languages. They take an English qualification exam when they complete this program. If they get enough marks from this qualification exam, they can start their education in the Department of Electrical and Electronics Engineering.

1.3. Distribution of Course Content by Years

The content of the courses in the curriculum have been spread over four years as follows to enable students to reach the departmental program outcomes, which are given in Section 1.7.

i. The first year of the program mainly consists of basic science and mathematics courses.
ii. In the second year, the courses mainly cover the core topics of Electrical and Electronics Engineering. In the second year, social elective courses are also offered to students.
iii. The third-year courses cover topics related to the sub-fields of Electrical and Electronics Engineering as well as core topics. In the third year, some technical elective courses are offered to students.
iv. In the fourth year, students must do an Engineering Design Project and a Graduation Project. All other courses in the fourth year are Technical Elective. Students can specialize in one of the subfields of Electrical and Electronics Engineering with the technical elective courses they take. There is also one social elective course in the fourth year.

1.4. Examination, Assessment and Grading Regulations

The examination, assessment and grading regulations have been set up for the university by the University Senate and the Department of Electrical end Electronics Engineering is bounded by these regulations.

Each course is assessed by an in-term work (50%) and a final end-of-term exam (50%). The in-term work consists of at least a midterm exam, assignments, term project, quizzes and/or labs.

The catalog values of grading system is given in Table 1. The passing grade of a student depends on the class average of the course. This is called the *relative grading system*. If the number of students taking the exam is 30 and above, *the relative grading system* based on the grade point average of the class is applied. If the number of students taking the exam is between 10 and 29, the relative grading system is applied according to the percentiles of success. If the number of students taking the exam is less than 10, the catalog grading system is applied. The catalog grading system is applied too when the class average is 60 and above.

Table 1. The catalog grading system

Score range out of 100.		Letter equivalence	Grading out of 4
90	100	AA	4.0
80	89	BA	3.5
75	79	BB	3.0
70	74	CB	2.5
60	69	CC	2.0
50	59	DC	1.5
40	49	DD	1.0
30	39	FD	0.5
0	29	FF	0.0

According to the regulations;

- The pass grade is CC.
- If term average grade is 2.0 and above, then DC grades are considered as passing grades.
- DD, FD and FF are considered unsuccessful.
- In order to be able to enroll in the 5th semester courses, the grade point average at the end of the 4th semester must be 1.8 or above.

1.5. Graduation Requirements

To be able to have the bachelor's degree in the field of Electrical end Electronics Engineering, the students are required

a. to have passed all courses in the curriculum with a grade of at least DC,
b. to have achieved a cumulative gross point average of at least 2.00 out of 4.00,
c. to complete the compulsory internship period of 60 days at least at two different places and had a passing grade for the reports prepared for these works,
d. to prepare, submit and successfully defend a graduation project.

1.6. Educational Outcomes

The graduates of the KTU Electrical and Electronics Engineering Department work open to new developments in a continuous education awareness and produce solutions at the national and international level for the requirements in the fields of communication systems, electronic hardware and software, industrial automation, energy production, transmission and distribution.

They design projects taking into account the standards in these issues and manage them within the framework of ethical rules. They put these projects into practice, taking into account their social, economic, political, legal and environmental consequences.

1.7. Program Outcomes

The program outputs are as follows.

i. Adequate knowledge in mathematics, science and related engineering discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems

ii. Ability to identify, define, formulate, and solve complex engineering problems; ability to select and apply appropriate analysis and modeling methods for this purpose

iii. Ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; ability to apply modern design methods for this purpose

iv. Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems encountered in engineering applications; ability to use information technologies effectively

v. Ability to design and conduct experiments, collect data, analyze and interpret results for studying complex engineering problems or discipline-specific research topics.

vi. Ability to work effectively in disciplinary and multidisciplinary teams; ability to work individually

vii. Ability to communicate effectively in Turkish, both orally and in writing; at least one foreign language knowledge; ability to write effective reports and understand written reports, to prepare design and production reports, to be able to present effectively, to give and receive clear and understandable instructions

viii. Awareness of the necessity of lifelong learning; ability to access information, to follow developments in science and technology, and to constantly renew itself

ix. Acting in accordance with ethical principles, awareness of professional and ethical responsibility; information about the standards used in engineering applications

x. Information about business life practices such as project management, risk management and change management; awareness of entrepreneurship, innovation; information on sustainable development

xi. Information about the effects of engineering applications on universal and social health, environment and safety and information about the problems reflected in the engineering field of the era, awareness of the legal consequences of engineering solutions

xii. Mathematical knowledge, basic sciences, computer and engineering sciences, including probability and statistical information, derivative, integral, linear algebra, complex variables and discrete mathematical calculations required for the design and analysis of complex electrical and electronic devices, software and hardware and software systems. Information on the topics.

The first 11 of the program outcomes defined are those that overlap with MÜDEK outcomes. Outcome number 12 is a specific output for the department.

1.8. Accreditation

Department of Electrical and Electronics Engineering at Faculty of Engineering of Karadeniz Technical University have been accredited by MUDEK since 2010. This accreditation has been renewed at every five years.

MUDEK is an organization that accredits engineering programs in Turkey. MUDEK is a member of Washington Accord and International Engineering Alliance. MUDEK is recognized by European Accreditation of Engineering Programs (EURO-ACE).

1.9. Contact Information

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2. COURSE LIST

The education period is four years in all departments of KTÜ Engineering Faculty. There are two semesters in one year, one being autumn and the other being spring. The curriculum applied in the 100% English program of the Department of Electrical and Electronics Engineering is given below for each semester. The meanings of the abbreviations used in the given course list are as follows.

ECTS : European Credit Transfer System
C : Credid hour
H : Course hour
A : Application
L : Lab
E : Elective
P : Prerequisite

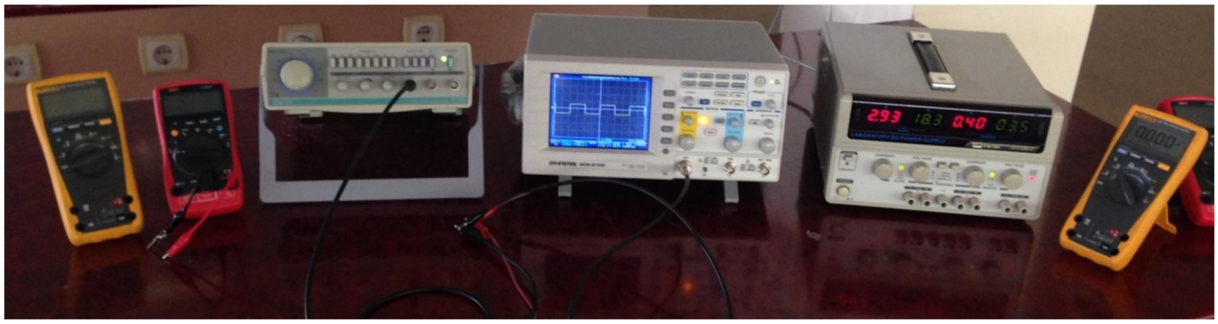
1st Year							
Fall Term - 1st Semester							
Code	Course Name	ECTS	C	H	A	L	Prerequisite
YDI1001	English - I	3	3,0	3	0	0	
MATH1001	Mathematics - I	5	4,0	4	0	0	
PHYS1001	Physics - I	5	3,5	3	0	1	
CHM1001	Basic Chemistry	5	3,5	3	0	1	
EEE1003	Introduction to Electrical and Electronics Engineering	2	2,0	2	0	0	
EEE1005	Fundamentals of Electrical Engineering	6	4,0	3	0	2	
EEE1001	Introduction to Computers	4	3,0	3	0	0	
	Total	30	23,0	21	0	4	
Spring Term - 2nd Semester							
Code	Course Name	ECTS	C	H	A	L	Prerequisite
YDI1002	English - II	3	3,0	3	0	0	
MATH1000	Mathematics - II	5	4,0	4	0	0	
PHYS1000	Physics - II	5	3,5	3	0	1	
EEE1000	Computer Programming	4	3,5	3	0	1	
EEE1002	Measurements in Electrical Engineering	4	3,0	2	0	2	EEE1005
EEE1004	Materials in Electrical Engineering	4	2,0	2	0	0	
EEE1006	Digital Design	5	3,5	3	0	1	EEE1001
	Total	30	22,5	20	0	5	

2nd Year, Fall Term - 3rd Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE2017	English in Engineering	2	2,0	2	0	0	
MATH2001	Differential Equations	5	4,0	4	0	0	
EEE2011	Probability Theory	4	3,0	3	0	0	
EEE2019	Microprocessors	5	3,5	3	0	1	
EEE2021	Electromagnetic Fields	3	3,0	3	0	0	
EEE2009	Circuits - I	3	3,0	3	0	0	EEE1005
TURK2001	Turkish Language - I	2	2,0	2	0	0	
HIST2001	History of Revolution and Ataturk's Principles - I	2	2,0	2	0	0	
	Social Elective - S31	4	2,0	2	0	0	
	Total	30	24,5	24	0	1	

Social Elective Group - S31 (Students must select 1 course from this group)							
Code	Course Name	ECTS	C	H	A	L	Prerequisite
EEE2013	Engineering Economics	4	2,0	2	0	0	
USEC0007	Protection of Personal data	4	2,0	2	0	0	
EEE2023	Engineering Software's	4	2,0	2	0	0	

Spring Term - 4th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE2000	Engineering Mathematics	3	3,0	3	0	0	
EEE2008	Electronics - I	5	4,0	3	0	2	EEE1005
EEE2014	Power Systems	3	3,0	3	0	0	
EEE2006	Circuits - II	5	4,0	3	0	2	EEE2009
EEE2016	Electromagnetic Waves	3	3,0	3	0	0	
EEE2018	Numerical Analysis	3	3,0	3	0	0	
TURK2000	Turkish Language - II	2	2,0	2	0	0	
HIST2000	History of Revolution and Ataturk's Principles - II	2	2,0	2	0	0	
	Social Elective - S41	4	2,0	2	0	0	
	Total	30	26,0	24	0	4	

Social Elective Group - S41 (Students must select 1 course from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
USEC0004	Professional Ethics	4	2,0	2	0	0	
EEE2020	Technological Developments	4	2,0	2	0	0	
EEE2022	Project Management	4	2,0	2	0	0	
USEC0012	Career Planning	4	2,0	2	0	0	



3rd Year, Fall Term - 5th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE3003	System Dynamics and Control	4	3,0	3	0	0	
EEE3013	Signals and Systems	4	3,0	3	0	0	
EEE3009	Electronics - II	5	4,0	3	0	2	EEE2008
EEE3019	Electrical Machines- I	5	4,0	3	0	2	
EEE3021	Power Electronic Circuits	5	4,0	3	0	2	
EEE3029	Entrepreneurship	3	2,0	2	0	0	
	Technical Elective - T51	4	3,0	3	0	0	
	Total	30	23,0	20	0	6	

Technical Elective Group - T51 (Students must select 1 course from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE3015	Computer Communication	4	3,0	3	0	0	
EEE3017	Network Synthesis	4	3,0	3	0	0	
EEE3027	Embedded Systems	5	4,0	3	0	2	

Spring Term - 6th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE3018	Power Distribution Systems	6	4,0	3	0	2	EEE2014
EEE3024	High Voltage Techniques	5	3,0	3	0	0	
EEE3008	Digital Signal Processing	6	4,0	3	0	2	
EEE3028	Communication Techniques	6	4,0	3	0	2	
EEE3032	Work Safety and Health	2	2,0	2	0	0	
	Technical Elective - T61	5	4,0	3	0	2	
	Total	30	21,0	17	0	8	

Students must select 1 course from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE3010	Automatic Control Systems	5	4,0	3	0	2	
EEE3020	Microwave Techniques	5	4,0	3	0	2	

4th Year, Fall Term - 7th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE4017	Professional Training - I	3	0,0	0	0	0	
EEE4019	Engineering Design	7	3,0	2	2	0	
	Technical Elective - T71	6	3,0	2	0	2	
	Technical Elective - T71	6	3,0	2	0	2	
	Technical Elective - T72	4	2,0	2	0	0	
	Technical Elective - T72	4	2,0	2	0	0	
	Total	30	13,0	10	2	4	

Technical Elective Group - T71 (Students must select 2 courses from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE4005	Renewable Energy Systems	6	3	2	0	2	
EEE4035	Power System Protection	6	3	2	0	2	
EEE4015	Process Control	6	3	2	0	2	
EEE4003	Power Electronic Applications	6	3	2	0	2	
EEE4023	Antennas and Propogation	6	3	2	0	2	
EEE4007	Medical Electronics	6	3	2	0	2	
EEE4021	Digital Communication	6	3	2	0	2	
EEE4001	Industrial Electronics	6	3,0	2	0	2	

Technical Elective Group - T72 (Students must select 2 courses from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE4025	Lighting Techniques	4	2	2	0	0	
EEE4027	Special Electric Machines	4	2	2	0	0	
EEE4029	Distributed Generation Systems	4	2	2	0	0	
EEE4031	Communication Electronics	4	2	2	0	0	
EEE4033	Image Processing	4	2	2	0	0	
EEE4037	Microwave Systems	4	2	2	0	0	
EEE4039	Electronic Device Techniques	4	3	2	0	0	
EEE4041	Introduction to Biomedical Optics	4	3	2	0	0	

Spring Term - 8th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE4010	Professional Training - II	3	0,0	0	0	0	
EEE4012	Graduation Project	8	3,0	2	2	0	EEE4019
	Technical Elective - T81	5	3,0	2	0	0	
	Technical Elective - T81	5	2,0	2	0	0	
	Technical Elective - T81	5	2,0	2	0	0	
	Social Elective - S81	4	2,0	2	0	0	
	Total	30	12,0	10	2	0	0

Technical Elective Group - T81 (Students must select 3 courses from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE4008	Power System Analysis	6	2	2	0	0	
EEE4004	Drive Systems	6	2	2	0	0	
EEE4009	Electrical machines - II	6	2	2	0	0	
EEE4014	Power System Design	6	2	2	0	0	
EEE4016	Electrical Vehicles	6	2	2	0	0	
EEE4028	Electromagnetic Compatibility	6	2	2	0	0	
EEE4024	Fiber Optic Communication	6	2	2	0	0	
EEE4026	Communication Systems	6	2	2	0	0	
EEE4020	Digital Control Systems	6	2	2	0	0	
EEE4022	Intelligent Control Systems	6	2	2	0	0	
EEE4030	Mobile Communications	6	2	2	0	0	
EEE4002	Medical Imaging Techniques	6	2	2	0	0	
EEE4036	Electrochemical Biosensors	6	2	2	0	0	

Social Elective Group - S81 (Students must select 1 course from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE4038	Business law	4	2,0	2	0	0	
OPE4032	Management and Organization	4	2,0	2	0	0	
EEE4040	Information Crime Law	4	2,0	2	0	0	
EEE4042	Expertise Law and its Application	4	2,0	2	0	0	

	ECTS	**C**	**H**	**A**	**L**
Overall Total	**240**	**165**	**146**	**4,0**	**32,0**

3. COURSE CONTENTS

1st Year, Fall Term - 1st Semester

Code	Course Name	ECTS	C	H	A	L	Prerequisite
YDI1001	**English - I**	**3**	**3,0**	**3**	**0**	**0**	

Reading passages and exercises, listening passages and drills, Translation studies, writing regarding a specific subject, holding discussion on a given topic.

Code	Course Name	ECTS	C	H	A	L	Prerequisite
MATH1001	**Mathematics - I**	**5**	**4,0**	**4**	**0**	**0**	

Functions, Inverse functions, Plotting the graphs of basic curves, Transformation of graphs, Trigonometric functions, Inverse trigonometric functions, Logarithmic and exponential functions. Limit, Rules of limit, Continuity. Derivative of function and its application (Derivative of trigonometric functions, Inverse trigonometric functions, Logarithmic and exponential functions, L'hospital rule, Limit at infinity, Rolle theorem and Mean value theorem, Optimization problems, sketching the graph of function). Integration and techniques, Indefinite integrals (Anti-derivatives) Methods of integration (change of variables, integration by parts), Partial fractions, Integrals of trigonometric (rational) functions. Elimination of incomplete parts, general assessment.

Code	Course Name	ECTS	C	H	A	L	Prerequisite
PHYS1001	**Physics - I**	**5**	**3,5**	**3**	**0**	**1**	

Vectors, Motion in One Dimension, Motion in Two Dimensions, The Laws of Motion, Circular Motion and Other Applications of Newton's Laws, Work and Kinetic Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Rotation of a Rigid Object About a Fixed Axis, Rolling Motion and Angular Momentum, Static Equilibrium and Elasticity, Oscillatory Motion, Universal Gravitation.

Code	Course Name	ECTS	C	H	A	L	Prerequisite
CHM1001	**Basic Chemistry**	**5**	**3,5**	**3**	**0**	**1**	

Matter, Molecules and Ions, Chemical Formula and Equations, Electronic Configurations of Atoms, Chemical Bonds, Periodic Table and Elements, Gases, Liquids, Solids, Solutions and Solubility, Acids and Bases, Ionic Equilibrium, Reaction in Solutions, Oxidation and Reduction.

Code	Course Name	ECTS	C	H	A	L	Prerequisite
EEE1003	**Introduction to Electrical and Electronics Engineering**	**2**	**2,0**	**2**	**0**	**0**	

General information about the department, faculty members and their research areas. Job opportunities and the companies offering jobs to Electrical and Electronics Engineers. Information about some regulations and by laws related to education and practicing as an electrical and electronics engineer. Information about internship, student exchange programs and subdivisions of the department.

Code	Course Name	ECTS	C	H	A	L	Prerequisite
EEE1005	**Fundamentals of Electrical Engineering**	**6**	**4,0**	**3**	**0**	**2**	

Circuit Concepts: Voltage-current relations, Circuit diagrams, Circuit Laws: Kirchoff''s voltage law, Kirchoff''s current Law, Energy and Electrical Power, Active circuits, passive circuits and ideal circuits. Analysis methods: The branch current method, The mesh current method, The node method, State variable analysis. Energy storage elements: The capacitors and inductors, Thevenin and Norton networks. Analysis methods in AC circuits: Average and effective values, Phasors, Impedance and Admittance, Phasor diagrams and resonance, Power in the time domain, Power in sinusoidal steady state. Average or real power, Reactive power, Complex power, Maximum power transfer, Three phase circuits.

Code	Course Name	ECTS	C	H	A	L	Prerequisite
EEE1001	**Introduction to Computers**	**4**	**3,0**	**3**	**0**	**0**	

Introduction to Combinational Logic: An Introduction Analog and Digital Systems, Number Systems, Number conversions, Logic Gates, Boolean Algebra and Logic functions, Boolean equations, Products of sums (POS), Sum of products (SOP), Simplification of logic functions (Karnaugh Maps), Combinational logic, Digital circuit design, De Morgan theorem, Priority circuits, Rules of circuit schematics, Multiple output circuits, Tristate buses.

1st Year, Spring Term - 2nd Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
YDI1002	**English - II**	**3**	**3,0**	**3**	**0**	**0**	

Reading texts related to the department; grammar activities; related vocabulary and translation between two languages; listening activities; discussions over the related current topics in the field.

MATH1000	**Mathematics - II**	**5**	**4,0**	**4**	**0**	**0**	

Matrix, Determinants, Eigenvalues and eigenvectors, Inverse matrix. Systems of linear equations and solutions by reduction to echelon form and Crammer rule. Conic sections and quadratic equations, Polar coordinates and plotting graphs, Parameterization of curves on plane. Three-dimensional space and Cartesian coordinates. Vectors on the plane and space. Dot, cross and scalar triple product. Lines and planes on three-dimensional space. Cylinders, conics, spheres and their coordinates. Vector valued functions and curves on the space, curvature, torsion and TNB frame. Multi variable functions, limit, continuity and partial derivative. Chain rule, directional derivative, gradient, divergence, rotational and tangent planes. Extremum values and saddle points, Lagrange multipliers, Taylor and Maclaurin series. Double integration, areas, moment and gravitational centre. Double integral in polar coordinates. Triple integrals in cartesian coordinates. Mass, moment and gravitational centre in three-dimensional space. Triple integrals in cylindrical and spherical coordinates. Change of variable in multiple integrals. Line integrals, vector fields, work, flux. Green's theorem on plane. Areas of surface and surface integrals. Stokes theorem, divergence theorem and applications

PHYS1000	**Physics - II**	**5**	**3,5**	**3**	**0**	**1**	

Electric fields, Gauss' law, Electric potential, Capacitance and dielectrics, Current and resistance, Direct current circuits, Magnetic fields, Sources of the magnetic field, Faraday's law, Inductance, Alternating current circuits, Electromagnetic waves, The nature of light and the laws of geometric optics, Geometric optics, Interference of light waves.

EEE1000	**Computer Programming**	**4**	**3,5**	**3**	**0**	**1**	

An Overview of C: The origin of C, the form of a C program: Variables, Constants, Operators, and Expressions: identification of names, data types, declaration of variables, assignment statements, constants, operators, bitwise operators. Program Control Statements: true? and false? in C, C statements, conditional statements, if (), switch (), loops while (), do/while (), break, exit (), continue. Functions: The return statements, scope rules of functions, function arguments, function prototypes, recursion, pointer to functions. Arrays: single-dimensional arrays, passing single-dimension arrays to functions, two-dimensional arrays, multidimensional arrays, arrays and pointers. Pointers: Pointers are addresses, pointer variables, the pointer operators, pointer expressions, pointers and arrays, initializing pointers, pointer to functions. Input, Output, and Disk Files: streams and files, console I/O, formatted console I/O. Structure.

EEE1002	**Measurements in Electrical Engineering**	**4**	**3,0**	**2**	**0**	**2**	**EEE1005**

Basic principles of measurement. Errors. Active quantities and their measurable values. Moving coil meters. Current, voltage and resistance measurement. Power and energy measurement. Measurement of circuit parameters. Measurement of Power coefficient and frequency. Expanding of measuring range of instruments. Cathode Ray Oscilloscopes. Bridges and their applications. Digital measurement techniques. Measurement of magnetic quantities. A. C. bridges. Digital measuring techniques.

EEE1006	**Digital Design**	**5**	**3,5**	**3**	**0**	**1**	**EEE1001**

Multiplexers and decoders. Types of delay. Critical paths. Glitch. Introduction to sequential circuits. Bi-stable circuit, SR, D latch and D flip-flop. Enabled flip-flop, Resettable flip-flop, Settable flip-flop. Sequential logic, Synchronous sequential logic design. Finite state machines (FSM), Moore and Mealy FSM. Timing, input and output constraints. Setup and hold timing constraints. Timing analysis. Clock skew. Design of adder, subtractor, comparator and ALU. Shifter, multiplier, divider. Fixed point and signed fixed point numbers. Floating point numbers. Counters, shift, registers, arrays of memory, ROM, RAM, DRAM, SRAM. Designing circuits using memory.

1st Year, Spring Term - 2nd Semester (Continued)

EEE1004 Materials in Electrical Engineering 4 2,0 2 0 0

Atomic structure, type of materials, crystal structures, defects in crystal structures, type of atomic, molecular bonding, holes, behaviour of electron-hole pairs, energy band theory, conductors, mobility, conductivity, conducting materials, metals and its properties, semiconductor materials and properties, intrinsic semiconducting, extrinsic semiconducting, n- and p-type semiconductors, effect of temperature on conductivity, conductivity dependence on materials, doping, diffusion, semiconductor applications and working principle of fundamental semiconductor based electronic devices, insulators, dielectric materials and properties, dipoles, polarization and dielectric strength, magnetic materials, magnetic dipoles, magnetic moment, magnetic field, magnetic flux, hard and soft magnetic materials, diamagnetism, para magnetism, ferro magnetism, and super-para magnetism, hysteresis in magnetic materials.

2nd Year, Fall Term - 3rd Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**

EEE2017 English in Engineering 2 2,0 2 0 0

Technical communication and its importance, Writing, Visual forms, Document and page design, technical description, Product and process description, Technical presentation.

MATH2001 Differential Equations 5 4,0 4 0 0

Differential equations and basic concepts. Differential equations as mathematical model (Ordinary differential equations, order and degree of differential equations. Derivation of differential equations.) General, particular and singular solutions of the differential equations. Separable, homogenous, exact differential equations and transforming to exact differential equation by using integrating factor. Linear differential equations, Bernoulli differential equation and applications of the first order differential equations. Change of variables. Reducible differential equations. General solution of nth order linear differential equations. General solution of nth order constant coefficient homogenous differential equations. Solutions of the constant coefficient non-homogenous equations. Initial Value Problems (IVP) and Boundary Value Problems (BVP) Physical applications, mechanical vibrations, electrical circuits. Variable coefficient homogenous and non-homogenous differential equations (Cauchy-Euler differential equation). Reduction of order. Power series solutions of differential equations around ordinary points. Laplace and inverse Laplace transformations. Solutions of constant and variable coefficient boundary value problems and differential equations containing Dirac-Delta function and transformation functions by using Laplace transformations.

EEE2011 Probability Theory 4 3,0 3 0 0

Axiomatic approaches of Probability, Axioms of Probability, Set Theory, Conditional Probabilities and Statistical Independence, Single Random Variables and Probability Distributions, Averages and Standard deviation, Variance, Common random Variables: Binomial, Gauss, Uniform, Rayleigh, Rician, Exponential, Gamma distributions and their models, Characteristics Function, Transforms techniques on Probability functions, Probability Distributions for more than one random Variables, Introduction to random Process, Correlation functions and their applications.

EEE2019 Microprocessors 5 3,5 3 0 1

Fixed and floating-point arithmetic, microprocessor/microcontroller, CPU, ALU, registers, memory map, assembler, compiler, linker, introduction to PIC16Fxx, 68HC05, 8031 and MSP430Fxx, assemble instructions, program flow and interrupt routines of MSP430Fxx, UART, SCI, SPI, DMA, TIMER and their applications.

EEE2021 Electromagnetic Fields 3 3,0 3 0 0

Introduction, electromagnetic model. Static electric fields, Coulomb's law, Gauss's law and applications, electric potential, material media in static electric field, boundary conditions for electrostatic fields, capacitances and capacitors, electrostatic energy and forces. Steady electric currents, current density and Ohm's law, power dissipation and Joule's law, resistance calculations. Static magnetic fields, Biot-Savart law and applications, behaviour of magnetic materials, inductances and inductors, magnetic energy, magnetic forces

EEE2009 Circuits - I 3 3,0 3 0 0 EEE1005

Classification of the circuits. Circuit analysis in t-domain: The branch current method. The mesh current method. The node method. Amplifiers and Operational amplifier circuits: Amplifier model. Feedback in Amplifier circuits. Operational amplifier. Analysis of circuits containing ideal op-amps. İnverting circuit. Summing circuit. Noninverting circuit. İntegrator and differentiator circuits. State variable analysis: İntroduction to state variables. Circuit state equations for linear and time invariant systems. Circuit state equations for nonlinear, linear and time variant systems. The Solutions of State Equations in s domain and t domain. Natural response. Forced response. Complete response. The state-transition matrix. Transfer-function matrix. Analysis of the stability.

2nd Year, Fall Term - 3nd Semester (Continued)

TURK2001 Turkish Language - I 2 2,0 2 0 0

Language and languages; (Language-Nation Relations, Language-Culture) Languages in the world and the place of Turkish language among other languages; (Language families in terms of their sources) Historical Development of Turkish written language: (Old Turkish- Middle Turkish-Divanü Lügati't-Türk, Atabet'ül Hakayık, Harezm Turkish). Old Turkey Turkish (Old Anatolian Turkish) ; The era new Turkish, Modern Turkish era, West (West eastern Turkish) Turkey's Turkish, East (North-eastern Turkish) Karatay Turkish Phonetics; (Sound and the formation of sound the harmony of vowel sounds) , Fundamental sound Features in Turkish; (Features sound of Turkish, Spelling structure of Turkish, Sentence Emphasis) . Morphology; (Words in terms of form, prefixes, suffixes, roots). Enumeration and words in respect to their functions; (Noun, pronouns, and adjectives) Verbs; (Shape and Tense supplements). Prepositions-Gerunds; (Derived from nouns-verbs). Meaning Science: Meaning in word, The frame of word meaning. Sentence Knowledge: (Kinds of Sentences). The analysis of sentences.

HIST2001 History of Revolution and Ataturk's Principles - I 2 2,0 2 0 0

Historical concepts, descriptions, descriptions of resources and methods, French Revolution and Industrial Revolution, Collapse of the Ottoman Empire, Tanzimat and Islahat Firman (order), I. and II. Constitutional Monarchy, Tripoli and Balkan Wars, I. World War, Mondros Truce, Wilson principles, Paris Conference, Atatürk, Samsun and Anatolia, Amasya Notice, National Congress, Opening the Mebusan Assembly, Foundation of Turkish National Assembly (TBMM) , Internal rebellions, 1921 Organic Law, Foundation of the Army, I. Inönü, Sakarya, Kütahya, Eskişehir Wars and the Last Attack, Pacts during the Turkish War of Independence, Lozan Pact, Abrogate of Saltanate. Concepts, descriptions, descriptions of resources and methods in the History of Revolutions, French Revolution and Industrial Revolution, Collapse of Ottoman Empire, Tanzimat and Islahat Firman (order), I. and II. constitutional Monarchy, Tripoli and Balkan Wars, I. World War, the Armistice of Moudros Truce, Wilson Principles, Paris Conference, Atatürk, Samsun and Anatolia, Amasya Notice, National Congress, Opening of the Mebusan Assembly, Foundation of Turkish National Assembly (TBMM) , Internal Rebellions, 1921 Organic Law, Foundation of the Army, I. Inönü, Sakarya, Kütahya, Eskişehir Wars and the Last Attack, Pacts during the Turkish War of Independence, Lozan Pact, Abolishment of Sultanate.

EEE2013 Engineering Economics 4 2,0 2 0 0

Subject of the Engineering Economy, Resolution Process on Economy, Applications of Economy in Engineering (Planning, Development), Alternative Cost Analysis, Competition Analysis of World Economy (OECD, NATO, AB, EFTA, LAFTA etc.) and AB with Turkey, Market Conditions and Demand Forecasting, Interest Event and Flow Series, Measurement of General Level of Prices (Inflation, Deflation) , Ant inflationary and Ant deflationary Policies and Effects on Investments Projects, Effects of Inflation or Deflation on Investments Projects, Financial and Market Analysis, Productivity and Economic Growth Analysis, Elements that Affect the Investment Projects, Production Costs and Profit-Loss Analysis.

USEC0007 Protection of Personal data 4 2,0 2 0 0

This course covers the definition of personal data. Personal data types and their properties. The rights of a person over own personal data. Protection of data against unauthorized use or an attack. Legal ways to take precautions for the attacks.

EEE2023 Engineering Software's 4 2,0 2 0 0

This course is meant to give information about the software used by Electrical and electronics Engineering students and engineers to design and analysis purposes. Some of these software are:

- MATLAB Codes
- MATLAB SIMULINK
- MATLAB TOOLBOXES
- Multisim
- Digsilent Powerfactory
- AutoCAD, Autodesk Fusion 36
- And Others

2nd Year, Spring Term - 4th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**

EEE2000 Engineering Mathematics 3 3,0 3 0 0

Fourier series and transform, Laplace transforms and applications to electrical engineering. Other transform methods. Complex functions theory. Cauchy theory. Conformal mappings. Vector analysis.

EEE2008 Electronics - I 5 4,0 3 0 2 EEE1005

Semiconductor: p-type semiconductor, n-type semiconductor, the p-n junction. Diodes : The open-circuit p-n junction, the Volt-Ampere characteristic, the temperature dependence of the V/ I characteristic , diode resistance, diode capacitance, breakdown diodes, the load-line concept, linear diode model, diode switching times, a breakdown-diode voltage regulator, clipping circuits, rectifiers, other diode circuits, capacitor filters, small-signal analysis. BJT: The junction transistor, transistor construction, the Common-Base (CB) , the Common-Emitter (CE), the Common-Collector (CC) configurations, on, cut-off, saturation regions, transistor ratings , transistor switching times, the operating point of a BJT, bias stability, self-bias or emitter bias, stabilization against variations in ICO, VBE, and b. JFET: The junction field-effect transistor, the Volt-Ampere characteristic, the enhancement MOSFET, the depletion MOSFET, MOSFET inverter, OSFET logic gates, complementary MOSFET, the operating point of a JFET.

EEE2014 Power Systems 3 3,0 3 0 0

Introduction. Power Stations. Generators, Power Transmissions, Power Distributions, Utilization 3-Phase Power Systems, Star Connected Generators, Delta Connected Generators, 3-Wire Systems, 4-Wire Systems, Star Connected Loads, Delta Connected Loads, Balanced Loads, Unbalanced Loads, Power Measurement, Two Wattmeter Method Transmission Lines, Short Lines, Medium Lines, Long Lines, Power Calculations, Phasor Diagrams Application Examples.

EEE2006 Circuits - II 5 4,0 3 0 2 EEE2009

Analysis of stability. Circuit analysis in s-domain. Two-port networks: Z-parameters. T-equivalent of reciprocal network. Y-parameters. PI-equivalent of reciprocal networks. Conversion between Z and Y parameters. h-parameters. g-parameters. Transmission parameters. Initial value, steady and transient response of RLC circuits.

EEE2016 Electromagnetic Waves 3 3,0 3 0 0

Time-varying fields, Faraday's law of electromagnetic induction, transformers, Maxwell’s equations, wave equation and its solution, uniform plane waves and propagation of energy, radiation, guided waves.

EEE2018 Numerical Analysis 3 3,0 3 0 0

Introduction, Basic concepts and definitions, Errors in Numerical Analysis, Matrixes, Solutions of the Equations in One Variable and the Equation Systems, Taylor Series and Finite Differences, Interpolations, Extrapolations, Numerical Differentiation, Numerical Integration, Numerical Solutions of the Differential Equations, Least Square Method and Curve Fitting.

TURK2000 Turkish Language - II 2 2,0 2 0 0

Punctuation and Composition (Punctuation Marks, Other Marks) marks of abbreviations, Spelling Rules (The spelling of capital letters, The writing of quotations. numbers, The Composition the purpose of composition, method in composition writing, planning, introduction, development and result in composition, the features of telling (purity in telling, simplicity in telling, clarity and sincerity in telling mistakes in telling (the use of synonymous words in the sentence). The use of synonymous words in the sentence, misuse of phrases, Explanation, story, description, criticism, portray, speaking, proving. The kinds of verbal telling (daily and unprepared speaking- prepared speaking, debate, panel) The kinds of written telling (letter, telegraph, celebration, invitation, literary letter Job letters, formal letter, petition, report, decision, announcement, advertisement). Talking, criticism, memoir, travel, writing, interview, survey Autobiography biography novel- story, fable- theatre tragedy, drama- scenario, poetry and its kinds.

2nd Year, Spring Term – 4th Semester (Continued)

HIST2000 History of Revolution and Ataturk's Principles - II 2 2,0 2 0 0

Concepts, descriptions, descriptions of resources and methods in the History of Revolutions, French Revolution and Industrial Revolution, Collapse of Ottoman Empire, Tanzimat and Islahat Firman (order), I. and II. constitutional Monarchy, Tripoli and Balkan Wars, I. World War, the Armistice of Moudros Truce, Wilson Principles, Paris Conference, Atatürk, Samsun and Anatolia, Amasya Notice, National Congress, Opening of the Mebusan Assembly, Foundation of Turkish National Assembly (TBMM) , Internal Rebellions, 1921 Organic Law, Foundation of the Army, I. Inönü, Sakarya, Kütahya, Eskişehir Wars and the Last Attack, Pacts during the Turkish War of Independence, Lozan Pact, Abolishment of Sultanate.

USEC0004 Professional Ethics 4 2,0 2 0 0

Bilimsel araştırma ile ilgili kavramlar. Bilimsel araştırmanın gerekliliği. Bilimsel araştırma ve bilim etiği. Kaynak kullanımı ve atıfta bulunma örnekleri. Bilimsel aşırma, hırsızlık, dublikasyon, dilimleme, yanıltma kavramları ve örnekleri. Kopyala yapıştır bağımlılığı, internet üzerinden araştırma ve kaynak kullanımı konuları. Ödev ve sınavlarda öğrenci etiği ve uyulması gereken kurallar. Etik kurallarına uyulmadığında alınması muhtemel ceza ve yaptırımlar. Mesleki etik kuralları.

EEE2020 Technological Developments 4 2,0 2 0 0

Historical discussion, perspective on industrial change and developments, physical megatrends, digital megatrends, biological megatrends, economic impacts, impacts on business, national and global impacts, impacts on society, impacts on individuals, the way forward and deep shift examples.

EEE2022 Project Management 4 2,0 2 0 0

Academic ethics. Plagiarism and other ethical rıles. Using referances in academic and technical writings. Methods for developing new ideas and new project topics and getting to know the project supporting offices such as TUBITAK and KOSGEB. Preparing a project application file to be submitted to TUBITAK, KOSGEB and other project supporting offices. Basic project management steps. Starting and managing a project. Project life cycle. Organizational structures, project concept, calendar, budget, and quality management, human resources, communications, risk analysis, material purchasing, Applying the project management, tracking and control, finalizing a project, Using project management software's..

USEC0012 Career Planning 4 2,0 2 0 0

Career Planning course enables students to get acquainted with the business world, different sectors and the requirements of these sectors; It aims to raise awareness in students about the importance of career planning in the preparation process for the business world. The course enables students to discover their personal competencies and to understand the expectations of the business world; helps them to develop their knowledge and skills in parallel with the requirements of the relevant sectors.

3rd Year, Fall Term - 5th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**

EEE3003 System Dynamics and Control 4 3,0 3 0 0

Physical systems and the concept of control systems. Mathematical background, mathematical modelling of physical systems. Test signals and transient responses of first and the second order systems. Transfer functions, block diagrams, signal flow graphs, state variables and state-space modelling. Simulation diagrams and computer simulation of the systems. PID controllers. Simulation of PID controllers. Controllability and observability. Stability of linear time invariant systems and Routh-Hurwitz Criterion. Students have to design an experiment to measure the parameters of a given system as a term project.

EEE3013 Signals and Systems 4 3,0 3 0 0

Introduction. Classification of signals. Time domain analysis of Linear Time Invariant (LTI) continuous systems. Frequency domain analysis of Linear Time Invariant (LTI) continuous systems. s-domain analysis of Linear Time Invariant (LTI) Continuous Systems, Discrete Systems, Frequency domain analysis of Linear Time Invariant (LTI) Discrete Systems, z- domain analysis of Linear Time Invariant (LTI) Continuous Systems, Time domain analysis of Linear Time Invariant (LTI) Continuous Systems, Discrete systems, Continuous and discrete systems with random inputs.

EEE3009 Electronics - II 5 4,0 3 0 2 EEE2008

Small signal amplifiers, CE, CC, CB transistor amplifiers, hybrid model of the transistor, CS, CD, CG FET amplifiers, Cascade amplifiers, Negative feedback, Negative feedback-circuits analysis, Response of the high frequency amplifiers, Bode diagrams, Operational amplifiers.

EEE3019 Electrical Machines- I 5 4,0 3 0 2

Introduction, Basic concepts and definitions, Magnetic circuits and materials, Basics of electromechanical energy conversion, Types, structures, working principles, equivalent circuits, characteristics, starting and control methods of electrical machines (DC machines, Induction machines, Synchronous machines).

EEE3021 Power Electronic Circuits 5 4,0 3 0 2

Definition of power electronics, history of power electronics, power semiconductor switches, Diodes, Thyristors, Transistors, Half and full wave diode rectifiers and applications, Half and full wave controlled rectifiers and applications, Three phase controlled rectifiers. DC-DC converters. Inverters and their applications.

EEE3029 Entrepreneurship 3 2,0 2 0 0

Definition of entrepreneurship, The competencies of the entrepreneur, Legal structures of companies, Business ideas, Business plans, Demand forecasting, Facility planning, Marketing, Funding and its managing.

EEE3015 Computer Communication 4 3,0 3 0 0

Network architecture. measuring network performance. Classes of links. Transmitting digital information through link. Framing. Error detection. Reliable transmission. Ethernet and multiple access networks. IEEE 802.11. Bluetooth. Switching, datagrams and virtual circuit switching. Internetworking, Internet protocol. Routing.

EEE3017 Network Synthesis 4 3,0 3 0 0

Network synthesis problem. Synthesis of 1-port passive networks. Positive real functions. Synthesis of LC, RC, RL and RLC networks. Cauer and Foster circuits, Synthesis of passive 2-port networks. Positive real matrices. Synthesis procedures converted to synthesis of 1-port network. Zero shifting technique and its application to RC circuits. Active Circuit Synthesis, Butterworth and Chebyshev approximations.

EEE3027 Embedded Systems 5 4,0 3 0 2

Embedded Systems Introduction and Background, Hardware Infrastructure such as microprocessors, microcontrollers, digital signal processors, combinational logic, storage elements and memories and FPGAs. Software design about creating a system, architecture, outputs, inputs and timer and communication with peripherals. Embedded linux. Software defined radios (SDRs).

3rd Year, Spring Term - 6th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE3018	**Power Distribution Systems**	**6**	**4,0**	**3**	**0**	**2**	**EEE2014**

Basic information about distribution systems. Load characteristics, radial and ring networks. Distribution system components. Power line and cable selection in distribution systems. Loss reduction and power factor improvement. Power factor correction. Voltage drop. Voltage drop calculations. Distribution transformers. Transformer design.

EEE3024	**High Voltage Techniques**	**5**	**3,0**	**3**	**0**	**0**

Introduction: Historical evolution of high voltage technology. Elements of high voltage system. Negative side of Alternating and Direct current power transmission. Determination of electric fields: Fundamentals, analytical field calculation. Calculation from Maxwell's equation charge simulation method. Direct integration of Laplace's equation. Conform transformation. Basic electrode systems. Breakdown of gases: Charge carriers in gases. Properties of different charge carriers. Non-self-sustaining discharge. Collision ionization by electrons. Self- sustaining discharge. Townsend mechanism in a strongly in homogeneous field corona effect. Breakdown phenomena in liquids: Mineral and Synthetic oils. Oil-impregnated paper. Breakdown of solid insulating materials: Intrinsic breakdown. Thermal breakdown natural and synthetic insulation materials used in high voltage technics. High voltage network elements: Insulators. Types of high voltage insulators material and their properties used in internal insulation of the insulators. Types of power cables. Conductors, Current switches. Circuit breaks.

EEE3008	**Digital Signal Processing**	**6**	**4,0**	**3**	**0**	**2**

Signals in discrete time, Sampling, Signal reconstruction, Systems in discrete time, The convolution sum, Difference equation, The Discrete Time Fourier Transform, Discrete Time Fourier Series, Fast Fourier Transform, System transfer function in frequency domain, The Z-transform, System transfer function in z domain.

EEE3028	**Communication Techniques**	**6**	**4,0**	**3**	**0**	**2**

Introduction. Analog signal transmission and reception. Amplitude modulation, Double side band suppressed carrier amplitude modulation, single side band amplitude modulation, quadrature amplitude modulation, vestigial side band modulation. Frequency Division Multiplexing. Frequency modulation. Phase modulation. Radio and television broadcasting. Random processes. Effect of noise on analog communication systems. Pulse amplitude modulation, pulse width modulation, pulse position modulation, pulse code modulation, differential pulse code modulation, delta modulation. Time division multiplexing. Information theory and source coding. Digital modulation: on-off keying, binary phase shift keying, differential phase shift keying, frequency shift keying, quadrature phase shift keying, M array phase shift keying, orthogonal quadrature phase shift keying, minimum shift keying, Gaussian minimum shift keying, orthogonal frequency division multiplexing. Channel capacity and coding. Channel coding. Introduction to wireless communications. Spread spectrum communication systems. Digital cellular communication systems. Recent developments in communications.

EEE3032	**Work Safety and Health**	**2**	**2,0**	**2**	**0**	**0**

Definition of the work safety, Risks and dangers, Legal and administrative responsibilities, Personal protection equipment, Electrical safety hazards, Electrical safety risks, Electricity Network Regulations, Fire and its Types and Causes, Methods Used in fire extinguishing, Fire Prevention, Extinguishing material, First Aid and purpose, Electrical Burns, First Aid in electrical accident.

EEE3020	**Microwave Techniques**	**5**	**4,0**	**3**	**0**	**2**

Introduction. Transmission lines. Line equations and solutions, lossy lines, lossless lines, reflection and standing wave ratio, power transmission. Smith chart and applications. Impedance matching. Microstrip lines. S-parameters. Waveguides. Passive microwave devices.

3rd Year, Spring Term - 6th Semester (Continued)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE3010	**Automatic Control Systems**	**5**	**4,0**	**3**	**0**	**2**	

Concepts of modelling, and analysis of systems in time and frequency domains, feedback and feed forward controllers, stability criteria, design of controllers. Design in time and frequency domains. Root locus analysis and design, Stability of control systems. The concept of Routh-Hurwitz stability, Nyquist stability criterion, and Bode plots. PID controllers: analysis and design. Optimal control systems, intelligent control, introduction to digital control systems. Computer based simulations and applications related to all topics.

4th Year, Fall Term - 7th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**

EEE4017 Professional Training - I **3** **0,0** **0** **0** **0**

The practical placement gives the student the opportunity to transform the theoretical knowledge obtained during the educational programme into the work environment and hence includes all kinds of work-related activities. Students are required to work 30 days in any field related to the area of interest where they can practise their profession. The work carried out is compiled in a detailed manner on daily basis in the form of a report, which is then approved by the chief staff in the place of work and then submitted to the academic staff responsible for the evaluation and grading of the internship reports.

EEE4019 Engineering Design **7** **3,0** **2** **2** **0**

Students select a project topic from the list in department's web site. Then a project supervisor is assigned to each students related the topic chosen. Each project supervisor gets usually 8 to 12 students and sets up project groups from them. Each group develop a project idea and submit it to TUBITAK 2209/B student project support program. After completing the design process, each project group make a presentation to examination jury and the other students. The students have to get a passing grade from this course in order to proceed with the Graduation Project.

Technical Elective Group - T71

EEE4005 Renewable Energy Systems **6** **3** **2** **0** **2**

Electric power generation from conventional power stations (hydro, thermal, nuclear), Basic operation principles of hydraulic, thermal and nuclear power stations, World energy outlook, Renewable energy systems, Electricity from wind and Solar PV, Using induction machine as an asynchronous generator in wind energy conversion (WEC), Modelling and simulation of WEC systems, Modelling and simulation of PV systems. Utilization of wind and PV energy systems. Power system compensation, bus bar voltage control, Power quality and power filtering, sizing and optimal location of capacitors in power compensation.

EEE4035 Power System Protection **6** **3** **2** **0** **2**

Introduction and General Philosophies, Fundamental Units: Per Unit and Percent Values, Phasors and Polarity, Symmetrical Components, Short Circuit Calculation, Relay Input Sources, Protection Fundamentals and Basic Design Principles, System-Grounding Principles.

EEE4015 Process Control **6** **3** **2** **0** **2**

Introduction to Process Control, Process Control Cycles, Basics of Electric and Electronic, Basics of Digital Systems, Pressure Measurement, Temperature Measurement, Analytical Measurement and Control, Flow Measurement, Final Control Elements, Process Control Computers.

EEE4003 Power Electronic Applications **6** **3** **2** **0** **2**

Solid state relays, Switches and circuit protection, AC voltage regulators, Static serial and shunt compensators, Switch mode dc supplies, electrical motor drives, power electronics for renewable, HVDC, FACTS devices.

EEE4023 Antennas and Propagation **6** **3** **2** **0** **2**

Introduction. Types of antennas. Fundamental parameters of antennas. Wire antennas. Antenna arrays. Radio waves and propagation. Surface waves. Space waves. Ionosphere propagation.

EEE4007 Medical Electronics **6** **3** **2** **0** **2**

The human anatomy and physiology, Origins of biopotentials, Electrodes, Transducers, Biopotential amplifiers, Cardiovascular, Nervous, muscular and nervous systems, Measurements of ECG, EEG and EMG, Measurements of the blood pressure and blood flow, Measurement of respiratory signal, Electrical safety.

EEE4021 Digital Communication **6** **3** **2** **0** **2**

Introduction to Digital Communication: channel capacity; channel sampling; digital channel; AWGN, frequency selective and flat channels; synchronisation, equalization and OFDM; diversity techniques. Digital Modulation Techniques: MPSK, MQASK, MFSK, coherent and noncoherent modulations; performance and spectrum efficiency. Signal Space Methods: optimum receiver, Gram-Schmidt Procedure, MAP Detectors. Error Correcting Codes: linear block, cyclic, convolutional. Spread Spectrum Communication.

Technical Elective Group - T71 (Continued)

EEE4001 Industrial Electronics 6 3 2 0 2
Basic industrial electronics elements: Types of diodes, UJT, SCR, DIAC, TRIAC, and their circuits. Electronic control of machines. Servomechanism and synchronization. Closed-loop control, Induction heating and dielectric heating. Converters (DC/DC. Inverters (DC/AC). Uninterruptible Power Supplies. Switching Mode Power Supplies. PLC's, Laser types and different applications of lasers.

EEE4025 Lighting Techniques 4 2 2 0 0
Domestic Installation, Lighting Concepts, light sources and their properties. Interior lighting, road lighting. Lighting Calculations, Interior Lighting Calculations, Computer Programs for Lighting, Application Examples.

EEE4027 Special Electric Machines 4 2 2 0 0
Basic concepts and definitions, permanent magnets and applications, saturation and hysteresis, solid rotors, permanent magnet DC motors, step motors, permanent magnet synchronous motors, brushless DC motors, single phase induction motors, reluctance motors, universal motors.

EEE4029 Distributed Generation Systems 4 2 2 0 0
Distributed Energy Resources, The Basic Principles of Wind Farms, Photovoltaic Technology, Microturbine Generation Power Systems, Fuel Cells, Design of Small Hydro Generation Systems, Energy Storage Systems, Market Design Issues of Distributed Generation, Distribution Generation Optimization and Energy Management, Impact of Distributed Generation Integration on the Reliability of Power Distribution Systems, DC Distribution Networks: A Solution for Integration of Distributed Generation Systems

EEE4031 Communication Electronics 4 2 2 0 0
Communication systems, noise and intermodulation distortion, communication system components, small signal amplifiers, power amplifiers, oscillators, mixers, coupling circuits, phase locked loop PLL, frequency synthesizers, modulators and demodulators, frequency selective circuits, automated gain control.

EEE4033 Image Processing 4 2 2 0 0
Introduction. Digital Image Fundamentals. Image Enhancement in the Spatial Domain. Image Enhancement in the Frequency Domain. Image Restoration. Colour Image Processing. Image Compression. Image communications systems. Image processing applications using MATLAB.

EEE4037 Microwave Systems 4 2 2 0 0
Microwave radio systems. Satellite communications systems. Radar systems. Electronic warfare systems. Microwave heating and applications.

EEE4039 Electronic Device Techniques 4 3 2 0 0
Statistical Analysis: Probability of errors. Correlation of data. Performance characteristics of an instrument system: Transfer functions, zero-order systems, 1st and 2nd order systems and their ramp, impulse and step responses. Frequency response. Dead time elements. Noise: Sources and types of noise, descriptions, equivalent circuits, measurement of noise. Methods of noise reduction. Interference, description and types of interference. Transducers: Types and specifications of transducers. Choosing a transducer. A/D Conversion: General principles, specifications and types. Advantages and disadvantages comparisons. D/A Conversion: Implementing D/A conversion, multiplexing (A/D and D/A). Digital Multi-meter Circuits, frequency and time interval measurements.

EEE4041 Introduction to Biomedical Optics 4 3 2 0 0
This course covers basic optical principles and techniques used in biomedical research and clinical medicine. The couse includes in-depth coverage of optical imaging and spectroscopy systems for biomedical research and clinical diagnosis, details of light interaction with tissue. This course is intended for undergraduate and graduate students in physics and engineering with a suitable background in optics and imaging.

4th Year, Spring Term - 8th Semester							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**
EEE4010	**Professional Training - II**	**3**	**0,0**	**0**	**0**	**0**	

The practical placement gives the student the opportunity to transform the theoretical knowledge obtained during the educational programme into the work environment and hence includes all kinds of work-related activities. Students are required to spend 30 days in any field related to the area of interest where they can practise their profession. The work carried out is compiled in a detailed manner on daily basis in the form of a report which is then approved by the chief staff in the place of work and then submitted to the academic staff responsible for the evaluation and grading of the internship reports.

EEE4012	**Graduation Project**	**8**	**3,0**	**2**	**2**	**0**	**EEE4019**

After getting a passing grade from Engineering Design course, the students build up an experimental prototype of their designs that they have completed in that course, as the graduation project. Experimental porotypes are exhibited at the end of the spring term in graduation project exhibition called "The Exhibition of Graduation Projects from Dream to reality".

Technical Elective Group - T81

EEE4008	**Power System Analysis**	**6**	**2**	**2**	**0**	**0**

Interconnected power systems and its structure. Power flow analysis. Gauss-Seidel and Newton-Raphson Methods. Balanced and unbalanced faults on power systems. Symmetrical components. Introduction to Dig silent Power-factory power system analysis software. Modelling power systems, performing power flow analysis, short-circuit analysis, transients (electromechanical and electromagnetic transients).

EEE4004	**Drive Systems**	**6**	**2**	**2**	**0**	**0**

Drive systems dynamics. Fundamental theory of DC machines. Concept of speed, torque and 4 quadrant operations. Power transmission components in mechanical systems. Joint speed-torque characteristics of electric motors and mechanical loads. Power equations in mechanical loads. Stability in drive systems. Types of operation in electric drive systems. Basic and modern control strategies for electrical drive systems.

EEE4009	**Electrical machines - II**	**6**	**2**	**2**	**0**	**0**

Introduction; Basic concepts and definitions, Effects of saturation, Harmonic, Losses and Residual flux on dynamic behaviour of the Electrical Machines, Single and three phase transformers, Dynamic behaviour of the Electrical Machines, Park transformation, Simulation of the Electrical Machines with MATLAB/Simulink.

EEE4014	**Power System Design**	**6**	**2**	**2**	**0**	**0**

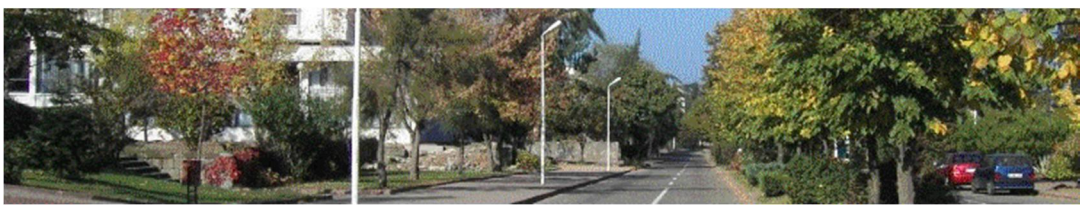
Basic Concepts of Electricity Project, Basic Elements of Distribution Network, Definitions of Power, Voltage Drop Calculation, Current Density, Distribution Networks, Distribution: Load Density, Short-Circuit Strength of Cables, Determination of Cable Fault Location.

EEE4016	**Electrical Vehicles**	**6**	**2**	**2**	**0**	**0**

Historical adventure of electric vehicles, Design criteria of propulsion systems, Electric motors used in propulsion systems, power electronics in electric vehicles, energy storage systems and energy management systems, charging stations, travel safety systems, international standards.

EEE4028	**Electromagnetic Compatibility**	**6**	**2**	**2**	**0**	**0**

General EMC and EMI concepts. Sources of electromagnetic interference. Effects of electromagnetic interference on devices and systems. Interference control techniques. Shielding and grounding. General EMC design principles. EMC standards. EMC measurements and testing.



Technical Elective Group - T81 (Continued)

EEE4024 Fiber Optic Communication 6 2 2 0 0

Refraction, refraction index and Snell's law, Critical angle. The choice of frequency. Propagation of light along the fiber. The layers of optical fiber. Cone of acceptance, numerical aperture. Decibels. Loses in optic fibers; absorption, Rayleigh scatter, Fresnel reflection and bending loses. Dispersion and methods to prevent it. Modes. Graded and step index fibers. Single mode fiber. Chromatic dispersion. Light sources and detectors. Lasers. Led, PIN diodes, avalanche diodes. Real cables. Strength members, loose, tight-buffer, breakout, hybrid cables. Fire, UV, moisture, hydrocarbon and radiation precautions. The manufacture of optic fiber. Advantages of optic fibers. Fusion splicing. Mechanical splicing. Connectors. Couplers. Testing a system; visible light continuity test, light source and power meter. Calibration. Testing a system, the optical time domain reflectometer (OTDR). System design, limitations of received power, transmitted power. System design, the usable bandwidth of optic fiber. Multiplexers and filters. Gratings, Bragg gratings, Fiber gratings. Optical amplifiers. Erbium-Doped Fiber Amplifiers. Optical amplifiers. Erbium-Doped Fiber Amplifiers.

EEE4026 Communication Systems 6 2 2 0 0

Audio, video, data communications; wireline, wireless, ultrasonic and optical communication systems: modem, radar sonar, RFID applications: 3G/4G communication technologies; IP networking and application.

EEE4020 Digital Control Systems 6 2 2 0 0

Introduction to Digital Control, Discrete-Time Systems, Modelling of Digital Control Systems, Stability of Digital Control Systems, Analog Control System Design, Digital Control System Design, State-Space Representation, Properties of State-Space Models, State Feedback Control, Optimal Control, Elements of Nonlinear Digital Control Systems, Practical Issues.

EEE4022 Intelligent Control Systems 6 2 2 0 0

Fuzzy set theory, properties of fuzzy sets. Fuzzy operators. Fuzzy relations, Fuzzy logic, fuzzy implication and Fuzzy reasoning. Fuzzy rules, fuzzification and defuzzification. Fuzzy decision makers. Intelligent machines to give decisions like the way human gives. Modelling thouts and experiences of experts in order to have machines to operate like human do. Fuzzy logic controllers. Other applications of fuzzy logic.

EEE4030 Mobile Communication 6 2 2 0 0

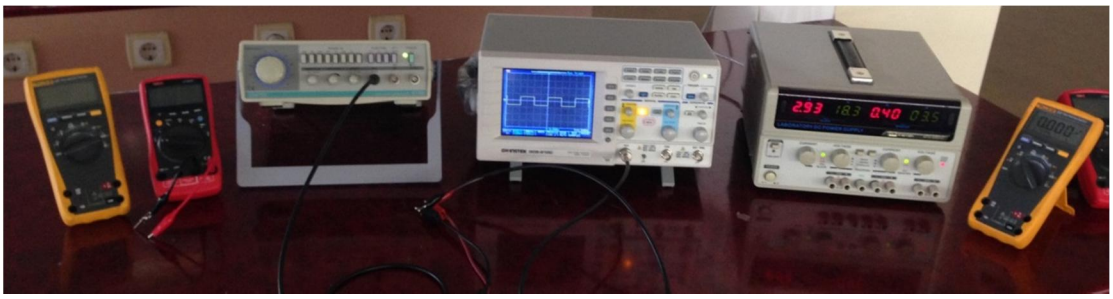
Mobile communication, fading, Rayleigh and Rician channels, multipath propagation, traffic analysis, cell planning, FDMA, TDMA, CDMA, modulation and coding in mobile communication, satellite-mobile communication systems, diversity, mobile communication architecture, types of antenna. GSM.

EEE4002 Medical Imaging Techniques 6 2 2 0 0

Medical physics and imaging principles: intensity, resolution, contrast. X-ray physics: photon interactions, attenuation. X-ray production, detection. Computed tomography. Mammography. Fluoroscopy. Nuclear medicine physics: radioactivity. Nuclear medicine imaging. SPECT, PET. Radiation exposure principles: safety, risk, radiation therapy, radiation protection. Ultrasound physics: waves, reflection, transmission, attenuation. Magnetic resonance physics: magnetic moment, magnetization, relaxation. Magnetic resonance imaging (MRI).

EEE4036 Electrochemical Biosensors 6 2 2 0 0

Fundamentals of biosensors and electrochemistry, components of biosensors, electroanalytical methods and potential excitation signals, Potentiostat circuits, Amperometric biosensors, Potentiometric biosensors, Conductometric biosensors, Impedimetric biosensors, Electrochemical Impedance Spectroscopy Biosensors.



Social Elective Group - S81 (Students must select 1 course from this group)							
Code	**Course Name**	**ECTS**	**C**	**H**	**A**	**L**	**Prerequisite**

EEE4038 Business law **4** **2** **2** **0** **0**

Introduction to business law. Basic business law terms. Worker, employer, workplace, employer's representative, subcontractor, business contract, contents and termination of business contract. Obligations of employer, obligations of employee, condition of work, working hours, annual holidays with pay, overwork, health and safety at work, dismissal and its kinds, redundancy payment, collective business contract, benefits of collective business contract, strike and lockout, concept of trade union, membership to trade union, the legal organs of trade union, union activities, benefits of collective business contract.

OPE4032 Management and Organization **4** **2** **2** **0** **0**

Management, administration and decision making, administration and planning, management by objectives, classical organization theory, neo-classical organization theory, systems approach, contingency approach, total quality management, customer satisfaction, quality control circles, quality assurance system, standardization.

EEE4040 Information Crime Law **4** **2** **2** **0** **0**

Concept and types of personal data and duty to keep secret, right to Access daatas, disposing informations under freem of speech, value of personal data, commercial use of personal data, protection of personal data and role of public and private instutitons, Turkish and EU legal frameworks will be covered during this course.

EEE4042 Expertise Law and its Application **4** **2** **2** **0** **0**

Theoretical training: general principles of trial law, expert legislation provisions, qualifications required of expert, powers and obligations of expert, basic and ethical principles to be complied with, procedures and principles of proving activity and expert examination, procedures and principles regarding the distinction between technical subject and legal subject, and report writing procedures and procedures. covers the technique. Application training: The use of the Expert Information System, the preparation of an expert report on a case study and practice surveillance activities that will enable the participants to develop their skills in using systematic techniques individually or as a team.