Course-Contents

EE211 Circuit Theory I	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): ES100, ES110
Contents:	

- **Circuit definitions:** Current, Voltage, Power, Independent and dependent sources, Node, Loop, Mesh, Branch, Ohm's law and Kirchhoff's laws and their applications on simple circuits.
- **Analysis techniques:** Equivalent resistance, Dividers, Source transformation, Superposition, Thevenin's and Norton equivalent, Maximum power transfer, Nodel analysis, Mesh analysis.
- **Electrical signals:** Mathematical and graphical representation, Graphical differentiation and integration.
- **Energy storage elements:** Capacitors and Inductors,
- **Transient and steady state response:** in first order circuits.
- **Transient and steady state response:** in second order circuits.

EE212 Circuit Theory II	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE211
Contents:	

- Review of complex number.
- Sinusoidal steady state response: phasor, impedance, frequency domain equivalent circuit.
- Analysis techniques in the frequency domain.
- Phase shift and phasor diagrams.
- Average, reactive, and complex power.
- Effective values and power factor.
- Frequency response and resonance.
- Three-phase systems, and three-phase power measurements.
- Circuit analysis of circuits containing coupled inductors and transformers.
- Circuit analysis using Fourier techniques.
- Circuit analysis using Laplace transformation (s-domain circuits).

EE221 Electromagnetics I	
4 lecture hours per week, (4+8) 12 Units	Prerequisite(s): ES100, ES110
Contents:	
• **Vector algebra:** Coordinate systems including general curvilinear. • **Vector analysis:** Differential relations and line, surface and volume integration. • **Static electric fields:** Coulomb's law, Maxwell's divergence and curl equations, Capacitance, Energy, Dielectric materials and boundary conditions. • **Steady magnetic fields:** Bio-Savart's law, Ampere's law, Maxwell's divergence and curl equations, Inductance, Energy, Magnetic materials, Boundary conditions and Magnetic circuits.	

EE222 Electromagnetics II	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE221
Contents:	
• **Boundary value problems for static fields:** Solutions by analytical, numerical and analog methods, analytical solutions of Laplaces equation (method of separation of variables). • **Time varying fields:** Maxwell's equations, Displacement current, Poynting's theorem and Poynting vector, Faraday's law, Ampere's circuital law. • **Propagation of uniform plane waves:** Wave equation and description of uniform plane wave, Plane wave propagation in perfect dielectric and conducting media, Skin effect, Eddy currents, Group velocity, Time averaged Poynting vector and Time averaged energy densities in the electric and magnetic fields, Reflection and refraction of waves.	

EE271 Computer Programming Language	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): ES261
Contents:	
• Basic data types. • Basic input and output functions. • Mathematic, logic and relational operators. • Program flow control functions: IF/ELSE, FOR, WHILE, DO/WHILE, SWITCH, and other controlling functions. • Predefined math function. • Defining functions. • Arrays. • Introduction to pointers. • Structures. • File input/output functions. • Programming design	

EE281 Circuits Laboratory I	
3 Laboratory hours per week, (3+3) 6 Units	Corequisite(s): EE211*
Contents:	
• Familiarization with the laboratory equipments. • Verification of Kirchhoff's laws and equivalent resistance. • Dividers and their application in meter-range extensions. • Superposition and reciprocity theorems. • Thevenin's and Norton's equivalents and the maximum power transfer theorem. • Different methods for measuring resistance. • Use of the oscilloscope for displaying and measuring electrical signals. • Charge and discharge characteristics of capacitors.	

EE282 Circuits Laboratory II	
3 Laboratory hours per week, (3+3) 6 Units	Prerequisite(s): EE281, Co-requisite(s): EE212*
Contents:	
• Transient and steady state response of first order circuits. • Transient and steady state response of second order circuits. • Phase and power measurements. • Frequency response and resonance. • Two port parameters-measurements. • Fourier analysis and synthesis of electrical signals. • Low pass, high pass, band pass and band-stop filters-design and testing. • Three phase measurements (voltage, current and power).	

EE311 Linear System Theory	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): ES212
Contents:	
• Classification of systems. • Continuous-time systems. • Block diagram, signal flow graph. • Concept of state space model of linear systems. • Solution of state equations. • The concept of controllability and observability. • Realization of state space model. • Introduction to the analysis of discrete-time systems. Difference equations, Z-transformation and its application to discrete systems, State space model of linear discrete systems, Controllability and Observability, Solution of systems.	

EE312 Control Systems	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE311
Contents:	
• Mathematical notations and definitions. • Mathematical modeling of physical systems and examples. • Closed-loop control systems: Characteristics. • Time domain analysis of control systems. • Stability of linear systems: Specifications. • Design of linear feedback control systems.	

EE 324 Logic Design	
3 Lecture hours per week, (3+6) 9 Units	Corequisite(s): EE311*
Contents:	
• Various number systems. • Boolean algebra and logic gates. • Simplification of Boolean functions. • Combinational logic. • Binary parallel adder. • Decimal adder. • Magnitude comparator. • Decoders and multiplexers. • Synchronous sequential logic: Introduction to flip-flops, RS flip-flop, JK flip-flops, T flip-flop and D flip-flop, Registers, parallel register, shift registers, design of logical circuits using flip flops and registers, counters, memory: ROM, RAM. • Hazards.	

EE325 Logic Design Laboratory	
3 Laboratory hours per week, (3+3) 6 Units	Corequisite(s): EE324*
Contents:	
• Binary and decimal numbers. • Digital logic gates. • Simplification of Boolean functions. • Combinational circuits. • Code converters. • Design with multiplexers, adders and subtractors. • Flip-flops. • Sequential circuits. • Counters.	

EE331 Electronics I	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): ES214, EE212
Contents:	
• Introduction to PN junction theory. • Diode operation, characteristics, large and small signal models. • Analysis of diode circuits. • Zener diode. • Diode applications such as clipping damping, rectification, regulation, function generation… etc. • Diode capacitance. • BJT theory: Operation, characteristics, large and small signal models. • BJT biasing. • CB, CE and CC amplifiers. • FET theory: Operation, characteristics, small signal model. • FET biasing, circuits and applications.	

EE332 Electronics II	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE331
Contents:	

- **Power amplifiers:** Classification graphical analysis, transistor limitation, class B push-pull and class C tuned power amplifiers, heat sinks.
- **Frequency response of amplifiers:** Multistage amplifiers, low frequency and high frequency response of BJT and FET, Gain-Bandwidth product, input and output impedance.
- **Difference amplifiers, operational amplifiers:** Ideal and practical Op-Amp, biasing, parameters and various configurations, balancing techniques.
- **Applications of Op-Amp:** Active filters using Op-Amp.
- **Feedback amplifiers:** Principles of negative feedback and its advantages, effect of feedback on gain stability, dynamic response, input and output impedances.
- **Sinusoidal Oscillators:** Principles of oscillation, various types of Oscillator's circuits: Tuned circuit, RC, Wien Bridge, Hartley, Colpitts and Crystal oscillators.

EE341 Electromechanical Energy Conversion I	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE212, EE222
Contents:	

- Single and polyphase transformers: equivalent circuits of transformers, parallel operation of transformers.
- Basic principles of electromechanical energy conversion.
- Basic principles of D.C. and A.C. machines.
- EMF generator and MMF for D.C and A.C. machines.
- Steady state performance of D.C. machines.
- Types of D.C. machines.
- Armature reaction.
- D.C. generator and motor characteristics, interpoles and compensating winding.

EE342 Electromechanical Energy Conversion II	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE341
Contents:	
• Polyphase synchronous machines: Steady state analysis. • Polyphase induction machines: Steady state analysis. • A.C. machine transients. • Single phase machines.	

EE351 Electrical Measurements	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE282
Contents:	
• Fundamentals: Units, significant figures, errors, statistical evaluation of measured data, principles of measurement. • Instrumentation: Electromechanical and electronic meters, meter features, oscillograph and oscilloscope. • Measurements: Voltage, current, resistance, induction, capacitance and energy.	

EE381 Electronics Laboratory I	
3 Laboratory hours per week, (3+3) 6 Units	Prerequisite(s): EE282, Corequisite(s): EE331*
Contents:	
• Diode characteristics and parameters. • Diode response to large and small signals. • Diode clipping and damping circuits. • Diode application in rectifier circuits. • Zener diode characteristics and application as a voltage regulator. • Transistors characteristics, and large signal parameters. • Transistor small signal parameters. • Design and testing of CE amplifiers.	

EE382 Electronics Laboratory II	
3 Laboratory hours per week, (3+3) 6 Units	Prerequisite(s): EE381, Corequisite(s): EE332*
Contents:	
• Design of CE amplifier and frequency response plot. • Emitter-follower circuit and Darlington pair connections of BJT. • JFET characteristics and parameters. • Common-source amplifiers. • Design of RC coupled amplifier with and without feedback. • Operational amplifier (Op-Amp) as a basic building block in the design of analog systems. • Design of 2^{nd} order active RC filters using Op-Amp: Low pass, High pass, Band pass, Band exclude filters. • Design of sinusoidal oscillator circuits using Op-Amp. • Design of a regulated power supply systems.	

EE384 Electrical Machine Laboratory	
3 Laboratory hours per week, (3+3) 6 Units	Corequisite(s): EE342*
Contents:	
• Three phase transformer. • D.C. motors and generators (shunt, series and compound). • Polyphase synchronous generators. • Single phase induction motors (capacitor start and run types). • Speed control of polyphase induction motors.	

EE409 Power System Analysis I	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE212, EE341
Contents:	
• Inductance of transmission lines. • Capacitance of transmission lines. • Current and voltage relations on a transmission line. • Generalized circuit constants. • Circle diagrams. • Structure of power systems. • Power system representation. • Power system components and their equivalent circuits. • Symmetrical three phase faults and components.	

EE410 Power System Analysis II	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE409
Contents:	
• Symmetrical components. • Unsymmetrical components. • Load flow analysis. • Methods controlling MW and MVAR flows. • Stability of power systems. • Economical operation of power system.	

EE 411 Digital Control Systems	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE312
Contents:	
• Basic of digital control system modeling. • Principles of signal conversion: Analog to Digital and Digital to Analog conversions, sampling process, timing considerations, and properties of zero and first order hold operations. • Discrete systems modeling: Linear difference equations, Z-transforms, mapping between S and Z domains, inverse Z-transform. • Z-plane analysis of discrete time systems: Transient response analysis and steady state error analysis, stability, Jury's stability test, root-locus analysis, pole assignment. • Bilinear transformations: Frequency response analysis, lead, lag and lead-lag compensators. • PID controllers. • State space design methods.	

EE412 Information Theory & Statistical Communication	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): EE 419
Contents:	
• Information Theory: Information, information entropy, information rate redundancy, Shannon's theorem for information rate in noisy channels. • Introduction to coding: Coding matched to entropy of message, error detection and correction, parity check, algebraic code and error syndrome. • Digital communications: Data communications, ASK, FSK, PSK and M-ary data communications system. • Decision theory: Optimum detection of signals in the white noise, matched filtering. • Fading channels: Diversity techniques, line of sight and troposcatter link design.	

EE419 Telecommunications I	
4 Lecture hours per week, (4+8) 12 Units	
Contents:	
• Introduction to signals and waveforms: Signals, waveforms, analysis using Fourier series and integral, power and energy spectral densities, filtering of signals, filter response, convolution and deconvolution, correlation between waveforms, autocorrelation and power relationships. • Modulation techniques: Modulators and detectors for AM, DSB-C, DSB-SC, SSB and comparison between the different techniques. • Angle and frequency modulation: Narrow and wide band FM systems, pulse modulations (PAM, PPM and PWM). • Multiplexing: Frequency division multiplexing (FDM), time division multiplexing (TDM). • Introduction to pulse code modulation (PCM). • Signal to noise ratio concepts and its calculations.	

EE420 Power System Protection and Control	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE312, EE409
Contents:	
• Structure of power systems, classification of power system protection and neutral earthing. • Basic terms used in PSP theory and practice, methods of discriminations, main components of PSP. • Non directional and directional over current protection. • Distance protection and differential protection. • Transformer Buchholz protection. • Automatic circuit reclosing, restoration and under frequency load shedding. • Power frequency control: Reactive power-voltage control, voltage control in electrical networks, computerized control and dispatch centers.	

EE422 Radio, T.V. and Radar	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE419
Contents:	
• Radio circuits and parameters: AM transmitter, AM super-heterodyne receiver, FM transmitter, FM receiver. • Television: Principles of black and white TV systems, B/W TV transmitter, B/W TV receiver, principles of color TV systems, color TV transmission, color TV reception. • Radar: Principles of radar, CW and FM radar, pulse radar, transmitter transmission track, antenna, receiver, inductor of a pulsed radar, MIJ radar.	

EE423 Microwaves	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE222
Contents:	
• Distributed circuit analysis of TEM mode transmission lines. • Rectangular and circular waveguides. • Different transmission modes of TE and TM. • Impedance transformation and matching techniques. • Passive microwave devices: Microwave resonators and filters, microwaves integrated circuits, PJN diodes, Gunn diode, ferrite isolator, chokes. • Scattering matrix. • Microwaves measurements.	

EE429 Power Electronics	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE332
Contents:	
• Large current electric components: Diodes, thyristors, triacs. • High power converters and special converters for D.C. transmission. • High frequency heating: induction and dielectric, influence of converters on supply network and special applications.	

EE430 Power Generation	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE342
Contents:	
• Basic contemporary energy resources. • Power generation in power system: Function of particular types of power stations, peak load and stand by power plants. • Fundamental knowledge of thermodynamics and thermodynamics cycles. • Thermal power stations: working cycles, fuels and generation efficiency, steam turbines and internal combustion plants, steam generators, hydropower stations and direct energy conversion. • Electric power utilization, illumination, industrial and commercial applications of electric power.	

EE431 Pulse and Digital Circuits	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE332
Contents:	
• Nonlinear wave shaping, inverter design. • Transient behavior of circuits containing a single reactive element. • Circuit design of DL, RTL, DTL, TTL, ECL and CMOS logic gates. • Regenerative switching and timing circuits.	

EE432 Integrated Electronics	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE332
Contents:	
• Integrated circuit fabrication and design, logic families, design and layout, memories and LSI techniques and applications. • Linear integrated circuits. • Digital to Analog and Analog to Digital conversion.	

EE434 Solar Energy	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE214, EE331
Contents:	
• Solar radiation, solar constant, spectral distribution, radiation on horizontal surfaces and tilted surfaces. • Available solar radiation, pyraheliometers and pyranometers, duration, of sunshine, estimation of clear sky radiation, atmospheric attenuation of solar radiation, beam and diffuse components of radiation (daily or monthly). • Solar cells: PN junction cell characteristics and equations, types of solar cells, solar cell output characteristics and limitations, photovoltaic array consideration, photovoltaic power system considerations, design of stand-alone PV system.	

EE 440 Transmission Line Design	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE409
Contents:	
• Electrical characteristics of a transmission line. • Mechanical characteristics of a transmission line. • Insulators, brushings, and underground cables.	

EE442 Medical Electronics	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE221, EE332
Contents:	
• Brief introduction to cell, tissue and physiological system, genesis of steady potential, action potential, propagated nerve impulses, volume conductor field, electrocardiography, electrocephalography and electromyography. • Transducers for recording biological events. • Amplifiers for biological signal recording. • Instrumentation for electrocardiographic, electrocephalographic and electromyographic signals. • Detection of physiological events by impedance techniques. • Magnetocardiograph, echocardiograph, casioscope, blood pressure recorder, telecorder and X-ray, display and recording devices for biological signals. • Diathermy. • Pacemakers and artificial aids, standardization of medical equipments.	

EE449 Control Instrumentation	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE312
Contents:	
• General structure of control systems, physics of control components, mechanical and electrical quantities equivalencies. • Transducers of non-electrical quantities. • Typical control components. • Design of control system in light of relative merits of various control components.	

EE450 High Voltage	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE342
Contents:	
• Application of high voltage. • Insulation equivalent circuit and parameters: Resistance, capacitance, polarization, absorption factor, loss factor, permittivity, resistivity, electrical strength. • Field distribution in insulation systems, grading, resistively and capacitively controlled field distribution. • Electrical discharge in gases, liquids and solids. • Electrical strength of insulation systems. • Overvoltages in power systems. • Impulse voltage. • Insulation coordination idea.	

EE451 Electronics Instrumentation	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE351
Contents:	
• Electronic analog and digital voltmeters, electronic multimeters, electronic component meters, Q-meters, special purpose electronic meters. • Introduction to vector voltmeters and vector impedance meters, single and double beam cross, applications of CROS. • Storage, sampling and digital readout oscilloscopes, oscillators, pulse generators, function generators, different types of wave analyzers simple frequency counter. • Measurement of periods, different types of transducers, measurements of strain, displacement, temperature, light and radiation. • Use of electronic instrumentation in scientific measurements.	

EE452 Antennas and Propagation	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE222
Contents:	
• Review of relevant electromagnetic theory: Maxwell's equations, boundary conditions, Poynting vector and power flow, wave equation, time varying plane, waves in various medias. • The far-field expressions of actual and equivalent source antennas: The Sratton-Chu solution, vector potential, the Schelkunoff field equivalence principles. • The far-field basic properties of antenna: Radiation pattern, gain, directivity, reciprocity, polarization, impedance, antenna's noise temperature and bandwidth, aperture, current elements. • Different types of antennas: Ideal dipole, short, dipole, long dipole, folded dipole, loop antenna, helical (helix) antenna, horn antenna, array antennas, parasitic elements in antennas and Yagi-Uda antenna. • Propagation: The basic of ground waves, tropospheric and ionospheric propagation.	

EE453 Antenna Laboratory	
3 Laboratory hours per week, (3+6) 9 Units	Prerequisite(s): EE 494, Corequisite(s): EE 452*
Contents:	
• Familiarization with antenna types, definitions and laboratory equipments. • Description the physical length and the electrical length of an antenna. • Plotting radiation patterns: calculating bandwidth and examining the polarization of different types of antennas: half-wave dipole, half-wave folded dipole, vertical end fed antenna (monopole antenna), parasitic arrays antenna (source, reflector and directors), Yagi-Uda antenna, slot antenna… etc. • Familiarization with the matching stubs. • Measurements of Gain and Standing wave ratio (SWR) of above antennas.	

EE459 Real Time Computer Appl.	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE312, EE492
Contents:	
• The role for one line, real time computer in engineering and management. • Hardware of real time computers. • Processors, storage, men-machine terminals interface, digital and analog inputs. • General configuration of computers. • Software of real time computers: Operation systems, languages. • Programming real time computers. • Parameters of existing real time minicomputers.	

EE460 Design of Electrical Systems	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE409
Contents:	
• Types of electrical systems. • Electric power systems. • Connection schemes, dimensioning conditions, normal load and fault conditions. • Thermal effect of normal and load current, power demand and calculations. • Thermal and dynamic effect of short circuit current rupturing capacity, circuit opening devices, loss calculations, power factor improvement, reliability and economics factor. • Lighting design, domestic and industrial electric systems. • Electric shock protection.	

EE470 Substation Equipments	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE409
Contents:	
• Classification of substation equipments and general requirements, substation equipments. • Short circuit level and circuit breaker rating. • Circuit interruption theory and process. • Different types of circuit breakers. • Reactive power compensation, earthing and testing of substation.	

EE472 Telecommunications Laboratory I	
3 Laboratory hours per week, (3+3) 6 Units	Prerequisite(s): EE 381; Corequisite(s): EE 419*
Contents:	
• LC circuits: Tuned circuits and coupled tuned circules. • Frequency analysis of periodic and modulated waveforms: Amplitude Modulation (AM), Double Sideband Full Carrier Modulation (DSB-FC), Single Sideband Modulation (SSB), Frequency Modulation (FM), Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Code Modulation (PCM), Delta and Sigma Modulations. • Sampling and receiver measurements.	

EE480 Electric Power Utilization	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE342
Contents:	
• Electrical motors for industrial drives, selection of motors and motors for particular services. • Electric heating and welding: Types of ovens and furnaces, and types of welding. • Electrolytic and electrometallurgical processes. • Illumination: basic calculations, types of devices. • Electric traction: calculations based on speed/time graphs, types of traction, speed control and electrical braking. • Storage batteries: Types and constructional features, charging and discharging, maintenance.	

EE484 Microwaves Laboratory	
3 Laboratory hours per week, (3+3) 6 Units	Corequisite(s): EE423*
Contents:	
• VSWR, reflection coefficient and impedance measurements, Smith chart. • Frequency and guide wavelength measurements. • Directional coupler, hybrid T and ferrite isolator measurement. • PJN diode modulator and Gunn diode oscillator measurements.	

EE 491 Control Laboratory	
3 Laboratory hours per week, (3+3) 6 Units	Corequisite(s): EE312*
Contents:	
• Analog computers: Passive and active computing components, introduction to analog technique and its application to simulation of control systems, simulation of open-loop and closed-loop control systems, time scaling and magnitude scaling. • Servomechanism: Motor characteristics and error channel investigation in modular servo-type MS-150 system, simple position control system (open-loop and closed-loop), simple speed control system, deadband and overshoot as functions of gain.	

EE492 Microprocessors and Applications	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE324
Contents:	
• Review of logic gates and memory devices. • Introduction to computers, microcomputer structure and operation, microprocessor hardware. • Programming the microprocessor.	

EE493 Microprocessor Laboratory	
3 Laboratory hours per week, (3+3) 6 Units	Corequisite(s): EE492*
Contents:	
• Familiarization with microcomputer kit, simple arithmetic addition and subtraction programs, logical operations, decimal and hexadecimal arithmetic programs. • Input/Output monitor interface, delay routines, stepper motor speed and direction control, monitoring analog to digital converters, waveform generation using digital to analog conversion.	

EE494 Telecommunications II	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE419
Contents:	
• Probability and random variable introduction, conditional probability and statistical independence, probability distribution and density function, transformation of random variables. • Autocorrelation and power spectra. • Noise: Thermal noise, equivalent noise bandwidth, noise in cascade systems, noise effect in modulation systems, AM detection performance, angle modulation detection performance, noise in PCM, performance of complete systems, digital system comparison. • Digital communications: Basic PCM encoding and quantization, baseband encoding forms, RF digital modulation methods, differential and quadriphase shift keying, data communication. • Information and channel capacity, measurement of information/communication channels, discrete communication channels, continuous channels.	

EE495 Telephony and Teletraffic	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE419
Contents:	

- General description of the public telephone network.
- Telephone terminals.
- CCITT recommendations.
- Analog telephone networks.
- Evolving digital networks.
- Voice band data transmission.
- Space division switching.
- Time division switching.
- PCM switching.
- Network synchronization.
- Teletraffic of telephone networks.

EE497 Electroacoustics	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): EE332
Contents:	

- Basics of electroacoustic, physical quantities of sound waves, the relationship between excess pressure and particle velocity of a plane sound wave in air, audible perception and the subjective value.
- Masking effect, spherical waves, specific acoustic impedance, acoustic intensity and energy density.
- Analog between mechanical and electrical circuit, the electromechanical analogy for acoustic system, electro-acoustical analogy for acoustic system electro acoustical analogy.
- Electroacoustic transducers classification: electromagnetic transducers (electrodynamics transducers and moving iron plate transducer), Electrostatic transducers (condenser transducer and PIEZO electric transducer.
- Microphones (μ-phones): technical characteristics, moving coil electromagnetic μ-phone, carbon μ-phone, capacitive μ-phone, dynamic ribbon μ-phone, PIEZO electric μ-phone.
- Loudspeakers (LS): simple theory of LS, moving coil LS.

EE499 Final Project I	
3 Lecture hours per week, (3+5) 8 Units	
Contents:	
• First part of the project course: Problem definition, collection of relevant data, investigation of preliminary solutions. • Some theoretical and experimental or computer work, submission and defense of a written formal report.	

EE500 Final Project II	
3 Lecture hours per week, (3+12) 15 Units	Prerequisite(s): EE499
Contents:	
• Continuation of the assigned research project in EE 499 by completing a more extensive investigation. • Submission of a comprehensive written report. • Oral presentations of project.	

ES120 Chemistry
Contents:
• Atomic structure periodic table, gaseous state, thermo-chemistry. • Introduction to the different classes of organic compounds with special emphasis of functional groups, nomenclature, isomerism, and fundamental concepts about structure and reactivity. • Artificial radioactivity, chemical bonds, theories of covalent bond, classification of compounds, the chemical behavior of some common substances, thermodynamics, electrochemistry, solid state chemistry and the organic reaction of alkanes, cycloalkanes, alkenes, alkynes, alkyl halides, alcohols, aldehydes and ketones with detailed study of reaction mechanism.

ES170 Arabic Language (لغة عربية)

Contents:

- النحو: الجملة الفعلية (الفعل، نائب الفاعل، الفاعل، المفعول به)، الجملة الاسمية (المبتدأ والخبر، كان وأخواتها، إن وأخواتها)، نصب وجزم الفعل المضارع، العدد المفرد المركب، ألفاظ العقود، تمييز العدد، الحال، المفعول لأجله، المفعول المطلق، الجر بالحروف، الجر بالإضافة، الجر بالتبعية.
- النصوص: سورة الزخرف (من الآية ٨٣ إلى الآية ٨٥)، قصيدة غيري يغيره الفعال الجافي لأبي فراس الحمداني، قصيدة غرناطة لنزار قباني، قصيدة وداع لأحمد رفيق المهدوي، موشحة جادك الغيث للسان الدين بن الخطيب، رثاء زوجة لمحمد بن عبد الملك الزيات، قصيدة يا ظبية البان للشريف الرضي، وجميع النصوص مقررة حفظاً ودراسة.
- الكتابة والإملاء: الأبجدية، حروف المد، همزتي الوصل والقطع، التاء المربوطة والمفتوحة، الألف الفارقة، حذف النون من آخر الكلمة، حذف حرف العلة من الأمر المضارع المجزوم، استعمال من وما الاستفهاميتين مع حروف الجر، الألف اللينة في آخر الأسماء والأفعال، علامات الترقيم، الكشف في المعاجم، صياغة الأفعال الثلاثية وغير الثلاثية.
- الدراسات الإسلامية: تتم دراسة هذا الفصل ضمن منهج اللغة العربية وتعطى فيه مواضيع السور القرآنية والأحاديث النبوية وأركان الإسلام.

ES180 English Language

Contents:

This course is designed for first year students of engineering, it consists of four parts:

- A short refresher course in ordinary English to help bridge the gap between school and university standards, oral approaches and techniques are used.
- A lengthy intensive course in scientific English to enable the students to understand their lectures and textbooks on engineering topics.
- A more advanced course in ordinary English to improve the student's standards in the four basic language skills.
- A still more intensive course in scientific English to enable the students to pursuer their higher and more complex studies in engineering.

ES201 Differential Equations	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): ES100
Contents:	
• Basic concepts, first order differential equations, equations of second and higher order differential equations, boundary value problems, series solutions. • Some classical equations, system of first order equations, Laplace transforms and operational methods, simple numerical methods, linear differences equations.	

ES206 Linear Algebra	
4 Lecture hours per week, (4+8) 12 Units	Prerequisite(s): ES100
Contents:	
• Vector spaces, matrices and determinants, simultaneous linear equations, linear transformations, eigenvalue problems, canonical forms, numerical linear algebra. • Linear differential equations, linear programming, linear product spaces. • Applications in various areas such as control theory, statistics, linear circuits and vibration theory.	

ES214 Material Science	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): ES120
Contents:	
• Simplified atomic theories, energy bands, periodic table, chemical bonds, structure of materials, • Dielectric properties of materials: dielectric susceptibility of different types, temperature and frequency dependence of dielectric constant, Ferro-electric material and their applications. • Magnetic properties of materials: magnetization, classification according to magnetic properties, Ferro-magnetism, hard and soft magnets, permanent magnets, ferrites. • Conductivity: theory of specific resistance, temperature dependence, super conductivity. • Semiconductors and devices, energy bands.	

ES261 Fundamentals of Computers and Programming
Contents:
• Introduction to the organization and characteristics of computers: Concepts of an algorithm, flow charts. • The programming process: Programming in BASIC, applications to numerical and non-numerical problems.

ES302 Numerical Analysis	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): ES201, ES206, ES261
Contents:	
• Principles and techniques of numerical mathematics commonly used by engineers. • Topics included are: numerical solutions of algebraic systems, eigenvalue problems, numerical integration, the solution of non-linear equations, interpolation and approximation, solutions of ordinary and partial differential equation. • Additional topics are: fast Fourier transform, linear and dynamic programming. Students shall be trained to organize mathematical problems for solution on digital computers.	

Mechanical Engineering-Courses For EE-Students

ME100 Engineering Drawing
Contents:
• The need for a graphical language, use and care of drawing instruments and equipment. • Freehand sketching, orthographic projections, sectioning and dimensioning of single machine elements. • Isometric drawing and dimensioning, space analysis of points and lines with applications. • Thread dimension, standard M/C elements assembly, inking space analysis, views of a point, lines, true length of line and oblique lines, bearing slope and grade. • Steel structure drawing.

Industrial Engineering-Courses
For EE-Students

IE307 Engineering Economy	
3 Lecture hours per week, (3+6) 9 Units	Prerequisite(s): ES100, Co-requisite(s): EE 500*
Contents:	
• A study of methods for determining the comparative financial desirability of engineering alternatives. • Topics include: interest, time value of investment, break even and minimum cost analysis, replacement analysis, and depreciation analysis. • The computer use in solving some problems in engineering economy.	