

Electrical & Electronics Engineering Department

Undergraduate Curriculum

This curriculum is VALID FOR NEW STUDENTS. Present students should visit ATACS for their curriculum.

FIRST YEAR					
1. Semester					
Code	Name of the Course	T	A	C	ECTS
CEAC105	General Chemistry	3	2	4	5.0
HIST221	History of Civilization	3	0	3	3.0
EE103	Introduction to Electrical and Electronics Engineering	2	2	3	3.0
MATH157	Extended Calculus I	4	2	5	7.5
PHYS101	General Physics I	3	2	4	6.0
ENG101	English Communication Skills I	4	0	4	3.5
HIST111	Principles of Atatürk and History of Turkish Revolution I	2	0	2	2.0
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2. Semester					
Code	Name of the Course	T	A	C	ECTS
CMPE102	Computer Programming	2	2	3	4.0
MATH275	Linear Algebra	4	0	4	6.0
ENG102	English Communication Skills II	4	0	4	3.5
MATH158	Extended Calculus II	4	2	5	7.5
PHYS102	General Physics II	3	2	4	6.0
HIST112	Principles of Atatürk and History of Turkish Revolution II	2	0	2	2.0
EE106	Introduction to Computational Tools	1	0	1	1.0
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SECOND YEAR					
3. Semester					
Code	Name of the Course	T	A	C	ECTS
EE203	Digital Circuits and Systems	3	2	4	6.0
EE209	Circuit Analysis I	4	2	5	8.0
ENG201	Advanced Communication Skills	3	0	3	3.0
MATH276	Differential Equations	4	0	4	6.0
EE213	Probability and Random Process	3	0	3	7.0
					30

4. Semester					
Code	Name of the Course	T	A	C	ECTS
EE210	Circuit Analysis II	3	0	3	8.0
EE212	Electronics Circuits I	3	2	4	8.0
ENG202	Presentation Skills	3	0	3	3.0
EE222	Microcontrollers	3	2	4	7.0
	General Elective 1	3	0	3	4.0
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THIRD YEAR					
5. Semester					
Code	Name of the Course	T	A	C	ECTS
EE303	Signals and Systems	3	1	3	7.0
EE313	Electronics Circuits II	3	2	4	7.0
ENG301	English for Career Development I	3	0	3	3.0
EE319	Engineering Electromagnetics	4	0	4	7.0
EE315	Digital Integrated Circuits and Systems	3	0	3	6.0
EE399 ⁽¹⁾	Summer Practice I				6.0
					30

6. Semester					
Code	Name of the Course	T	A	C	ECTS
EE352	Electromechanical Energy Conversion	3	2	4	6.0
	Area Elective 1 (A)	3	2	4	6.0
EE316	Communication Systems	3	2	4	6.0
ENG302	English for Career Development II	3	0	3	3.0
EE326	Control Systems	3	0	3	5.0
	General Elective 2	3	0	3	4.0
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FOURTH YEAR					
7. Semester					
Code	Name of the Course	T	A	C	ECTS
EE493	Engineering Design Project I	0	4	2	9.0
TURK401	Turkish Language I	2	0	2	2.0
	General Elective 3	3	0	3	4.0
	Area Elective 2 (B/C)	3	0	3	5.0
	Area Elective 3 (B/C)	3	0	3	5.0
	Area Elective 4 (B/C)	3	0	3	5.0
EE499 ⁽¹⁾	Summer Practice II				6.0
					30

8. Semester					
Code	Name of the Course	T	A	C	ECTS
EE494	Engineering Design Project II	0	4	2	8.0
TURK402	Turkish Language II	2	0	2	2.0
IE305	Engineering Economic Analysis	2	0	2	5.0
	Area Elective 5 (B/C)	3	0	3	5.0
	Area Elective 6 (B/C)	3	0	3	5.0
MATH380	Numerical Methods for Engineers	3	1	3	5.0
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(1) Students first perform the summer spactice and then get enrolled to the course in the following semester

Area Elective Courses

Group (A): Credit (4) ECTS (6) ; Group (B): Credit (3) ECTS (5) ; Group (C): Credit (3) ECTS (5)

*Group (A/B/C)	Code	Name of the Course	T	A	C	ECTS
A	EE306	Digital Signal Processing	3	2	4	6
A	EE310	RF and Microwave Engineering	3	2	4	6
B	<u>EE403</u>	Communication Networks	3	0	3	5
B	<u>EE405</u>	Antennas and Propagation	3	0	3	5
B	<u>EE406</u>	Optical Communication Systems	3	0	3	5
B	<u>EE408</u>	Satellite Communications	3	0	3	5
B	<u>EE410</u>	Communication Electronics	3	0	3	5
B	<u>EE422</u>	Statistical Signal Processing	3	0	3	5
B	<u>EE423</u>	Neural Networks and Applications	3	0	3	5
B	<u>EE424</u>	Adaptive Systems and Signal Processing	3	0	3	5
B	<u>EE426</u>	Real Time Signal Processing	3	0	3	5
B	<u>EE430</u>	Computer Vision	3	0	3	5
B	<u>EE432</u>	VLSI Design	3	0	3	5
B	<u>EE433</u>	RF Microelectronics	3	0	3	5
B	<u>EE434</u>	Microwave Circuit Design	3	0	3	5
B	<u>EE435</u>	Optoelectronics	3	0	3	5
B	<u>EE445</u>	Introduction to Robotics	3	0	3	5
B	<u>EE448</u>	Pattern Recognition	3	0	3	5
B	<u>EE451</u>	Power Systems Analysis	3	0	3	5
B	<u>EE452</u>	High Voltage Techniques	3	0	3	5
C	<u>EE401</u>	Digital Communications	2	2	3	5
C	<u>EE421</u>	Digital Image Processing	2	2	3	5
C	<u>EE425</u>	Advanced Digital Design with HDL	2	2	3	5
C	<u>EE402</u>	Wireless Communications	2	2	3	5
C	<u>EE404</u>	Radar Systems	2	2	3	5
C	MECE422	Interdisciplinary Engineering Design	2	2	3	6

Course Contents

EE103 Introduction to Electrical and Electronics Engineering (2-2)3

Integrated introduction to selected fundamental concepts and principles in electrical and electronics engineering: circuit analysis, signals and systems, electromagnetics, telecommunications, electronics.

EE106 Introduction to Computational Tools (1-0)1

Introduction to algorithmic thinking and flowcharting, MATLAB environment, basic operations, arrays, vector and matrix manipulation, conditional statements, for and while loops, if-then-else, switch-case structures, data plotting, polynomials, root finding.

EE203 Digital Circuits and Systems (3-2)4

Number systems and codes, Boolean algebra and logic gates, minimization of Boolean functions, combinational circuits, design of combinational circuits using SSI and MSI components, flip-flops, analysis and design of sequential circuits, counters, shift registers, memory elements, programmable logic devices (PLD), design with PLDs. Introduction to Hardware Description Languages.

EE209 Circuit Analysis I (4-2)5

Circuit elements, techniques of circuit analysis (node voltage and mesh current methods), circuit theorems, inductors and capacitors, analysis of first order RL and RC circuits, analysis of second order RLC circuits, operational amplifiers (Op-Amp), applications of Op-Amp circuits.

EE210 Circuit Analysis II (3-0)3

Sinusoidal steady-state analysis, Complex numbers and applications, power calculations in sinusoidal circuits, three-phase circuits, transformers and concept of mutual inductance, Laplace transform, circuit analysis with Laplace transform, filter circuits, two-port circuits.

EE212 Electronic Circuits I (3-2)4

Introduction to semiconductors, PN junction diodes, diode circuits, special diodes, bipolar junction transistor (BJT), BJT amplifiers, field effect transistors (FET), JFET and MOSFET amplifiers.

EE213 Probability and Random Processes (3-0)3

Probability and its axioms, conditional probability, independence, counting, discrete and continuous random variables and distributions, functions of random variables, expectations, order statistics, central limit theorem, estimation of random variables, random processes and their characterization, autocorrelation function, response of linear systems to random inputs.

EE222 Microcontrollers (3-2)4

Basic microcontroller structure, memory organisation and addressing, addressing modes, assembly language programming, C programming, interrupts, interrupt programming, interfacing with input and display devices, timers, capture, compare and PWM operations, serial communication, I2C interface, A/D conversion.

EE303 Signals and Systems (3-1)3

Representation and analysis of continuous and discrete time signals and systems; time and frequency analysis of linear time-invariant systems; convolution, differential and difference equations, Fourier series and Fourier transform, Laplace transform, Z-transform, sampling, quantization and discrete-time processing of continuous-time signals.

EE306 Digital Signal Processing (3-2)4

Signals and signal processing, discrete-time signals and systems, discrete-time Fourier transform (DTFT) and computation of the DFT, the z-Transform, sampling of continuous-time signals, transform analysis of linear time-invariant (LTI) systems, structures for discrete-time systems, digital filter design techniques, discrete Fourier transform, applications to speech and image processing

EE310 RF and Microwave Engineering (3-2)4

Introduction to RF and microwave systems, analysis of transmission lines and waveguides, the Smith chart, scattering parameters and matching networks, LC networks, single and double stub tuning using the Smith chart, PCB realization of RF and microwave circuits, microstrip lines, various RF and microwave passive components including filters, and their system parameters, RF and microwave design tools and measurement techniques.

EE313 Electronic Circuits II (3-2)4

Multistage amplifiers, differential amplifiers, operational amplifiers, feedback amplifiers, oscillators, waveform shaping circuits, analog filter circuits, regulated power supplies.

EE315 Digital Integrated Circuits and Systems (3-0)3

Quality metrics of a digital circuits, CMOS manufacturing process, review of diode and MOSFET, interconnects: electrical parameters, models, CMOS inverter: static and dynamic behavior, power and energy, static CMOS design: complementary CMOS, ratioed logic, pass-transistor logic, dynamic CMOS design, sequential CMOS logic: timing metrics, static latches and flip-flops, dynamic latches and flip-flops.

EE316 Communication Systems (3-2)4

Amplitude modulation and demodulation, angle modulation and demodulation, phase locked loop, frequency division multiplexing, noise analysis in AM and FM systems, sampling theorem, PAM, PPM and PWM systems, time division multiplexing.

EE319 Engineering Electromagnetics (4-0)4

Review of vector analysis, line, surface and volume integrals, electric field and potential, electric flux and currents, magnetic fields, magnetic flux, changing magnetic fields, Maxwell's equations, wave concept, Helmholtz equation, wave propagation in dielectrics, power flow, propagation in conductors, wave polarization, plane waves at plane boundaries: reflection and transmission, TE and TM waves, normal and oblique incidence cases.

EE326 Control Systems (3-0)3

Laplace transform, transfer functions, stability, steady-state error analysis, root-locus technique, frequency response technique.

EE352 Electromechanical Energy Conversion (3-2)4

Electric machinery fundamentals, magnetic circuits and materials, electromechanical energy conversion principles, transformers: the ideal transformer, practical transformers, special transformers, three-phase transformers, DC Machines; DC generators, DC motors, DC motor starters, variable speed control of DC motors, synchronous machines: synchronous generators, synchronous motors, induction machines, solid-state induction motor drives

EE399 Summer Practice I (0-0)0

Implementing the theoretical knowledge into various applications, improving teamwork abilities, motivating to learn more in work-environment, appreciating continuous-learning process and enhancing oral and written communication skills

EE401 Digital Communications (2-2)3

Introducing digital communication systems, digitization process in communication systems, baseband and bandpass transmission/modulation techniques, performance analysis of digital modulation schemes under Gaussian noise, evaluation of digital communication techniques.

EE402 Wireless Communications (2-2)3

Introduction to wireless systems and standards, radio propagation effects, coverage and statistical channel modeling, time-varying channels, fading effects, various bandpass modulation schemes and detection systems, channel capacity, spread spectrum communications, diversity and combining in cellular systems.

EE403 Communication Networks (3-0)3

Introduction. Architecture, OSI layer, topologies. Communication interface and data link control, error detection and correction. Circuit and packet switching, ATM and Frame relay, congestion control. Ethernet, token ring and FDDI, wireless LANs. Internet protocols (IP), internetwork operation, transport protocol (TCP), network security, ISDN and broadband ISDN. Wireless networks. Network issues for current and future wired/wireless communication systems.

EE404 Radar Systems (2-2)3

Radar principles and operation. Radar equation and detection systems. CW and FM radars, pulse and MTI radars. Search and tracking operations. Analysis of radar systems: channel, antennas, transmitter and receiver structures. Current and future trends in radar systems.

EE405 Antennas and Propagation (3-0)3

Review of Maxwell's equation and radiation. Basic antennas and parameters. Array theory, broadband antennas, aperture antennas, microstrip antennas, and design concepts. Measurement techniques, measurement of antenna parameters. Wave propagation over spherical earth, electromagnetic waves in atmosphere, space and urban and indoor environments. Path, frequency and antenna design and selection for communication systems. Computer aided design for antennas and propagation.

EE406 Optical Communication Systems (3-0)3

Optical fiber structures, waveguiding and fabrication, attenuation, signal distortion, mode coupling, LEDs and LASERS, power launching and coupling, photo detectors, optical receivers, point- to -point links, line coding, coherent optical systems, photonic switching, unguided optical communication systems.

EE408 Satellite Communications (3-0)3

Introduction to communication using satellites. Orbits and launching methods. Propagation characteristics. Orbit perturbations. Geostationary orbit. The space segment. The earth segment. Interference. Satellite access. Modulation techniques and coding.

EE410 Communication Electronics (3-0)3

Communication systems overview. System blocks; transmitters and receivers, modulation and modulator circuits. Oscillators, filters and Phase Lock Loop (PLL) circuits, frequency synthesizer and amplifier design for communication systems of a broad range of frequencies. Project assignments on the design of communications circuits and/or subcircuits.

EE421 Digital Image Processing (2-2)3

2-D systems and transforms, image acquisition, sampling and quantization, linear and non-linear techniques for image enhancement and restoration and image compression, differential pulse code modulation, vector quantization, wavelets, subband coding, still and video compression coding standards.

EE422 Statistical Signal Processing (3-0)3

Introduction to random process, detection and estimation theory, maximum variance unbiased estimation, Cramer-Rao lower bound, general minimum variance unbiased estimation, best linear unbiased estimation, maximum likelihood estimation, Least square methods of estimation, method of moments: second moments analysis, Bayesian philosophy and Bayesian estimators, and applications to communications and radar systems

EE423 Neural Networks and Applications (3-0)3

An introduction to basic neurobiology, the main neural network architectures and learning algorithms, and a number of neural network applications, McCulloch Pitts Neurons, Single Layer Perceptrons, Multi-Layer Perceptrons, Radial Basis Function Networks, Committee Machines, Kohonen Self-Organising Maps, and Learning Vector Quantization

EE424 Adaptive Systems and Signal Processing (3-0)3

Applications of adaptive filtering, autoregressive and moving average processes, linear prediction, lattice filters, Least Mean Square (LMS) algorithm, least squares filtering, convergence analysis, Recursive Least Squares Estimation(RLS), Kalman Filters

EE425 Advanced Digital Design with HDL (2-2)3

Behavioural, dataflow and structural modelling of digital circuits with Verilog HDL. Language constructs of Verilog. Design of finite state machines with data path using Verilog. Introduction to modern CAD tools. Simulation and verification of digital circuits.

EE426 Real Time Signal Processing (3-0)3

Architecture, instruction set, and hardware and software development tools associated with the Texas Instruments TMS320C6x family of fixed and floating processors. Signal processing applications such as waveform generation, FIR and IIR digital filtering, and DFT and FFT based spectral analysis and filtering. Requires an extensive DSP project of the student's choice.

EE430 Computer Vision (3-0)3

Human vision, geometric camera models, image segmentation, object recognition, video signals and standards, vision system design, computer vision and digital video applications

EE432 VLSI Design (3-0)3

Sequential circuits, pipelining. Interconnects: Effects of capacitive and resistive parasitics and solutions. Timing of digital circuits, clock skew and jitter, Clock distribution techniques. Design of arithmetic blocks: Adder, Shifter, Comparator, Multiplier. Designing memory and array structures. Design Methodology and tools. Testing and verification.

EE433 RF Microelectronics (3-0)3

RF Design Basics. Review of modulation and multiple access techniques, Transceiver architectures and design considerations. LNA and Mixer design, monolithic implementation of oscillators, frequency synthesizers and power amplifiers

EE434 Microwave Circuit Design (3-0)3

Active microwave circuits, detectors and mixers. Microwave integrated circuits. Microwave amplifiers and oscillators. Broadband transistor amplifier design. Microwave oscillator design.

EE435 Optoelectronics (3-0)3

Nature of light. Basic optical laws and definitions. Photodetectors. Solar cells. Light emitting diodes. LASER and applications. Homojunction, heterojunction, quantum well, and advanced structure lasers. Fiber types. Light propagation in optical fibers. Modulators. Display devices. Compact discs.

EE445 Introduction to Robotics (3-0)3

Basic components of robotic systems: selection of coordinate frames; homogeneous, transformations; solutions to kinematics equations; velocity and force/torque relations; manipulator dynamics in Lagrange's formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using the computed torque method; and classical controllers for manipulators.

EE448 Pattern Recognition (3-0)3

Introduction to the theory of pattern recognition, Bayesian decision theory, Maximum likelihood estimation, Nonparametric estimation, Linear discriminant functions, Support vector machines, Neural networks, Unsupervised learning and Clustering, Applications such as handwriting recognition, lipreading, geological analysis, medical data processing, data mining, information retrieval, human-computer interaction

EE451 Power System Analysis (3-0)3

Basic concepts in power systems, current and voltage relations on a transmission line, the single-line diagram, per-unit quantities, impedance and reactance diagrams, the admittance model and network calculations, the impedance model and network calculations, power flow analysis, symmetrical faults, symmetrical components, unsymmetrical faults, power system stability

EE452 High-Voltage Techniques (3-0)3

Mechanisms of electrical breakdown in gases, in solid and liquid dielectrics and practical aspects, vacuum insulation, standard impulse voltages, discharge time, breakdown due to pollution.

EE493 Engineering Design Project I (0-4)2

Individual design projects in various areas of electrical and electronics engineering, projects are chosen by students with approval of the supervisor.

EE494 Engineering Design Project II (0-4)2

Individual design projects in various areas of electrical and electronics engineering.

EE499 Summer Practice II (0-0)0

Implementing the theoretical knowledge into various applications, improving teamwork abilities, motivating to learn more in work-environment, appreciating continuous-learning process and enhancing oral and written communication skills