CYPRUS INTERNATIONAL UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Undergraduate Curriculum

	1st Semester				**2nd Semester**		
CODE	**COURSE NAME**	**CREDIT**	**ECTS**	**CODE**	**COURSE NAME**	**CREDIT**	**ECTS**
EELE100	Introduction to Electrical and Electronic Engineering	(1-0) 0	4	CMPE112	Introduction to Programming	(3-2) 4	6
CHEM110	General Chemistry	(3-2) 4	6	ENGL142	Reading and Writing Skills II	(2-2) 3	4
CMPE101	Introduction to Computing	(2-2) 3	5	MATH102	Calculus II	(3-2) 4	6
ENGL141	Reading and Writing Skills I	(2-2) 3	4	MATH122	Discrete Mathematics	(3-1) 3	5
MATH101	Calculus I	(3-2) 4	6	PHYS101	General Physics I	(3-2) 4	6
MATH121	Linear Algebra	(2-0) 2	4	TURK/ TREG100	Introduction to Turkish / Turkish Language	(2-0) 0	2
TARH/ HIST100	History of Modern Turkey/ History of Civilization	(2-0) 0	2				
TOTAL		**16**	**31**	**TOTAL**		**18**	**29**
	3rd Semester				**4th Semester**		
CODE	**COURSE NAME**	**CREDIT**	**ECTS**	**CODE**	**COURSE NAME**	**CREDIT**	**ECTS**
EELE221	Digital Logic Design	(3-2) 4	7	EELE202	Circuit Theory I	(3-2) 4	6
MATH203	Differential Equations	(3-1) 3	6	EELE224	Electronic Properties of Materials	(3-0) 3	5
MATH205	Int. To Prob. & Statistics	(4-1) 4	6	EELE234	Electromagnetic Theory I	(3-1) 3	6
PHYS102	General Physics II	(3-2) 4	6	INDE232	Engineering Economy	(3-0) 3	4
XXX XXX	Free Elective	(3-0) 3	4	MATH202	Math. Methods for Engs.	(3-2) 4	6
				XXX XXX	Free Elective	(3-0) 3	4
TOTAL		**18**	**29**	**TOTAL**		**20**	**31**
	5th Semester				**6th Semester**		
CODE	**COURSE NAME**	**CREDIT**	**ECTS**	**CODE**	**COURSE NAME**	**CREDIT**	**ECTS**
EELE301	Circuit Theory II	(3-2) 4	6	EELE324	Microprocessors	(3-2) 4	7
EELE321	Signals and Systems	(3-2) 4	7	EELE326	Linear Control Systems	(3-2) 4	5
EELE331	Electromagnetic Theory II	(3-1) 3	5	EELE342	Electronics II	(3-2) 4	6
EELE341	Electronics I	(3-2) 4	6	EELE344	Power Electronics	(3-2) 4	6
ENRE305	Electromechanical Energy Conversion	(3-2) 4	5	EELE362	Communication Systems	(3-2) 4	7
TOTAL		**19**	**29**	**TOTAL**		**20**	**31**
	7th Semester				**8th Semester**		
CODE	**COURSE NAME**	**CREDIT**	**ECTS**	**CODE**	**COURSE NAME**	**CREDIT**	**ECTS**
EELE300	Summer Training	-	5	EELE456	High Voltage Techniques	(3-1) 3	5
EELE411	Robotics	(3-1) 3	4	EELE464	Wireless Communication Systems	(3-1) 3	5
EELE415	Program. Logic Controllers	(3-2) 4	5	ENGI402	Capstone Project	(2-4) 4	8
EELE453	Electrical Machinery	(3-1) 3	4	EFE XXX	Faculty Elective	(3-0) 3	5
ENRE401	Power Transmission and Distribution	(4-1) 4	4	EFE XXX	Faculty Elective	(3-0) 3	5
ENGI401	Project Management	(3-0) 3	5				
EFE XXX	Faculty Elective	(3-0) 3	5				
TOTAL		**20**	**32**	**TOTAL**		**16**	**28**

Total Credit: 147
Total ECTS: 240

FACULTY ELECTIVE COURSES

CODE	**DESCRIPTION**	**CREDIT**	**ECTS**	**CODE**	**DESCRIPTION**	**CREDIT**	**ECTS**
EELE322	Advanced Digital Electronics	(3-0)3		EELE432	Microwave Theory and Design	(3-0)3	
EELE328	Introduction to Microcontroller Programming	(3-0)3		EELE458	Electrical Engineering Design and Illumination	(3-0)3	
EELE403	Digital Control Systems	(3-1) 3		EELE434	Biomedical Imaging	(3-0)3	
EELE404	Satellite Systems	(3-1) 3		EELE463	Antennas and Propagation	(3-0)3	
EELE416	Power System Protection	(3-0)3		EELE465	Communication Systems II	(3-0)3	
EELE420	Digital Signal Processing	(3-0)3		EELE466	Fiberoptic Communications	(3-0)3	
EELE431	Computational Methods in Electromagnetics	(3-0)3		EELE468	Image, Video and Speech Coding	(3-0)3	

FACULTY OF ENGINEERING
Department of Electrical and Electronic Engineering
Undergraduate Course Descriptions

1st Semester

EELE100 Introduction to Electrical and Electronic Engineering
Short history of Electrical and Electronic Engineering.Definition, scope and occupation areas of Electrical and Electronic Engineering. Interaction between related scientific and engineering fields. Academic staff and main scientific subdivisions and laboratories of the department. Vision, mission, program objectives and outcomes of the department. Education plan and quality development program of the department. Ethical and professional rules in engineering. Life long learning concept. Engineering Standards and Sustainable Development. Student counseling system and surveying. Summer training, technical trips, seminars and meeting activities of the department. Social and universal impact of Electrical and Electronic Engineering. Effective written and oral communication in engineering. Team work and project management in engineering.

CHM 110 General Chemistry
In this course, Engineering and Pharmacy Faculty students will learn types of matter, measurements, properties of substances; atoms and atomic theory, components of the atom, introduction to the periodic table, molecules and ions, formulas of ionic compounds, names of ionic compounds; atomic masses, the mole, mass relations in chemical formulas, mass relations in reactions; measurements on gases, the ideal gas law, gas law calculations, psychometric of gaseous reactions, gas mixtures: Partial pressures and atomic spectra, the hydrogen atom, quantum numbers, atomic orbitals; shape and sizes; electron configurations in atoms, orbital diagrams of atoms; polarity of molecules; principles of heat flow, measurements of heat flow, calorimetry, enthalpy, thermochemical equations, enthalpies of formation, the first law of thermodynamics, liquids and solids.

CMPE101 Introduction to Computing
This course presents the basics of computer systems. The course is structured in two parts; including a short history of computers, the first part of this course presents the history, basic concepts and terminology of information technology, basic hardware and software components of a computer system, and integration of computer system components. Besides the terminologies and abbreviations, the students learn about the hardware setup of a personal computer and the relations between the processor, memory and secondary devices. The laboratory part includes basic computer usage and office programs (MS Word, Excel). In the second part, basics of problem solving approaches, components and construction of computer programs, flow-charting, and modular programming issues are discussed. Basics of C programming language are covered in classroom.

ENGL141 Reading and Writing Skills I
This course aims to develop students' listening, speaking, reading - writing and study skills. The course provides students with the opportunity to develop their communication skills through controlled activities and to equip students with the basic study skills necessary to follow the curriculum of English. This course also provides students with the opportunity to process the newly acquired knowledge and to develop their ability to ask questions about how to apply the new knowledge to new situations and ask them to think critically. In addition, this course will enable students to learn about the different strategies required to review the various reading pieces, such as finding the main idea and distinguishing the details from the main idea.

MATH101 Calculus I
Calculus-I provides the methods of differential and integral calculus with applications in geometry, physics and engineering. Students in this course will learn how to use mathematical language needed for applying the concepts of calculus to numerous applications in science and engineering such as identifying types of functions, graph of functions, evaluating limit of functions, limit of elementary functions (polynomial, trigonometric, logarithmic, exponential,…), methods to solve the undefined limits (L'Hopitals Rule), continuous functions, evaluate derivative of functions, definition of derivative, derivative of elementary functions, derivative of product of two functions and division of functions, applications of derivative, evaluate integrals of functions, definition of the integral, integral of elementary functions, substitution method, integration by parts, integral of rational functions, application of the integral (finding the area) .

MATH121 Linear Algebra
The aim of this course is to introduce the basic operations in linear algebra and applications in engineering problems; matrices, matrix properties and matrix operations: Addition, scalar multiplication, multiplication, transpose, solution of system of linear equations: Elimination method, Gauss Jordan forms, inverse method to solve linear systems, row reduced echelon forms, Gaussian elimination method, inverse and determinants: solving linear equations with determinant (Cramer's rule), use one row to evaluate determinant, minor, cofactor, adjoint matrix, identity matrix, square matrix of the matrices. Real vector spaces, vectors and their properties and applications in engineering: Addition, subtractions, dot product, scalar multiplication, cross product, basis, dimensions and subspaces.

TARH100 Modern Turkish History

In this course, Ottoman state and society, factors causing the collapse of the state; Ottoman modernization; Tripoli and Balkan Wars, World War I, Mudros Armistice and Sevres Agreement; parties and associations, the national resistance movement led by Mustafa Kemal, the Havza and Amasya Circulars, the Congresses, the National Pact, the Turkish Grand National Assembly; the rebellions, the regular army and the War of Independence; the Mudanya Armistice, the Lausanne Peace Treaty; Revolution in the political field, secularization of the state and society, abolition of the sultanate, declaration of the republic, abolition of the caliphate; 1921 and 1924 constitutions, constitutional changes; Sheikh Said Rebellion; Multi-party experience, secularization and modernization in law, nationalization and secularization in education, Kemalizm and 6 principles, Turkish foreign policy(1923-1938) are covered.

HIST100 History of Civilization

The aim of this course is to outline the development of civilizations in the course of history. It firstly focuses on the concepts such as "Civilization", "Prehistoric", and "Historic" and on the factors forcing the emergence of the first civilizations. As well as examining the prehistoric periods and their characteristics in the course of human life since the first appearance of human beings on earth, the course mainly focuses on the early civilizations, namely the Mesopotamian, Egyptian, Aegean, Classical Greek, Hellenistic, Indian, Chinese and Roman Civilizations. Political, social, economical, cultural, intellectual, philosophical and scientific aspects in these entities are also examined in this course.

2nd Semester

CMPE112 Introduction to Programming

The course will introduce basic and fundamental programming constructs and techniques through using the C++ programming language in order to generate algorithmic solutions to problems. Upon completion of the course, students will learn an introduction to algorithms, solving problems by flowcharts and pseudo codes, header files, data types, arithmetic & logic operators, control statements (if, if/else, switch-case) and use them as inner statements, loop statements (while, do/while, for), functions, standard functions of programming language, random number generation and their area of use, user-defined functions, global and local variables, recursion, arrays, searching algorithms on arrays, sorting algorithms on arrays, pointers, pointer operators, using pointers with arrays and functions. In the laboratory hours, students are supposed to write full programs or modify existing programs for other solutions.

ENGL142 Reading and Writing Skills II

This course is the continuation of ENG 101. The course aims to improve students' listening, speaking, reading, writing and working skills. In the course, students are guided in writing compare and contrast essays using Venn diagram. In addition, the aim of the course is to learn the necessary conjunctions for composition writing. In addition, the students will be able to write a four-part critical composition by learning the difference between ideas and factual real sentences and how to write the opposing opinion and sentences used to refute it. Thus, the students will be able to distinguish between the compare and contrast essay and discursive essay. Students will also be able to make presentations by using presentation techniques. In addition, this course aims to summarize the reading pieces of the students and to use the strategies of reading and to draw conclusions and meanings using their reading skills.

MATH102 Calculus II

This course provides the methods of differential and integral calculus with applications in geometry, physics and engineering. Topics included are as follows: Sequences and infinite series, properties of sequences, test for convergence, tests for series with both positive and non-positive series, absolutely convergence and conditionally convergence . Power series, Taylor and Maclaurin series, the radius of convergence. Parametric equations and Polar coordinates, the graph of polar equations, the area in polar coordinates, arc length, speed on a curve and derivative of polar equations. Vectors and vector-valued functions, dot product and cross product of two vectors. Lines and Planes. Functions of several variables, their domain, limit and partial derivatives and definite integral of a function over a region.

MATH122 Discrete Mathematics

The objective of the course is to introduce the students fundamental principles: logic and Boolean algebra, set theory, relations(Partial ordering, Total ordering and Hasse diagrams, Equivalence relations and equivalence classes), functions(one-to-one, onto, identity, inverse and composition of functions), inductive proofs and recurrence relations, counting techniques(multiplication and addition rules, permutations, combinations, unordered samples with repetitions, principle of inclusion and exclusion, pigeonhole principle) and introduction to graph theory(basic terminology like vertex, edge, degree of a vertex in directed and undirected graphs, Eulerian and Hamiltonian graphs, trees and spanning trees, minimal spanning trees, Prim's Algorithm, Kruskal Algorithms, Shortest Path Problems, Dijkstra's Algorithm).

PHYS101 General Physics I
The aim of the course is to provide the basic information in order to help the students to understand the possible complicated problems in engineering. In this regard, the basic principles and methods of solving the problems in physics are thought. The course provides a basic grounding in elementary physics including mechanics. The basic subjects of the course are: Units and dimensions, Uniformly accelerated motion in one dimension, Freefall, Vector mathematics, Two dimensional motion, Newton's laws of motion, Applications of Newton's laws, Free body diagrams, Circular motion, Work and energy, Conservation of energy, Momentum, impulse, and collisions, Rotational kinematics, Torque, Static equilibrium. For completeness, the students are supposed to do 6 experiments related to the subjects of the course.

TREG100 Turkish Language
This course examines basic areas of language and expression. In the first half of the course, the theoretical approach to language is formed and the spelling rules of the Turkish language are studied. In the latter part of the course, language and narrative errors are studied together with editing. In the second half of the course, formal writing, curriculum vitae, petition, evaluation of the columns in terms of language and style, types of written expression and practice; Turkish production and application of shooting attachments; Turkish grammar structure; It is aimed to teaching subjects like phonetics of Turkish to students.

TURK100 Introduction to Turkish
This course provides an orientation to modern Turkish language for foreign students who wish to communicate in this language for their needs. It mainly focuses on the differences between Turkish and English Alphabets, especially the sounds and the letters which are not included in the English alphabet (i.e. Turkish letters ç-ğ-i-ö-ş-ü). In addition, basic grammar and sentence structure forms in Turkish are practised. The required grammar and vocabulary will also be developed through their adaptation to daily situations in contexts such as introducing yourselves, greeting, talking about the things they possess by using possessive adjectives, forming positive, negative and question sentences by using present simple, telling the time, talking about their own timetables, using demonstrative pronouns when describing the place of objects and becoming familiar with vocabulary related to family members.

3rd Semester

EELE221 Digital Logic Design
This course presents the basic tools for the design and analysis of digital circuits and provides methods and procedures suitable for a variety of digital design applications in computers, control systems, data communications, etc. The course introduces data representation in binary systems, complements, Boolean algebra, logic gates, truth tables, logic circuits, timing diagrams, De Morgan's law, algebraic manipulation, minterms and maxterms, Sum of Products (SOP) and Product of Sums (POS) forms, Boolean function simplification tools and Karnough Map method, NAND and NOR implementations, don't care conditions, combinational circuit design and analysis procedures, and design of Adders, Subtracters and Code Converters.

MATH203 Differential Equations
In this course, the ordinary differential equations and their applications will be considered. The course will demonstrate the usefulness of ordinary differential equations for modelling physical and engineering problems. Complementary mathematical approaches for their solution will be presented, including analytical methods. The basic content of the course includes first order ordinary differential equations and their types of exact, separable, Bernoulli, first order, homogeneous ordinary differential equations, linear independence of the solutions, higher order ordinary differential equations and their solutions. The undetermined coefficient methods, the variation of the parameter method, Cauchy-Euler equations. The definition of the Laplace transform and some important applications of the Laplace transform will be included in this lecture.

MATH205 Introduction to Probability and Statistics
The objective of this course is to introduce basic probability and statistics concepts. The focus of this course is on both applications and theory. Topics include: introduction to random variables, simple data analysis and descriptive statistics, frequency distribution, cumulative distribution, sample space, events, counting sample points (basic combinatorics), probability of an event, probability axioms, laws of probability, conditional probability, Bayes' rule, discrete and continuous random variables, probability distributions, cumulative probability distributions, discrete and continuous probability distributions, discrete uniform, Binomial, Geometric, Hypergeometric, Poisson, Continuous uniform, Normal Disributions, Gamma and Exponential distribution, jointly distributed random variables, expectation and covariance of discrete and continuous random variables, random sampling, sampling distributions, distribution of Sample Mean, Central Limit Theorem(CLT).

PHYS102 General Physics II
This course provides the basic information to help the students to understand the possible complicated problems in engineering. The subjects of the course are mostly Electricity and Magnetism. The basic subjects of the course are Properties of electric charges, Coulomb's law, and Electric field of a continuous charge distribution, Gauss's law and electric flux. Application of Gauss's law to charged insulators, Obtaining the value of the electric field from the electric potential, Electric potential and the potential energy due to point charges, Electric potential due to continuous charge distributions, Electric current, Resistance and Ohm's law, Electromotive force, Resistors in series and in parallel. Kirchhoff's rules. For completeness, the students are supposed to do 6 experiments all are related to the subjects of the course.

4th Semester

EELE202 Circuit Theory I
The course provides students with fundamental Concepts of Circuit Theory: Current, Voltage, Power and Energy as well as Definitions of Circuit Componentes: Voltage Current Sources; Resistors and Ohm's Law. Computation of Power over a Resistor, Set Up Circuit Model. Kirchhoff's Current and Voltage Laws. Resistors in Series and Parallel Configuration; Voltage and Current-Divider Circuits. Ampermeter, Voltmeter and Ohmmeter Circuits. Wheatstone Bridge, Triangle-Star Transformation. Loop Currents and Node Voltages Techniques, Source Transformation. Linearity and superposition principles, source transformations. Thevenin's and Norton's Theorems, Maximum Power Transfer, Graf Theory. Inductance and capacitance. The natural and forced response of the first – order (RL and RC) circuits. Natural and step responses of second-order RLC circuits.

EELE224 Electronic Properties of Materials
Hydrogenic atom. Electron spin. Stern-Gerlach experiment. Pauli's exclusion principle. Lasers. Free electron theory of metals. Fermi-Dirac statistics. Fermi energy. Band theory of solids. Fermi-Dirac statistics. Intrinsic semiconductors. Electrons and holes.Conduction in semiconductors. Semiconductors; impurities; carrier transport in semiconductors; generation and recombination of minority carriers. n- and p-type doping. Compensation doping. Semiconductor devices. Ideal p-n junction. Crystal structures, energy levels in crystals. Electronic transport in metals. A short account on superconductivity. Semiconductors; impurities; carrier transport in semiconductors; generation and recombination of minority carriers. The P-N junction diode and Schottky diode; the bipolar junction transistor (BJT); current flow in diodes, BJT's and MOSFETs.

EELE234 Electromagnetic Theory I
Review of vector calculus. Electrostatics in vacuum. Coulomb's Law and Gauss's laws; Electric Field. Electrical Potantial,Force-Energy and Potantial Units. Poisson's and Laplace's equations. Conductors in the presence of electrostatic fields. Method of images. Dielectrics; polarization. Dielectric boundary conditions. Capacitors with Dielectrics, Energy of the Capacitor and Capacitance. Electrostatic energy. Electrostatic forces by the virtual work principle. Steady currents. Ohm's and Joule's laws. Static Magnetic Fields of Stable Electric Currents. Resistance calculations. Magnetostatics in vacuum. Ampere's force law. Biot-Savart law. Magnetic vector potential. Ampere's circuital law. Magnetic boundary conditions. Magnetic dipole. Magnetization. Hysteresis curve. Self and mutual inductance. Magnetic stored energy. Magnetic forces by the virtual work principle.

ILE 232 Engineering Economy
The purpose of this course is to provide an introductory basis for economic analysis in decision making process in engineering design, manufacturing equipment and industrial projects. This course aims to supplement engineering students with the knowledge and capability to perform financial analysis especially in the area of capital investment. It emphasizes the systematic evaluation of the costs and benefits associated with proposed technical projects. The student will be exposed to the concepts of the "time value of money" and the methods of discounted cash flow. Students are prepared to make decisions regarding money as capital within a technological or engineering environment. Assignments and homework help and guide the students to apply the knowledge acquired during the course.

MAT202 Mathematical Methods for Engineers
Complex numbers. Algebra of complex numbers. Polar representation. Complex functions. Limits and continuity. Analyticity. Analytic functions. Cauchy-Riemann equations. Line integrals. Cauchy integral formula. Isolated singularities. Residue theorem. Numerical error. Solution of nonlinear equations. Convergence. Solution of linear systems of equations: direct and iterative methods. Interpolation. Curve fitting. Numerical differentiation and integration. Error types, Taylor series and truncation error and rounding numbers. Numerical solution of nonlinear equations; Bracketing methods, Bisection and False position, Iterative methods: Fixed point and Newton method. Numerical methods for solution of linear systems, Iterative methods and LU decomposition methods. Interpolation and polynomial approximation, Lagrange polynomials, Least square lines, curve fitting and spline functions (linear and quadratic). Numerical differentiation, finite difference formulas. Numerical integration, Simpson's rules and Trapezoidal rules.

5th Semester

EELE301 Circuit Theory II

Impedance, admittance and Kirchhoff"s laws in the frequency domain. Sinusoidal steady state analysis using the nodal and mesh techniques. Sinusoidal steady state analysis using source transformation and superposition. Thevenin and Norton Equivalents in the frequency domain. Instantenous power, average power and RMS value. Maximum average power transfer. Apparent power, power factor and the complex power. Power factor correction. Balanced Three-Phase voltages. Balanced Three-Phase connections: Y-Y, Y-Delta, Delta-Delta. Power in three phase systems. Mutual inductance and energy in a coupled circuit. Linear transformers. Ideal transformers. Transfer function, the decibel scale and Bode plots. Series and parallel resonance. Passive filters Active filters, properties of the Laplace transform. Applicaton of the Laplace transform. Application to integrodifferential equations and network stability.

EELE321 Signals and Systems

Classification of Signals and Basic Signal Properties. Time Domain Models of Linear Time Invariant (LTI) Systems: Continuous time systems. Causal LTI systems described by differential equations. System block diagrams. The solutions of differential equations. The unit impulse response and convolution integral. State variable analysis of LTI systems. Discrete time systems. The unit sample response and discrete convolution. Fourier series and Fourier transform representation of continuous-time and discrete- time periodic signals. Time and frequency characterization of signals and systems. Z-transform and inverse z-transform. Region of convergence of the z-transform. z-domain analysis of discrete LTI systems. LTI Systems With Random Inputs. Definition of Random variables, stochastic process, first and second order statistics, moment, correlation and co-variance, stationary process, ergodicity. System resonse.

EELE331 Electromagnetic Theory II

Review of Electromagnetic Field Theory. Electromagnetic induction; Faraday's and Lenz's laws; transformer and motional Electromotive force; induction heating; transformer; displacement current; time-varying fields; Maxwell’s Equations in differential and integral forms; the law of conservation of charge; wave equations; time-harmonic fields; complex phasors; scalar and vector potential functions; plane waves in vacuum; plane waves in dielectrics and conductors; polarization; skin effect; Electromagnetic energy and power; Poynting's theorem; Electric and Magnetic Field Boundary Conditions Boundary conditions for the tangential and normal components of the fields. Reflection and refraction of plane waves at dielectric interfaces; The basic laws and Fresnel’s equations. Snell’s Law. The Brewster angle. Nonuniform plane waves and total reflection. Reflection and refraction at the surface of an good conductors, standing waves.

EELE341 Electronics I

Operational amplifiers: common mode and difference mode process. Op-amp applications: voltage adder, voltage follower, differential amplifier, derivate and integrator circuits, active filter design. Semiconductor elements and diodes. Diode equivalent circuits. LEDs and zener diodes. Load line analysis. Half-wave and full-wave rectifier circuits. Bipolar junction transistor: Operation limits of transistors, testing and electrical specifications. DC biasing of transistors: Determining of operation point, voltage divider biasing, voltage feedback biasing and other biasing types. Transistor switching circuits. PNP transistors and stability of biasing. Characteristic of field effect transistors. Depletion-type MOSFETs, Enhancement-type MOSFETs, VMOS and CMOSs. Biasing of field effect transistors. Self-biasing and voltage divider biasing. Biasing of depletion-type MOSFETs and enhancement-type MOSFETs. Other two gates: Varactor, power diodes, tunnel diode, photodiode.

ENRE305 Electromechanical Energy Conversion

This course analyzes magnetic materials, magnetic parameters and magnetic properties of the materials. Application of soft magnetic materials and magnetic circuits are also involved in the course. Single phase transformers are analyzed in two categories such as ideal transformers and real transformers. Special purpose transformers such as auto-transformers and their power rating advantage are analyzed. This course also aims to examine three-phase transformers and their functions in power distribution systems. DC machinery fundamentals, simple rotating loop, power flow and losses of real DC machines, analysis of shunt and series connected DC machines and DC generator fundamentals are also take significant part in the course.

6th Semester

EELE324 Microprocessors

The Microprocessors course includes the understanding of the main components and working principals of the microprocessor. Intel 80x86 family is used as a base microprocessor architecture. Course content includes the understanding of the basic computer architecture, memory organization and memory interfacing, programming and debugging in assembly language, developing programs that perform unsigned arithmetic (addition, subtraction,

multiplication, and division), BCD, ASCII, logical and bitwise manipulation operations, performing input/output device programming in assembly language, input characters or strings from keyboard, output characters or strings to the screen, convert data to ASCII, packed BCD, unpacked BCD. Also, understanding the properties and interfacing of the parallel and serial ports and the design and interfacing of microprocessor-based systems using the real world example of the 80x86 IBM PC are in the scope of the course.

EELE326 Linear Control Systems
Concepts of modeling, and analysis of electromechanical systems in time and frequency domains, feedback and feed forward controllers, stability criteria, design of controllers. Physical systems and the concept of control systems, mathematical backgraund, mathematical modelling of physical systems, transfer functions, block diagrams, signal flow grapghs, state variables and state-space modelling, simulation diagrams and computer simulation of the systems, test signals and transient responses of first and the second order systems. 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.

EELE342 Electronics II
Junction field-effect transistors (JFETs): physical structure and modes of operation, input and output parameters and characteristics. JFET biasing configurations, fixed bias, self bias, Small-signal analysis of JET amplifiers Frequency response of BJT amplifiers, high-frequency BJT model, Miller's theorem. High frequency response of commonemitter amplifier, bandwidth estimation, bode plots. High frequency response of JFET amplifiers, JFET model at high frequency, high frequency response of BJT amplifiers. Broadband amplifier design, single-stage broadbanding techniques, gainbandwidth product, base compensation. Cascade amplifiers. Multistage amplifiers. BJT differential amplifier, differential and common-mode gains, biasing, current mirror Feedback amplifiers, the general feedback structure, properties of negative feedback:. The four basic feedback topologies, determining the loop gain, stability problem.

EELE344 Power Electronics
Introduction to power electronics, types of power electronic circuits. Single phase half wave rectifiers.Single phase full wave rectifiers with resistive and with inductive load. Thyristor characteristics; turn on, turn off behaviors and types. Single phase controlled rectifier with resistive and with inductive load. Free wheeling diodes, single phase full converters with resistive and with inductive load.Single phase semiconverters. Three phase semiconverters and three phase bridge rectifiers. DC-DC converters; principles of step down operation, step down converters with inductive load. Principle of step up operation, step up converter with resistive load. Performance parameters and converter classifications. Pulse width modulated inverters. Single and three phase bridge inverters. Voltage control of single phase inverters

EELE 362 Communication Systems
Properties of signals and noise, Fourier Transform and properties of the Fourier Transform. Power spectral density and autocorrelation function, Fourier series expansion and linear systems. Discrete Fourier Transform (DFT), bandwidth requirement of signals. Pulse Amplitude Modulation (PAM) employing natural sampling and flat-top PAM. Pulse Code Modulation (PCM): Sampling, quantizing and encoding, bandwidth requirement of PCM, quantization noise, binary line coding. Inter-symbol Interference (ISI), Nyquist's method for zero ISI and roll-off filtering. Time-division multiplexing (TDM) and TDM hierarchy, frame synchronization. Radio Frequency (RF) components: limiters, mixers, up and down converters, frequency multipliers, etc. Envelope detector, product detector, frequency detector, PLL. Generalized transmitters and receivers: The superheterodyne principle. Amplitude modulation (AM), Double-Sideband Suppressed Carrier (DSBSC) and asymmetric sideband signals (SSB, VSB). Phase and frequency modulated signals (FM, PM).

7th Semester

EELE300 Summer Training
Engineering summer training is the thirty working days long internship period in which the engineering students are expected to apply their theoretical knowledge, which they acquired during their Bachelor level studies, in a real life professional environment. Summer training can be performed at any institution which is involved in any of the Electrical and Electronic Engineering subdisiplines. During the training, the engineering students encounter with the professionals and the real life tasks, so that they have a better chance to prepare themselves for the industries' needs and decide on their exact field of professional interests. At the end of the thirty days of training, which is performed after the third year of the bachelor studies, the students write their summer training reports which summarize their internship experience. The internship period of a student is then judged by the committee evaluation of his/her summer training report.

EELE411 Robotics
This course introduces fundamentals of robot control. Brief review about robots, hardware and robot problems will be explained to give a general idea about the use of robotics. Various types of basic sensors are also be discussed under the issue of robot hardware. Agent function design will be taught to gain robot control algorithm development and design.

Robot control programming with mostly used controllers and related programming language concepts will also be covered to improve hardware programming skills of participants of this course. Lectures give the background to the extensive hands-on practical work using the laboratories A practical project will be performed to have an experience about to control a real robots with microcontroller.

EELE415 Programmable Logic Controllers
The aim of this course is to provide an introduction to programmable logic controllers. The basic architecture of PLCs and the commonly used input and outputs in such systems are included in the course. The relationship between the PLC operation and the Logic gates are stated. The programming languages which are used in PLC are examined. Furthermore, the Ladder Diagram technique is developed involving internal relays, timers and counters. The course includes compare and program control instructions. Both 16 and 32 bit operations are used in basic math instructions. It also includes the examples of important industrial applications that uses PLC.

EELE453 Electrical Machinery
AC Machine Fundamentals; The Rotating Magnetic Field; Magnetomotive Force and Flux Distribution in AC Machines; Induced Voltage in Ac Machines; Distributed Windings in AC Machines; Induced Torque in AC Machines; AC Machine Power Flows and Losses; Synchronous Generators; Synchronous Generator Construction; The Speed of Rotation of a Synchronous Generator; The Equivalent Circuit Synchronous Generator; The Phasor Diagram of Synchronous Generator; Power and Torque in Synchronous Generator, Measuring Synchronous Generator Model Parameters; Alone and Parallel Operation of Synchronous Generators; Synchronous Generator transients; Synchronous Motors; Steady State Synchronous Motor Operation; Starting synchronous Motors; Induction Motors; Construction and Motor Concepts of Induction Machine; The equivalent Circuit of and Induction Motor; Power and Torque Induction Motor; Torque-Speed characteristics; Speed Control of Induction Motors; Solid-State Induction Motor Drives; Determining Circuit Model Parameters; Induction Generator.

ENRE401 Power Transmission and Distribution
General structure of Electric power systems. Electrical characteristics of transmission lines, transformers and generators: series impedance and capacitance of transmission lines, current – voltage relations on a transmission line for short, medium and long lengths. System modeling of synchronous machines, transformers, transmission lines and loads. Representation of power systems. Per unit analysis of power systems. Bus admittance matrix. Power flow analysis. Power circle diagram. Traveling waves, reflections. Symmetrical three – phase faults. Symmetrical components. Unsymmetrical components. Single line to ground, double line to ground and line to line faults. Basic probability methods for power system reliability evaluation. Failure Time, Failure Distribution Function and Reliability Function. Network modeling and evaluation of system reliability.

ENGI401 Poject Management
This course is designed to focus on project management framework, project integration management, project scope management, project communication management and teamwork, health & safety, engineering ethics, environmental management, risk management and sustainability, entrepreneurship and feasibility report, legal aspects in project management. This course also prepares the senior students to select their capstone design projects and form teams. The students undertake literature review for their projects, prepare feasibility report, and a written/oral presentation at the end of the term.

8th Semester

EELE456 High Voltage Techniques
Basic equations of electrostatic fields. Electric field and potential on planar electrode system. System capacity and forced. Electric field and potential on sphere electrode system and system's capacity. Sphere electrode system's examination for to breakdown. Electric field and potential on cylinder electrode system and system's capacity. Cylinder electrode system's examination for to breakdown. Parallel axis cylinder electrode systems. Maximum electric field's approximate calculation on electrode systems. Electrode systems with multi-dielectrics. Break on the limit surface. Discharge, ionization and types. Streamer or channel breakdown theory. Corona discharge and surface discharge. Electrical breakdown of dielectric liquids and solids, insulating materials, impulse voltage and current generator circuits.

EELE464 Wireless Communication Systems
This course is an introduction to the design, analysis, and fundamental limits of wireless transmission systems. Topics to be covered include: wireless channel and system models; fading and diversity; resource management and power control; multiple-antenna and MIMO systems; space-time codes and decoding algorithms; multiple-access techniques and multiuser detection; broadcast codes and precoding; cellular and ad-hoc network topologies; OFDM and ultrawideband systems; and architectural issues. 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.

ENGI402 Capstone Project
This course is an interdisciplinary project based course involving engineering design, cost estimating, environmental impacts, project schedule and team work. Students are expected to work in pre-assigned team under the supervision of faculty on a predetermined project. Each team will submit a final report including drawing, specification, and cost estimate that completely describe their proposed design. Each team will make oral presentation defending their final design and project feasibility to peers and faculty members.

FACULTY ELECTIVE COURSES

EELE322 Advanced Digital Electronics
Why digital signals & circuits? Noise immunity of Digital circuits /Ideal & practical inverter (NOT gate) characteristics. Simple resistive-load (RTL) inverter /Static & dynamic behavior & parameters of an inverter /Various logic gate realizations (RTL, TTL, nMOS, CMOS, BiCMOS) and their properties /Transistor-level realization of AND, OR, NAND, NOR, EXOR, etc. and complex logic gates / Interfacing and Fan-in & Fan-out issues of IC logic circuits /Speed - delay considerations for digital circuits /Power consumption issues of different logic gate realizations

EELE328 Introduction to Microcontroller Programming
The aim of this course is to introduce fundamentals of PICBASIC programming language. A breif review of low level and high level programs will be explained to give a general idea about microcontroller programming. PIC controllers with PICBASIC Pro programming language concepts will also be covered to improve hardware programming skills of participants of this course. A practical project will be performed to have an experience to control several PIC microcontrollers.

EELE403 Digital Control Systems
This course introduces digital control and discrete transform (z-transform). Introduction to sampled data and discrete modeling of systems. Discrete and hybrid Signal Flow Graphs (SFG)s. Students will learn designing controllers and applying compensation techniques both in s and z domains.The topics are: Review Of The Root Locus Method. Controller Design in S-Domain. Frequency Response Methods.Implementation of a Control Law on a Microprocessor.Sampling and Reconstruction.Digital Design: Introduction to Z- Transform.Open Loop and Closed Loop Discrete Time Systems.The S - Z Plane Mapping, Second Order Desired Response.Z - Plane Root Locus.Controller Design in Z - Plane, PI Controllers.Controller Design in Z - Plane, Pole-Zero Compensation and PID Controllers. Stability

EELE404 Satellite Systems
Satellite communication systems provide fixed and mobile communication services over very large areas of land, sea and air.This course begins with a review on the background and basic concepts of satellite systems. Then it covers the orbital aspects and launching methods. Then, non-geostationary and geostationary orbits are covered. Frequency assignments, propagation aspects and polarization that affect the satellite link is discussed. Antennas, space and ground segments including very small antenna aperture terminals (VSATs) are presented. The design of satellite link is discussed including link budgets, error control coding, modulation and multiple access methods. Specific applications are also explored, including GPS, satellites for mobile communication etc.

EELE416 Power System Protection
The performance of instrument transformers, transducers, protective relays, and circuit breakers is first addressed. These devices are then integrated into coordinated protective systems for generators, transformers, transmission lines, reactors, capacitor banks, system buses, etc. Trade-offs between reliability, selectivity, speed, simplicity, and economy are emphasized. The topics of this course are : Power system unsymmetrical faults. Line to ground, line to line, double line to ground unsymmetrical faults. Current and voltage transformers. over current relay. Application of DTOC and IDTM relay for protection of a distribution feeder. Protection of three-phase feeder, directional over current relay. Differential protection. Zone of protection of the differential relay. Transformer protection. Busbar protection. Distance protection of Transmission line. Generator protection. Motor protection.

EELE420 Digital Signal Processing
Overview of digital signals and systems. Frequency and time representation of sampling, decimation, interpolation. Z-transform: Evaluation, region of convergence (ROC) and properties. Discrete time system structures: tapped delay line and lattice structures. Fast Fourier Transform (FFT). Digital filter design: Finite impulse response (FIR), infinite impulse response (IIR), windowing, Hilbert transform.

EELE431 Computational Methods in Electrodynamics
Review of Electromagnetic Theory; Electrostatic fields, Magnetostatic fields, Time-varying fields, Boundary Conditions, Wave Equations, Time-Varying Potentials, Time-Harmonic Fields. A review of basic numerical methods in electrodynamics. Finite Difference Method (FD); Finite Difference Schemes, Laplace's Equation, Finite Differencing of

Laplace's Equation, Accuracy and Stability of FD Solutions, Practical Applications. Finite Difference Time Domain Method (FDTD). Yee's Finite Difference Algorithm, Accuracy and Stability, Lattice Truncation Conditions, Initial Fields, Programming Aspects, Absorbing Boundary Conditions (ABC) for FDTD, Applications. Method of Moments (MoM); Introduction, Integral Equations, Green's Functions, Applications ,Quasi Static Problems, Scattering Problems.

EELE432 Microwave Theory and Design

Definition of microwaves; basic properties and application areas. Circuit viewpoint TEM transmission lines in sinusoidal steady state and in transient regime. Smith chart. Impedance matching. Single and double stub matching. Field analysis of transmission lines and waveguides. TEM, TM and TE Waves. Parallel plate and rectangular waveguides. Waveguides modes of a coaxial line. Dielectric slab waveguides, surface waves. Stripline. Planar guiding structures: microstrip, coplanar lines, fin lines, etc. Microwave network analysis. Impedance and admittance matrices. Scattering parameters. ABCD matrix. Two-port networks.

EELE434 Biomedical Imaging

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

EELE458 Electrical Engineering Design and Illumination

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

EELE463 Antennas and Propagation

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

EELE465 Communication Systems II

Review of probability and random variables. Random processes, stationarity, correlation, covariance and ergodicity concepts. Transmission of random processes through linear filters, power spectral density. Gaussian random processes, white noise, filtered noise and narrowband noise. Baseband pulse transmission and optimal (matched filter) receiver. Probability of error for pulse transmission. Nyquist criterion for distortionless binary transmission, partial response signalling, multi-level signalling and tapped delay line equalization. Geometric interpretation of signals, coherent detection of signals in noise. Digital modulation techniques such as PSK, FSK, QPSK and etc. Detection of the digitally modulated signals.

EELE466 Fiberoptic Communications

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

EELE468 Image, Video and Speech Coding

The aim of this course is to introduce the principles of image, video and speech coding. The fundamentals of image, video and speech will be introduced. After learning how to digitize these analog signals, the techniques for coding these digital data will be handled. Speech, audio, still image, and video compression. Overview of standards and their applications, with an emphasis on underlying technologies, algorithms, and performance. Source decompositions, perceptual models, quantization and lossless coding of parameters. Codec designs for robustness, diversity, and scalability.