**EK 2 - DERS İÇERİKLERİ**

**Üsküdar University**

**Department of Electronics Engineering**

**Course Contents**

**Year One**

**1stTerm**

**MATH 101–Calculus –I 4 / ECTS: 6**
Foundations, coordinates and vectors, functions, limits, continuity, derivative, tangent lines, the mean value theorem, graphing, extreme values, optimization problems, linearization and differentials, integration, Riemann sums and definite integrals, the fundamental theorem of calculus, natural logarithm, exponential functions, inverse trigonometric functions, L'Hospital's rule, methods of integration, applications of integrals.

**PHYS 101–Physics-I 4 / ECTS: 6**

Physics and measurements. Vectors; motion in one and two dimensions; the laws of motion; circular motion and other applications of Newton's Laws; work and energy; conservation of energy; linear momentum and collisions; rotational motion; angular momentum; equilibrium; gravitation, simple harmonic motion.

**CHEM 101–General Chemistry-I 4 / ECTS: 6**

Chemical foundations, atoms, molecules and ions, modern atomic theory, chemical compounds and their nomenclature, stoichiometry of chemical reactions, chemical calculations, reactions in solutions, precipitation, acid-base neutralization and oxidation-reduction (redox) reactions, gases, thermochemistry, periodic table and its properties, properties of solutions, chemical reaction kinetics and principles of chemical equilibrium. Laboratory experiments accompany the lectures.

**EE 101–Introduction to Electronics Engineering 2 / ECTS: 3**

The contents of the course cover electrical concepts, units, evaluation of basic electronics elements, explaining of basic theorems, resistance, inductance and capacitance, direct and alternating current circuits, electrical measurements, analog and digital circuit analysis.

**ENG 101–English-I 3 / ECTS: 3**

Reading texts and exercises. Listening exercises. Translation exercises. Writing essay. Speaking exercises, conversations.

**RPSC 109–Positive Psychology and Communication Skills 3 / ECTS: 5**
The course includes subjects like the general framework of the basic concepts of communication sciences, solutions and recommendations to strengthen communication skills, interpersonal communication, group communication, organizational communication, mass communication, public communication, international communication and intercultural communication.

**RCUL 101–University Culture –I 1 / ECTS: 1**

The course consists of reports on seminars and conferences organized by the university.

**Year One**

**2nd Term**

**COME 102–Introduction to Algorithms and Programming 3 / ECTS: 4**

Basic computer literacy: terminology, system components and operation. Fundamentals of computer programming: sequence, decision, repetition, syntax, compilation, debugging and maintenance, procedures, parameters, arrays, searching, sorting, top-down structured design, and style. Recursion, pointers and dynamic memory allocation; strings and string processing; advanced file processing; programmer-defined types; Introduction to Object Oriented Programming; classes and data abstraction: behaviour/state (data) model, member scope and access, constructors/destructors, object assignment.

**EE 102–Materials Science 3 / ECTS: 5**

Semiconductor Materials, Crystal Lattices (Cubic Lattices, Planes and Directions, The Diamond Lattice), Atomic Spectra and Bohr Atomic Model, Quantum mechanics (Probability and Uncertainty Principle, The Schrödinger Wave Equation, Potential Well Problem, Atomic Structure and the Periodic Table Bonding Forces in Solids, Energy Bands.

**MATH 102–Calculus –II 4 / ECTS: 6**
Sequences and series, Taylor and Maclaurin series, lengths of plane curves, polar coordinates and complex numbers, lines, planes and quadratic surfaces in space, functions of several variables, limits and continuity, partial derivatives, differentiability, the chain rule, directional derivatives, extreme values, multiple integrals, integrals in polar, cylindrical and spherical coordinates, line integrals and surface integrals.

**MATH 104–Basic Linear Algebra 3 / ECTS: 5**

Matrices, row equivalence, invertibility, systems of linear equations, determinants, Cramer's rule, vector spaces, linear dependence and independence, bases, inner product spaces, Gramm-Schmidt orthogonalization process, orthogonal projections, Fourier series, eigenvalues, eigenvectors, exponential matrix, diagonalization and its applications, linear transformations and their matrices. Examples for each subject of this course are performed in Matlab.

**PHYS 102–Physics -II 4 / ECTS: 6**
Topics in Electricity and Magnetism: Electric charges and matter, Coulomb's law, electric fields, electric field calculations, motion of a charged particle in electric field. Gauss's law, electric flux and Gauss's law, applications of Gauss's law. Electric potential and electric potential difference, electric potential energy, electric potential due to point charges and charge distributions. Capacitance and dielectrics, definition and calculations of capacitances, energy stored in capacitors, capacitors with dielectrics. Current and resistance, electric current, resistance, electrical conduction. Direct-current circuits, electromotive force, Kirchhoff's rules, applications. Magnetic fields, definition and properties of Magnetic fields. Magnetic forces on charges and currents, applications of magnetic fields. Sources of magnetic fields, the Biot-Sawart Law, Ampere's law. Faraday's law, Lenz's law, induced electric fields, generators and motors. Inductance, mutual and self inductance, RL circuits, energy in magnetic fields.

**ENG 102–English-II 3 / ECTS: 3**

Reading texts about profession, grammar exercises, word activities, translation activities, listening and speaking exercises.

**RCUL 102–University Culture –II 1 / ECTS: 1**

The course consists of reports on seminars and conferences organized by the university.

**Year Two**

**3rd Term**

**EE 201–Circuit Theory-I 4 / ECTS: 5**

Basic concepts and definitions, nodal and mesh equations, introduction to operational amplifiers, inductance and capacitance, sinusoidal circuit analysis.

**EE 203–Computer Tools for Electronics Engineering 3 / ECTS: 4**
Matlab expressions, constants, variables, arrays. Graph plots. Procedures and functions. Matlab syntax. Graphic User Interface (GUI). Linear algebra using Matlab. PSpice overview, Circuit schematics, schematic rules and analysis types. Modeling with PSpice, mixed analog and digital simulation, measurement in PSpice. Programming in Labview.

**MATH 205–Probability and Random Variables 3 / ECTS: 4**

Fundamentals of probability. Random variables, distribution and density functions and some specific functions. Operations on one random variable: expectation, moments and transforms of random variables. Vector random variables, joint distribution and density functions. Statistical independence. Operations on multiple random variables. Random processes, stationarity, independence and ergodicity, correlation function. Spectral characteristics of random processes. Linear systems with random inputs.

**COME 203–Logic Circuits 4 / ECTS: 6**
Realization of Boolean functions, logic gates. Multivibrators. Coding and debugging techniques. Boolean functions with a single-chip implementation. Flip-flops. Clock mode sequential circuits. Level mode sequential circuits. Counters. MSI integrated circuits. MSI chips, integrated circuit design. Logic circuits, race and hazard.

**MATH 203–Differential Equations 3 / ECTS: 5**
Differential equations and basic concepts. Differential equations as mathematical models. Differential equations of general, special and unique solutions. Existence and uniqueness theorems. Separable, homogeneous, complete and fully convertible into ordinary differential equations. Of linear differential equations, Bernoulli's differential equation and its applications. Change of variables. General solution of n-th order linear differential equations. n-th order homogeneous differential equations with constant coefficients, the general solutions. Non-homogeneous equations with constant coefficients and solution methods. Initial and boundary value problems. Homogeneous and non-homogeneous differential equations with variable coefficients. Power series solutions of differential equations around ordinary points. Laplace and inverse Laplace transforms. Fixed and variable coefficient initial value problems. Systems of differential equations. Conversion of higher-order system of first order differential equations. Solutions of non-homogeneous diff. equations with constant coefficients. Application of Laplace transformation of differential equations systems. Methods for the numerical solution of differential equations.

**TURK 101–Turkish Language -I 2 / ECTS: 3**
Definition of “language”, social role and importance, language-culture relationships, Turkish language and its place and relationships amongst the global languages, the history and development of Turkish language, current position and the hinterland of Turkish language. Phonetics and classification, characteristics of Turkish phonetics and the rules related to phonetics. Spelling rules and applications, punctuations marks and applications, general rules about essay writing, planning of essay writing, words and verbs, adverbs and prepositions with applications.

**ATA 101–Principles of Atatürk and History of Revolutions-I 2 / ECTS: 3**

In this course the meaning and the importance of the Turkish Revolution, the conditions which led to the Turkish Revolution, the environment and the developments, the National War of Independence under the leadership of Mustafa Kemal Pasha, the founding of the new Turkish State that is totally independent that rests upon national sovereignty, Ataturk as a genius soldier, as a great statesman, as a reformer and as a perfect organiser are presented.

**Year Two**

**4th Term**

**EE 202–Circuit Theory II 4 / ECTS: 5**
Natural response of electric circuits, forced and total response in RL circuits, forced and total response in RC circuits, natural, forced and total responses of second order circuits, resonance, elementary signals, Laplace Transform, Inverse Laplace Transformation, circuit analysis with Laplace Transforms, frequency response and Bode plots, self and mutual inductances – transformers, one-and two-port networks, three-phase systems

**EE 204–Electromagnetic Field Theory 3 / ECTS: 5**
This course provides in depth coverage of all aspects electromagnetics, with a focus on field and wave generation and propagation. The course will focus on the more practical aspects of E-M theory, with application examples taken from the problems in the textbook as well as from other references. The specific subjects covered will be vectors and fields, electrostatics, electric current flow, magnetic fields, Maxwell’s equations, electromagnetic wave propagation, transmission lines, waveguides, resonators and antennas.

**EE 206–Numerical Methods 3 / ECTS: 5**

General Overview on numerical methods, Solution of Equations, Interpolation, Numerical Differentiation, Numerical Integration

**COME 214–Signals and Systems 3 / ECTS: 5**

Time-domain representations of linear time-invariant systems, Fourier representations of signals and linear time-invariant systems, applications of Fourier representations to mixed signal classes, application to communication systems, representing signals by using continuous time complex exponentials: The Laplace transform, representing signals by using discrete time complex exponentials: the z-transform, application to filters and equalizers, application to linear feedback systems.

**ATA 102–Principles of Atatürk and History of Revolutions-II 2 / ECTS: 3**
The struggle of the Turkish Nation to go above the level of the contemporary nations with all its institutions and values, Principles and Revolutions of Ataturk, Ataturk's School of thought, Turkey's national and international politics during Ataturk's leadership, Second World War and Turkey and the transition period to the multi political party era in Turkey.

**TURK 102–Turkish Language–II 2 / ECTS: 3**
Components of a sentence, analysis and applications of the sentence, reading and investigating of the literature and philosophy examples from the world and rhetoric applications. Arts of written essay and applications, expression and grammar defaults and their corrections, the rules to prepare scientific articles.

**EE 282–Summer Practice-I ECTS: 4**

Stajın amacı, elektronik mühendisliği alanındaki çalışma ortamlarını tanımak ve üniversitede edinilen bilgileri böyle bir pratik çalışma ortamında uygulamaktır.

**Year Three**

**5th Term**

**EE 301–Electronics I 4 / ECTS: 7**

Semiconductors, PN junction, diodes, structure and operation principles of BJT, small signal analysis, structure and operation principles of FET.

**EE 303–Communication Engineering 3 / ECTS: 6**

Building blocks of communication systems. Signal types, generalized functions. Hilbert transform and analytical signals. Linear and angular modulation methods, frequency division multiplexing. Sampling, quantization, Pulse-Code Modulation (PCM), Differential Pulse-Code Modulation (DPCM), Delta Modulation (DM), Time Division Multiplexing (TDM), pulse transmission. Baseband data transmission: Nyquist pulse shaping; Bandpass data transmission and digital modulation techniques. Noise analysis of modulation systems.

**COME303–Microprocessors 3 / ECTS: 5**
Central processing unit (CPU): The CPU registers, arithmetic and logic unit, status flags, microcommand execution, microprogramming, and the control unit, the CPU legs. Memory: ROM, RAM, PROM, EPROM and E2PROM memories. Connection of the CPU and memory decoders. Parallel Input / Output: Programmed I / O, interrupped I / O, direct memory access I / O. Serial Input / Output. Programming of microcomputers: the source and the purpose programs. Assembly language and assembler directives. Memory addressing methods. CPU command set. Real CPUs. Microcomputer system design. Applications.

**EE 305–Electromagnetic Waves 3 / ECTS: 5**

Solutions of Maxwell’s equation in different media, Transmission lines, Wave guides, introduction to Antennas

**RPRE 104–Entrepreneurship and Project Culture 2 / ECTS: 3**

The skills and knowledge which students will gain through this course are; 1. To learn scientific, academic and application oriented entrepreneurship, 2. To develop different perspective and manner of approaching corresponding with entrepreneurship, 3. To perceive and learn entrepreneurship with economical and social aspects, 4. To understand, entrepreneurship and especially economical entrepreneurship phenomenon as a system at a theoretical and practical level, 5. To be able to evaluate entrepreneurship processes and relations between them systematical and make it practicable, 6. To develop knowledge and skills at basic level about “marketing”, “financing”, “business establishment processes”, “applicable legal legislation” etc. which are closely associated with entrepreneurship and especially economical entrepreneurship. 7. To be able turn an opportunity into an idea and turn an idea into a business idea and evaluate this process, 8. To be able to create marketing, financial and business management plan and evaluate it, 9. To be able to make a feasibility study at a basic level.

**XXXXXX–Elective (2nd Foreign Language) 2 / ECTS: 3**

**Year Three**

**6th Term**

**EE 302–Electronics II 4 / ECTS: 7**

Basics of electronic circuits, analysis and design of BJT and MOSFET amplifiers, power amplifiers, feedback, frequency response of amplifiers, OPAMPs, oscillators.

**EE 304–Control Systems 3 / ECTS: 5**

Introduction to control engineering, review of complex variables & functions, review of Laplace transform, review of linear algebra, linear differential equations, obtaining transfer functions, block diagrams, concept of feedback and closed loop, basic control actions, P-I-D effects, concept of stability, stability analysis of the closed loop, system by routh criterion, state space representation and stability.

**EE 3XX–Departmental Elective I 3 / ECTS: 5**

**EE 3XX–Departmental Elective II 3 / ECTS: 5**

**XXXXXX–Social Elective I 3 / ECTS: 5**

**EE 382–Summer Practice II ECTS: 4**

Stajın amacı, elektronik mühendisliği sektöründeki çalışma ortamlarını tanımak ve üniversitede edinilen bilgileri böyle bir pratik çalışma ortamında uygulamaktır.

**Year Four**

**7th Term**

**EE 491–Graduation Project 2 / ECTS: 8**

It covers developments in the field of engineering and the content may vary depending on the research interest of student and supervisor.

**EE 4XX–Departmental Elective III 3 / ECTS: 5**

**EE 4XX–Departmental Elective IV 3 / ECTS: 5**

**XXX 4XX–Field Elective I 3 / ECTS: 5**

**XXX–Social Elective II 3 / ECTS: 5**

**OHS 401–Occupational Health and Safety I 2 / ECTS: 2**

**Year Four**

**8th Term**

**EE 492–Graduation Thesis 2 / ECTS: 8**
Complete production and test procedure of the project that designed conceptually in EE 491.

**EE 4XX–Departmental Elective V 3 / ECTS: 5**

**EE 4XX–Departmental Elective VI 3 / ECTS: 5**

**XXX 4XX–Field Elective II 3 / ECTS: 5**

**XXX 4XX–Field Elective III 3 / ECTS: 5**

**OHS 402–Occupational Health and Safety II 2 / ECTS: 2**

**ELECTIVE COURSES POOL**

**EE 314–Introduction to Computational Electromagnetics 3 / ECTS: 5**

Analytical Methods, Finite Difference Methods, Finite Difference Time Domain for computational electromagnetic, Applications

**EE 403–Health Effects of EM Fields and Protection 3 / ECTS: 5**

Review of electromagnetic fields at different frequencies. Health effects of ELF and RF EM Fields. International regulatory activities and Safety standards. Human epidemiological studies. Site surveys, measurements and safety guidelines. Internal field Dosimetry. Health effects of Optical frequencies.

**EE 405–Introduction to Remote Sensing 3 / ECTS: 5**

Physical Bases of Remote Sensing. Radiation Characteristics of Natural Phenomena Sensors. Sensors Platform. Interpretation and Processing of Data. Introduction to Geographic Information Systems. Modeling Studies

**EE 406–Electromagnetic Compatibility 3 / ECTS: 5**

Introduction to Electromagnetic Compatibility. Non-ideal behavior of components. Crosstalk and cables. Digital circuit radiation. Shielding, Grounding. EMC standards. Open area test sites, Radiated interference measurements. Conducted interference measurements. Pulsed interference immunity.

**COME402–Artificial Neural Networks 3 / ECTS: 5**

Introduction to neural networks, feed-forward networks, multi-layer perceptrons, multi-layer samples for the networks, back propagation networks (Hopfield Network), back propagation network examples and supervised, unsupervised learning, SOM (Self Organizing Networks)

**EE 409–Electromagnetic Wave Propagation 3 / ECTS: 5**

Introduction to the Wireless Communication Channel, Properties of Electromagnetic Waves, Propagation Mechanisms, Fundamentals of Antenna, Basic Propagation Models, and Terrestrial Fixed Links Satellite Fixed links, Macrocells. Microcells. Picocells, Antennas for Mobile Systems.

**EE 414–Digital Image Processing 3 / ECTS: 5**

Digital Image formation, human visual system, 2D signals and systems, image enhancement in time domain, image enhancement in frequency domain, image restoration, image segmentation, image compression, image analysis.

**EE 415–Digital Signal Processing 3 / ECTS: 5**

Introduction of digital signal processing and its applications, discrete transformations, Discrete Fourier transform, fast Fourier transform, inverse fast Fourier transform, and other discrete transformations. Z-Transform and signal processing applications, digital filter design principles, digital filter design with finite impulse response, FIR filter design by windowing, frequency sampling-based FIR filter design, recursive digital filters and design. Adaptive digital filters.

**EE 417–Introduction to Digital Communication 3 / ECTS: 5**

Stochastic processes, noise analysis in analog communication, data transmission through AWGN channel, bandpass data transmission, equalization, optimum receiver design, carrier and pulse synchronization, error probabilities for binary/m-ary transmission, carrier modulation, Amplitude Modulation (AM), Phase Modulation (PM), Frequency Modulation (FM), Quadrature Amplitude Modulation (QAM) and their performances, entropy, quantization and rate distortion, information sources, channel capacity, coding.

**EE 420–Control Technology and Design 3 / ECTS: 5**

An overview of design techniques with particular interest to industrial requirements. Feedback implementation: Transducers, sensors, and signal conditioning. Implementation of various types of control actions and servo control. Laboratory.