UNDERGRADUATE COURSE DESCRIPTIONS

EE 101 Introduction to Electrical Engineering (2-0)2

Overview and principles of some topics like circuits and systems, optics, image processing, microwave, speech processing, communication, control systems will be covered with various instructors.

EE 103 Introduction to Programming (3-2)4

Algorithm design using flowcharts. Fundamentals of code development using C Programming Language: Editing/Compilation/Linking of C code, I/O functions, Conditional statements, Loops, Functions, Arrays, Pointers, Strings, File processing. Introduction to programming in Matlab.

EE 142 Introduction to Logic Design (3-2)4

Binary systems; Boolean algebra; logic gates: AND, OR, NOT, EXOR; Karnaugh diagram; combinational logic; Flip-Flops; registers; counters; memory unit; sequential circuits; programmable logic.

PHYS 121 General Physics I (3-2)4

Scientific notation, length, time, mass, unit systems, dimensional analysis. Motion along a straight line. Motion in two and three dimensions. Force and Motion. Newton's laws and their applications. Kinetic energy, work, power, and potential energy. Systems of particles. Linear momentum and collisions. Rotation, angular momentum and its conservation. Equilibrium and elasticity. Gravitation.

PHYS 122 General Physics II (3-2)4

Electric charge: Coulomb's law, Electric field and field lines. Gauss' law. electric potential and electric potential energy. Capacitors and dielectrics. Currents in materials. Direct current circuits. The effects of magnetic fields. The production and properties of magnetic fields: Ampere's law, Gauss' law for magnetism, and the Bio-Savart law. Faraday's law of induction. Magnetism and matter.

CHEM 121 General Chemistry I (3-0)3

Matter, its properties and measurement. Introduction to atomic theory, stoichiometry. The structural and chemical properties of matter. Gases, liquids and solids. Intermolecular forces. Atomic and molecular structure. Compounds, molecules and molecular formulas. Ions and ionic compounds. Atomic and electronic configurations and periodicity. Basic concepts of chemical bonding, ionic, covalent and metallic bonding.

CHEM 141 General Chemistry Laboratory I (0-2)1

Experiments complementary to the course material related to the topics discussed in CHEM 121 General Chemistry I lectures will be carried out in this laboratory section.

MATH 145 Calculus for Engineering and Science I (4-2)5

Functions; preliminaries. Limits and continuity. Differentiation. Applications of Derivatives; Extreme values of functions, the mean value teorem, monotonic functions and the 1st derivative test, concavity and curve sketching, optimization problems, indeterminate forms and L'Hopital's rule, antiderivatives. Integration; estimating with finite sums, the definite integral, the fundamental theorem of calculus, the substitution rule. Applications of Definite Integrals. Transcendental functions. Techniques of Integration. Conic sections and polar coordinates.

MATH 146 Calculus for Engineering and Science II (4-2)5

Infinite sequences and series, power series, Taylor and Maclaurin series. Vectors and the geometry of space; the dot product, the cross product, lines and planes in space, cylinders and quadric surfaces. Vector-valued functions and motion in space. Partial derivatives; functions of several variables, limits and continuity in higher dimensions, directional derivatives and gradient vectors, extreme values and saddle points, Lagrange multipliers. Multiple integrals; double integrals, double integrals in polar form, triple integrals in rectangular, cylindrical and spherical coordinates, substitutions in multiple integrals. Integration in vector fields; line integrals, vector fields, path independence, Green's theorem, surface area and surface integrals, Stokes' theorem, the Divergence theorem.

MATH 265 Basic Linear Algebra (3-0)3

Matrices, determinants and systems of linear equations. Gaussian elimination. LU Decomposition. Vector spaces; subspaces, sum and direct sums of subspaces. Linear dependence, bases, dimension. rank and nullity, change of basis, canonical forms, inner product, Gram-Schmidt orthogonalization process, QR decomposition. Eigenvalues, eigenvectors, diagonalization, similarity. Quadratic Forms. Complex vector spaces, Complex eigenvalues, Unitary and Hermitian Matrices. Least-squares.

ENG 101 Development of Reading and Writing Skills I (3-0)3

This is a course that aims to develop skills to analyze paragraphs and essays, reading skills and written and spoken communication skills

ENG 102 Development of Reading and Writing Skills II (3-0)3

This is a course which aims to equip students with the skills to anaylze essays and articles, to write an organized essay and article, to make presentations, to take notes while listening and reading skills, which wll help them in their academic studies.

EE 201 Circuit Analysis I (4-0)4

Lumped circuits: Kirchoff's laws, circuit graphs, circuit equations, linear and nonlinear resistive circuits, first and second order dynamic circuits.

EE 202 Circuit Analysis II (4-0)4

Sinusoidal steady-state analysis, phasors. Three-phase circuits. Coupled inductors. Frequency response. Linear time-invariant dynamic circuits: state equations, natural frequencies, complex frequency domain analysis.

EE 203 Electrical Circuit Laboratory (0-4)2

Voltage, current, resistance and power measuring instruments; signal generators; oscilloscope. Thevenin-Norton circuits. Superposition. Steady state analysis. Reciprocity. Impedance matching. Experiments on first and second order RLC circuits.

EE 204 Scientific Programming for Electrical Engineering (2-2)3

A short review of fundamental programming in C. Advanced topics in C: Data structures, implementation of efficient algorithms, software testing procedures, interface design. An introduction to high level programming languages specialized on symbolic and interpreted problem solving. Efficient numerical solutions of several scientific problems.

EE 212 Electronics I (4-0)4

Semiconductor device physics; operation principles of p-n junction diode, field effect transistor, bipolar junction transistor. Diode circuits. Basic single-stage BJT and FET amplifier biasing and small-signal models. Differential amplifiers, current mirrors, operational amplifier circuits. Introduction to circuit analysis with Spice simulator.

EE 221 Concepts of Modern Physics (4-0)4

Electromagnetic Waves; Lightwaves: Reflection and Refraction; Interference, Diffraction and Polarization; Special Theory of Relativity ; Photon and Matter Waves; Introduction to Quantum Theory.

EE 222 Electromagnetic Theory I (4-0)4

Review of vector analysis. Electrostatic fields in vacuum and material bodies. Dielectric properties of materials. Electrostatic energy and forces. Steady electric current and conductors. Static magnetic fields in vacuum and in materials. Magnetic energy and forces. Quasistatic fields and electromagnetic induction.

EE 271 Circuit Analysis (3-2) 4

Circuit variables; Circuit elements; Simple resistive circuits; Techniques of circuit analysis: Node-voltage / Mesh-current analysis, Source transformations, Thevenin and Norton equivalent of the circuits, Maximum power transfer, Superposition technique, Operational

amplifier; Inductance, capacitance, mutual inductance; Response of 1st order RL and RC circuits; Natural and step responses of RLC circuits

EE 272 Electronics Circuits (3-2) 4

Semiconductor materials and diodes. Diode circuits. The field-effect transistors. The bipolar junction transistors. Transistor amplifiers and switches. Operational amplifiers. Op-amp circuits.

MATH 255 Differential Equations (4-0) 4

First order equations and various applications. Second order linear equations. Higher order linear differential equations. Power series solutions: ordinary and regular singular points. The Laplace transform: solution of initial value problems. Systems of linear differential equations: solutions by operator method, by Laplace transform. Fourier series and boundary value problems.

TURK 201Turkish Language I (2-0) 0

The course is organized in such a way that the students develop a consciousness of and an interest in Turkish language, which is the native language for most of the students.

TURK 202 Turkish Language II (2-0) 0

Grammatical and linguistic knowledge, poems, stories, novels and essays written by the Turkish writers who use the language most skillfully. Besides, some panels and conferences are held, related to the books selected.

TURK 203 Turkish for Foreigners I (2-0) 0

Turkish sound knowledge of basic level, simple sentence structures, establish a dialogue, introducing yourself

TURK 204 Turkish for Foreigners II (2-0) 0

A study on the simple sentence structure of Turkish with tenses, possesive suffixes with -e, -de, -den, or -(y)i and certain structures necessary for fluent communication

HIST 201 Principles of Atatürk I (2-0) 0

Discusses the modernisation of the Ottoman Empire during the nineteenth and early twentieth centuries, the spread of nationalism among its subject peoples, and the revolutionary changes in Ottoman institutions and society that led to the Empire’s demise and the transitional period from the Empire to the national state and the foundation of the Turkish Republic following the national struggle led by Mustafa Kemal Atatürk.

HIST 202 Principles of Atatürk II (2-0) 0

Discusses major events that have taken place from 1923 to 1950, the structuring of the Republic of Turkey and the political, social, economic, and cultural revolutions introduced by Mustafa Kemal Atatürk.

HIST 203 HİStory Of Turkish Revolution I (2-0) 0

The modernization of the Ottoman Empire during the nineteenth and early twentieth century's, the spread of nationalism, and the revolutionary changes in Ottoman institutions and society that led to the Empire's demise, the transitional period from the Empire to the national state and the foundation of the Turkish Republic following the national struggle led by Mustafa Kemal Atatürk.

HIST 204 History Of Turkish Revolution II (2-0) 0

The foundation of Turkish Republic, Principles of Atatürk and major events and changes that have taken place in politic, society, economy, and culture as a results of revolution for reorganization of state and society.

EE 311 Digital Electronics (3-0)3
MOSFET and BJT revisited; NMOS and CMOS combinational logic circuits; clocked CMOS logic circuits; CMOS sequential logic circuits; NMOS and CMOS memories: RAM, ROM, PROM; emitter-coupled logic (ECL); diode-transistor and transistor-transistor logic (DTL and TTL); BiCMOS digital circuits; regenerative circuits (astable, monostable, bistable multivibrators and Schmitt triggers); A/D-D/A converters.

EE 313 Electronics II (4-0)4

Output stages and power amplifiers, multistage amplifiers. Frequency response, feedback, and stability of amplifiers. Regenerative circuits, MOSFET and TTL digital circuits. Linear power regulators. Switching mode power drivers and regulators. Components, PCB layout, and wiring.

EE 315 Electronics Laboratory (0-4)2

PN-Junctions; diode I-V Curves. Bipolar Junction Transistor (BJT) amplifiers; DC biasing, small-signal modeling. Field Effect Transistor (FET) amplifiers; DC biasing; small-signal modeling. Frequency response of BJT amplifiers. Operational amplifier circuits. Design project.

EE 316 Electronics Design Project (1-4)3

Student groups work on projects related to electronics applications. Project topics include switched mode drivers and amplifiers, digital circuits and user interfaces, closed-loop control, AC power control, ground fault detection, variety of electronic sensors and transducers, optical and wireless data transmission, and basic modulation methods. Technical writing topics and critical subjects of all projects are covered in class meetings.

EE 323 Electromagnetic Theory II (3-0)3

Maxwell's equations in time and frequency domains. Electromagnetic energy and power. Wave equation. Uniform plane electromagnetic waves; reflection and refraction. Introduction to transmission lines, waveguides, antennas and radiation.

EE 331 Signals and Systems (3-2)4

Signals and systems. Linear time-invariant systems. Fourier series representation of periodic signals. The continuous time Fourier transform. The discrete-time Fourier transform. Time and frequency characterization of signals and systems. Sampling. Communication systems. The Laplace transform. The z-transform.

EE 333 Fundamentals of Probability and Random Processes (4-0)4

Axiomatic definition of probability space. Combinatorial methods. Conditional probability; product spaces. Random variables; distribution and density functions; multivariate distribution; conditional distributions and densities; independent random variables. Functions of random variables; expected value, moments and characteristic functions. Fundamentals of Random Processes, Gaussion and Poisson processes, stationarity, ergodicity, correlation functions, spectral density, random inputs to linear systems, Markov Chains.

EE 334 Introduction to Numerical Computation for Electrical Engineers (3-0)3

Introduction to Numerical Methods & Structured Programming Principles. Vectors, matrices, dynamic allocation. Linked lists, adjacency-lists, trees. Iterations and Recursion, Algorithms and analysis. Numerical errors, Truncation errors, Rounding errors. Roots of equations, Bisection, Newton's Method. Linear Algebraic Equations, Gauss Elimination, LU Decomposition, Gauss Seidel. Solving linear equations, Perturbation Analysis – Effect of variations on A and b. Solving nonlinear equations -- Iterative methods. Optimization – 1D and Multidimensional Constrained Optimization. Curve Fitting – Least squares regression and interpolation. Numerical Differentiation – Newton Cotes.

EE 342 Digital System Design (3-2)4

Review of Boolean Algebra, logic circuits, and implementation technology. Verilog HDL (Hardware Description Language) programming basics and coding style. Digital design and optimization methods; timing concepts, pipelining, parallelism, scheduling, data flow control. Students are given simple design projects and they are expected to share their solutions with the entire class through presentations and project reports.

EE 352 Communication Systems I (3-2)4

Building blocks of communication systems. Introduction to modulation; AM and FM modulation and demodulation; Frequency division multiplexing; Noise; Effect of noise on AM and FM; Effects of transmission losses and noise in analog communications; Carrier

Phase Estimation with PLL; Source-coding theorem, Entropy, Quantization, PCM, DPCM, DM, Time division multiplexing; Pulse transmission: PAM, PDM, PWM.

EE 362 Feedback Control Systems (3-0)3

Mathematical modeling: Transfer functions, state equations, block diagrams. System response; performance specifications. Stability of feedback systems: Routh-Hurwitz criterion, principle of argument, Nyquist stability criterion, gain margin and phase margin. Design of dynamic compensators. Analysis and design techniques using root-locus. State-space techniques: Controllability, observability, pole placement and estimator design. Discrete-time control systems.

EE 401 Neural Networks (3-0)3

Introduction; Fundamentals of Artificial Neural Networks (ANN); Multilayered Feedforward Neural Networks; Back Propagation Algorithms; Competitive Learning and Other Special Neural Networks: Self- Organizing Systems, Radial Basis Function and Generalized Regression Neural Networks; Dynamic Systems and Recurrent Neural Networks, ANNs in System Identification; Adaptive Processors and Neural Networks: Neural networks for Control; Applications: Modelling, Neural networks in Spectral Analysis and Time-Series Prediction.

EE 411 Fundamentals of Photonics (3-0)3

Ray properties of lightwaves; Paraxial Wave solutions: Beam optics; Various optical beams and Beam propagation through optical system; Fourier optics analysis; Electromagnetic representation of lightwaves; Polarization properties of lightwaves; Electro-optical principles and application in practical devices.

EE 412 Lightwave Communication (3-0)3

Dielectric waveguides; Optical fibers; Optical fiber fabrication; Signal degradation in optical fibers; Optical sources; Power launching and coupling; Photodetectors and optical receivers; Analog/Digital transmission systems; Optical amplifiers; Wavelength division multiplexing systems; Free-space optical communication systems; All-optical network concepts.

EE 423 Antennas (3-0)3

Hertz dipole; radiation pattern; impedance; effective area; feeds; matching; loops; antennas as transitions between guided and free radiation; antenna arrays and the general array formula; reflectors; Yagi.

EE 425 Microwave Engineering (3-0)3

Passive components and their behaviour at high frequencies; transmission line theory and equivalent circuit; Smith Chart; single and multiport networks; S parameter; Rf filters and

coupled resonance circuits; matching and biasing networks; Rf transistor amplifier design - gain, stability, noise figure, linearity; oscillators and mixers.

EE 426 Intoduction to Microwave and Antenna Measurements (1-4)3

Laboratory exercises are provided to reinforce the theory of electromagnetic fields, transmission lines and antennas: Standing wave ratio of transmission lines; measurement of S parameters; amplifier gain measurement; frequency spectrum; antenna impedance and radiation pattern measurement.

EE 430 Introduction to Systems Biology (3-0)3

This course will begin with a broad description of molecular organization of living cells. The signal transduction networks and the regulation of gene transcription will be studied with regards to molecular circuits modeled by kinetic equations. Mathematical aspects of the development of robustness and functionality will be overviewed.

EE 431 Introduction to Image and Video Processing (3-0)3

Image formation, binary image processing, mathematical morphology, region segmentation, edge detection, texture analysis, shape recognition, color spaces, optics, image enhancement, image filtering and restoration, image data compression.

EE 432 Speech Processing (3-0)3

Speech Production and modeling, short-term processing of speech, linear prediction analysis, cepstral analysis, speech coding and synthesis, speech recognition.

EE 433 Introduction to Digital Signal Processing (3-0)3

Discrete-time signals and systems. The z-transform. Sampling of continuous-time signals. Transform analysis of linear time-invariant systems. Structures for discrete-time systems. Filter design techniques. The discrete Fourier transform. Fourier analysis of signals using the discrete Fourier transform. Discrete Hilbert transforms.

EE 434 Biomedical Signal Processing (3-0)3

Biomedical signals, types and their sources; Sampling and aliasing in biomedical signals; A/D and D/A conversions; Fourier analysis and applications on biomedical signals; Time-frequency domain methods: Wavelet transformation, Wigner-Ville distribution and their applications in biomedical engineering; Filtering: FIR and IIR filters and their biomedical applications: Noise removal, signal compensation, etc.; Interpolation methods and algorithms; Spectral estimation and applications in biomedical engineering; Matched filtering and

applications. Independent component analysis and blind source separation: Applications on EEG signal analysis. Nonlinear models for biomedical signals.

EE 436 Mathematical Foundations of Signal Processing and Systems (3-0)3

Introduction to set theory. Field properties and the real number system. Metric spaces. Convergence and Cauchy sequences. Normed spaces and Banach spaces. Inner product spaces and Hilbert spaces. Continuity, continuous functions, and limits. Differentiation and Taylor's theorem. Riemann integration. The method of successive approximations and the fixed point theorem.

EE440 Wireless NETWorking Technologies (3-0)3

Wireless networking fundamentals. Wireless channel characteristics. Networking basics. Wireless local area networks (WLAN), medium access control in WLANs and IEEE802.11. Bluetooth and wireless personal area networks (WPAN). ZigBee and ZigBee/IEEE802.11/Bluetooth coexistence. Mobile ad-hoc networks (MANET) and MANET routing protocols. Wireless mesh networks and WiMAX. Mobile IP, DHCP, NAT and TCP performance in wireless networks.

EE 442 Computer Networks (3-0)3

Seven layered ISO-OSI model. Physical Layer: Data rate, modulation, coding. Data Link Layer: medium access sublayer, CSMA/CD. Network Layer: IPv4 and IPv6, packet routing. Transport layer : UDP, TCP, RTP, RTSP, RTCP, congestion control. Application Layer: HTTP, FTP, SMTP.

EE 443 Embedded Systems (3-2)4

Review of microprocessor basics, common processor architectures, and assembly language. Design and development of hardware and software for embedded systems; microcontroller peripherals, real-time programming concepts, data flow control and interrupts. Real-time process and data flow control applications, communication protocols, real-time operating systems, in-system programming.

EE 444 Introduction to CMOS Integrated Circuit Design (3-0)3

Introduction to CMOS circuits; MOS transistor theory; CMOS processing technology; CMOS circuit characterization; CMOS digital IC design: layout, modeling, clocking strategies, case studies; CMOS analog IC design: basic building blocks, applications; BiCMOS IC design.

EE 451 Communication Systems II (3-2)4

PAM, ASK,FSK,PSK, QAM, CPM, M-ary modulation techniques, Optimum receivers in AWGN: Error probabilities for Binary and M-ary modulations; Inter-symbol-Interference, equalization, eye-pattern; carrier synchronization; channel capacity; coding: linear block and convolutional codes.

EE 452 Digital Coding of Waveforms (3-0)3

Information Content, conditional, joint and mutual entropy. Binary symmetric Channels;channels with and without memory. Source coding algorithms and rate-distortion bounds. Channel capacity and Shannon law. Block code, cyclic codes, convolution codes.

EE 455 Mobile Communication (3-0)3

Cellular radio design fundamentals: frequency reuse, handoff, interference and system capacity. Mobile channel characterization: large-scale path loss, log-normal shadowing ; small-scale fading and multipath, delay spread an coherence bandwidth, frequency selectivity, coherence time and Doppler spread, fast and slow fading. Modulation techniques for mobile radio; receiver complexity, error rate analysis, efficient spectral utilization. Different techniques of diversity and combining. Time, frequency and code division multiple access; packet reservation, space division multiple access. Capacity calculations and networking.

EE461 Nonlinear Control Systems (3-0)3

Introduction to nonlinear control systems. Nonlinear systems analysis: Phase plane analysis, stability of nonlinear control systems and Lyapunov theory, advanced stability theory, describing function analysis. Nonlinear control systems design: Feedback linearization, sliding mode control, adaptive control. Control of multi-input physical systems.

EE 462 Optimal Control (3-0)3

Definition of optimization. Calculus of extrema and parameter optimization. Lagrange multipliers. Performance measures. Dynamic programing. Variational calculus and Pontragin's minimum principle. Dynamic optimization in control systems for different terminal conditions. Hamilton Jacobi-Bellman equation.The matrix Riccati equation. Optimization of discrete control systems. Numerical solution methods in optimal control problem.

EE 463 Introduction to Robotics (3-0)3

This course provides an overview of robot mechanisms, kinematics, dynamics, and controls. Topics include robot designs, actuators, and sensors; rotation matrices, homogenous transformations and Denavit-Hartenburg convention; forward and inverse kinematics, and the Jacobian matrix; Newton-Euler and Lagrangian formulations; and conventional and inverse dynamics control techniques.

EE 465 Industrial Power Electronics (3-0)3

Description and applications of power electronic converters, Switching elements: Thyristor, Triac, GTO, BJT, MOSFET and IGBT, Snubbers, AC/DC controlled Rectifiers, phase control, single phase and three phase inverters, PWM control for inverters, DC/DC

converters, buck, boost converters, brief introduction to microcontrollers as a tool for converter control applications; stepping motors, brushless dc motors, position and speed control techniques, applications of converters in induction heating and servo control.

EE466 Advanced Industrial Power Electronics (3-2)4

BJT, IGBT and MOSFET Drive and Snubber Circuits, resonant DC/DC and series inverter circuits, Space Vector PWM Control Technique, Application of Fuzzy Logic and Neural Networks in Converter Control. Brushless DC Motor Control, Step Motor Control, Frequency Converters for Induction Heating Applications, Phase Locked Loop Control, Harmonic Elimination and power factor correction.

EE 467 Introduction to Digital Control System (3-0)3

Introduction to digital control. Transform analysis. State-variable analysis for discrete time systems. System Simulation techniques. Digital implementation. Design techniques for dicsrete-time systems, design in the z-domain. Controllability and state-variable feedback. Observability and state estimator design. Introduction to optimal control. Optimal Stochastic Control.

EE 472 Nonlinear Time Series Analysis (3-0)3

Dynamical systems and chaos. Characterization of dynamical systems: Autocorrelation function, power spectrum. Poincaré section, fractal dimensions. Dimension algorithms. Determinism in time series: Reconstruction of phase space, choosing delay time, determination of embedding and attractor dimensions. Noise reduction in phase space. Prediction of chaotic time series.

EE 499 Cooperative Educatıon Course (0-6)3

Within the scope of this course, students will receive introductory courses during the first two weeks of the semester covering the topics of learning outcomes and objectives of the cooperative education and evaluation of the work experience. Following this, students are installed to the jobs wehere they are obliged to work two days a week. Students Daily summarize what is done in a journal and provide a report by the end of the semester which they also have to present and defend in front of the jury.