أرقام ومسبقات مواد قسم الهندسة الكهربائية الإلزامية والاختيارية لدفعة 2015 وما بعد
ELECTRICAL ENGINEERING COURSES

0610-212 Advanced Mathematics for Electrical Engineering (3-0-3)
(Pre-requisite: 0600-205)

0610-213 Linear Circuit Analysis (3-0-3)
(Pre-requisites: 0600-205; 0600-207)
Operational amplifier, balanced three-phase circuits, circuit response using Laplace transform frequency selective circuits, Fourier series, Fourier transform, two-port networks.

0610-233 Electronics I (3-0-3)
(Pre-requisites: 0600-205; 0600-207; Co-requisite: 0610-234)

0610-234 Electronics Laboratory I (0-3-1)
(Pre-requisites: 0600-207; Co-requisite: 0610-233)
Laboratory experiments related to 0610-233 course contents.

0610-297 Cornerstone Design (3-2-3)
(Pre-requisites: 0600-209; 0612-262; Co-requisite: 0610-333)
Introduction to design process, creativity in design, development of skills needed for design including: project specifications, planning and scheduling, circuits/components selection, circuit simulation using computer tools, circuits construction and testing. Effective application of communication skills and teamwork. Considerations are given to realistic constraints such as economic factors, safety, reliability, and ethics. Students are expected to work on multiple hands-on engineering projects.

0610-312 Signals and Systems (3-0-3)
(Pre-requisites: 0610-213; 9988-221)
Introduction to signals and systems, continuous and discrete, differential and difference equations, solution of differential and difference equations using Laplace and Z-transforms, convolution and its properties, frequency domain analysis of linear systems, transfer functions, BIBO Stability, introduction to state space analysis.
0610-320 Electromagnetic Field Theory (3-0-3)
(Pre-requisites: 0610-212; 0610-213)

Plane waves in lossless and lossy media plane waves in good conductors, Poynting’s theorem, Reflection and transmission of plane waves at planar interfaces, total internal reflection and zero reflection, transmission lines and matching schemes using Smith chart, Waveguides and resonators, topics of waves with applications, introduction to antennas.

0610-333 Electronics II (3-0-3)
(Pre-requisite: 0610-213; 0610-233; Co-requisite: 0610-334)


0610-334 Electronics Laboratory II (0-3-1)
(Pre-requisite: 0610-234; Co-requisite: 0610-333)

Laboratory experiments related to 0610-333 course contents.

0610-343 Energy Conversion I (3-0-3)
(Pre-requisite: 0610-213)

Magnetic circuits, mutual inductance, single-phase power transformers, synchronous generators, induction motor, and DC motors.

0610-345 Energy Conversion Laboratory I (0-3-1)
(Pre-requisite: 0610-343)

Laboratory experiments related to 0610-343 course contents.

0610-350 Power System Analysis I (3-0-3)
(Pre-requisites: 0600-307; 0610-343; Co-requisite: 0610-345)

AC power and the per unit system, determination of transmission line parameters, transmission line models in the transient and the steady state, power system modeling, power system Admittance matrix and network calculations, load flow solutions and control.

0610-370 Control Theory I (3-0-3)
(Pre-requisite: 0610-312; Co-requisite: 0610-374)

Features of feedback control systems, modeling of specific control systems examples, transfer functions, block diagram and signal flow graph, time domain analysis of control systems, stability of linear systems, basic control actions and response of control systems, root locus analysis and design, frequency domain analysis and design of control systems.
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<td>0610-374</td>
<td>Control Laboratory I</td>
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<td>Laboratory experiments related to the contents of 0610-370.</td>
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<td>0610-381</td>
<td>Communication Theory</td>
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<td>(Pre-requisites: 0610-312; 0600-304)</td>
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<td>Introduction to communication Systems, signal spectral analysis, signal transmission and channel characterization, amplitude modulation (Analog), angle modulation (Analog), behavior of analog communication systems in the presence of noise, PCM and delta modulation schemes, introduction to digital communication systems.</td>
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<tr>
<td>0610-384</td>
<td>Communication Laboratory</td>
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<td>0610-385</td>
<td>Introduction to Digital Signal Processing</td>
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<tr>
<td>0610-399</td>
<td>Electrical Engineering Field Training</td>
<td>(0-10-3; 200 hours of training)</td>
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<td>(Pre-requisites: Completion of 100 credit hours; consent of the Electrical Engineering Department; consent of the Engineering Training Center)</td>
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<td>Students should attend a training program at one of the approved institutions engaged in electrical engineering practices. The objective is to gain practical experience in real engineering problems. The student should submit a formal report related to the program attended at the end of the training period. A minimum of 200 hours of supervised training is required.</td>
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<td>0610-410</td>
<td>Active Filter Design</td>
<td>(3-0-3)</td>
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<td>(Pre-requisites: 0610-233; 0610-234; 0610-312)</td>
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<td>The approximation theory, Passive Butterworth LP filter design, frequency band transformation and the design of Passive HP, BP and BE Butterworth filters, design of Passive Chebyshev LP, HP, BP and BE filters, design of inverse Chebyshev LP and HP filters, delay equalization, sensitivity analysis, active Filter Design with Operational amplifiers and their finite gain effects, bilinear and biquadratic transfer functions and their RC-op amp realizations, cascade realization of higher-order filters- Leap frog filters, synthetic L and FDNR Simulations.</td>
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<td>0610-414</td>
<td>Industrial Control Laboratory</td>
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0610-415 Instrumentation and Measurements Laboratory (Co-requisite: 0610-416) (0-3-1)

Laboratory experiments related to 0610-416 course contents.

0610-416 Instrumentation and Measurements (Pre-requisites: 0610-333; 0610-334) (3-0-3)

Electrical sensors and transducers, analog and digital signal conditioning techniques, A/D and D/A converters, signal multiplexing, digital signal processing of data, data acquisition systems, microprocessor based instrumentation, noise sources.

0610-417 Network Synthesis (Pre-requisite: 0610-213) (3-0-3)

Properties of positive real functions, Foster’s and Cauer’s methods for LC-RC and RL networks, Brunei’s impedance synthesis method, lossless two-port networks, Cauer’s two-port method, transfer function, partial pole removal, zero shifting, the synthesis of doubly terminated reactance two-port network, transducer parameter H(s), relations between H(s) and Z or Y parameters, reactance ladder realization, approximation theory, Butterworth and Chebyshev approximations, design of filters.

0610-420 Antenna and Propagation (Pre-requisite: 0610-320) (3-0-3)

Retarded potentials, radiation from a short current element and linear wire antenna, antenna parameters, radiation from arbitrary current distribution, antenna impedance, arrays: uniform, binomial, Chebyshev, aperture-type antenna, receiving antenna, line of sight propagation, ground-wave propagation, ionospheric propagation.

0610-421 Microwave Engineering (Pre-requisite: 0610-320) (3-0-3)

Passive microwave circuit components, reciprocal and nonreciprocal, CAD tools, scattering matrix representation of microwave circuit, microstrip line circuits, microwave measurements, active Microwave sources and amplifiers.

0610-422 Fiber Optics (Pre-requisites: 0610-320; 0610-381) (3-0-3)

Theory of light guidance on planar dielectric sheets and on dielectric rods, signal loss and dispersions on fibers, attenuation and dispersion measurements, principles of optical sources and detectors, system design, lab work on OTDR and dispersion measurement sets.

0610-423 Computational Electromagnetics (Pre-requisite: 0610-320) (3-0-3)

Numerical Techniques for solving electromagnetic problems: Finite Differences, Richardson’s Extrapolation, Relaxation Method, Finite Difference Time-Domain
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**0610-424 Microwave Lab**
*(Pre-requisite: 0610-320; Co-requisite: 0610-421)*

Laboratory experiments related to 0610-421 course contents

**0610-425 Electromagnetic Compatibility**
*(Pre-requisite: 0610-320)*

Introduction to Electromagnetic Fields, sources of electromagnetic interference, conducted and radiated interference, grounding and shielding, electromagnetic interference filtering, electromagnetic compatibility standards, compatibility measurements and Testing.

**0610-426 Introduction to Remote Sensing**
*(Pre-requisite: 0610-381)*

Radiation Characteristics, airborne and space-born sensors and instruments, satellite systems, multispectral/Hyperspectral Data Compression, transmission, archiving, and distribution, spectral signature characteristics of soil, vegetation, water, and cloud, Multispectral/Hyperspectral Data Processing, analysis, and classification, active radar and microwave remote sensing, applications of remotely sensed data in reconnaissance, agriculture, geology, hydrology, forestry, oceanography, meteorology, & ecosystem studies

**0610-428 Wireless Communication Networks**
*(Pre-requisite: 0610-381)*

Introduction to wireless communication principles, the cellular concept-system design issues, signal propagation and link budgets for wireless links, communication over fading channels, modulation, multiplexing, and multiple access techniques, channel coding for wireless systems, speech coding for wireless networks, and wireless communication networks.

**0610-430 Semiconductor devices**
*(Pre-requisites: 0610-234; 0610-233)*

Review of solid state physics fundamentals, solid state energy band structure, electron and hole statistics, theory of electric conduction in semiconductors, generation recombination phenomena, PN junction static and dynamic behavior, non-ideal PN junction behavior, operation at microwave frequencies, the PIN diode, metal semiconductor contacts, the MOS capacitor, the MOSFET transistor, ideal and non-ideal behavior of the MOSFET transistor, short channel effects in MOSFETs, hot electron effects in MOSFETs, the Bipolar Junction Transistor, long base and short base BJT: ideal and non-ideal behavior, the Early effect, the Kirk effect, operation at microwave frequencies, hetero-junction devices, photonic devices, semiconductor device processing, novel processing techniques, new applications of semiconductor materials and devices.
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0610-432 Analog Integrated Circuits
(Pre-requisites: 0610-333; 0610-334; 0610-312) (3-0-3)

Types of signals and systems, thin and thick film (hybrid) technology, MOS and Bipolar technology and modeling, switched capacitor (SC) resistor simulation, MOS SC integrators, first order SC building blocks, SC biquads, basic analog building blocks, current mirrors, comparators, Transconductance and Operational amplifiers, realization and design, examples of Non-Linear Circuits.

0610-433 Digital Integrated Electronics
(Pre-requisites: 0610-233; 0610-234; 0612-262) (3-0-3)

Overview of digital circuit design, CMOS inverter, CMOS logic gate circuits, Pseudo-NMOS logic circuits, pass transistor logic circuits, dynamic logic circuits, latches and flip-flops, multivibrator circuits, semiconductor memories (RAM and ROM), Bipolar Transistor Transistor Logic (TTL), Bipolar Emitter coupled logic circuits (ECL), BiCMOS digital circuits.

0610-434 Digital Integrated Electronics Laboratory
(Co-requisite: 0610-433) (0-3-1)

Laboratory of 0610-433.

0610-436 VLSI Design Laboratory
(Pre-requisites: 0610-233; 0610-234; Co-requisite: 0610-437) (0-3-1)

Laboratory experiments related to 0610-437 course contents.

0610-437 Introduction to VLSI design
(Pre-requisites: 0610-233; 0610-234; 0612-262) (3-0-3)

Introduction to MOS technology, gate level minimization, scaling of MOS technology and circuits, layout algorithms and techniques, combinational CMOS digital blocks, aspects of system timing, synchronous and asynchronous sequential logic, register transfer level, programmable logic and FPGA’s, introduction to HDL, design project.

0610-438 CAD for VLSI design
(Pre-requisites: 0612-262; and (0610-433 or 610-437) ) (3-0-3)

Implementation strategies for digital IC’s, interconnects, more on timing issues in digital circuits, design of arithmetic building blocks, finite state machines, design of memories and array structures, introduction to digital circuit simulation, placement and routing and synthesis design tools, configuration and implementation of designs on FPGA’s, Testing and Verification techniques of digital circuits, design project.

0610-439 Semiconductor and Solid State Optoelectronics
(Pre-requisite: 0610-233) (3-0-3)

Overview on the nature of light using both the classical and the modern approach. Light generation, propagation and interaction with matter. Optical waveguides and optical
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0610-443 Energy Conversion II
(Pre-requisites: 0610-343; 0610-345)


0610-444 Energy Conversion Laboratory II
(Co-requisite: 0610-443)

Laboratory experiments related to 0610-443 course contents.

0610-446 Introduction to Power Electronics
(Pre-requisites: 0610-233; 610-312)

Specifications of Diodes, Thyristors and Transistors, switches and switch matrix, Diodes and Thyristor rectifiers with AC and DC source excitation, AC voltage controllers, single, and three-phase controlled rectifier circuits, DC-DC converters (Choppers), DC-AC inverters, switching losses and snubber circuits.

0610-447 Power Electronics Laboratory
(Pre-requisite: 0610-333, 0610343, Co-requisite: 0610-446)
Laboratory experiments related to 0610-446 course contents.

0610-452 Power System Analysis II
(Pre-requisite: 0610-350)

Economic dispatch operation of power system, Bus impedance model, Symmetrical three-phase fault, calculation of symmetrical components for Unsymmetrical faults, Unsymmetrical faults, power system stability, steady state and transient stability.

0610-454 Power System Analysis II Laboratory
(Co-requisite: 0610- 452)
Laboratory experiments related to the contents of 0610-452: Electrical Power systems II.

0610-455 Computer Methods in Power System Analysis
(Pre-requisite: 0610-452)

Network models and matrices, Z-Bus algorithms, table-of-factors and sparcity programming, three-phase networks, untransposed lines, symmetrical components, 3-phase network matrices, fault studies, Numerical methods, load flow studies, transient stability
studies, swing and machine equations, load network representation, Multimachine transient, Stability programs.

**0610-456 Power Apparatus and Systems** (3-0-3)
(Pre-requisite: 0610-350)

Power network protection, circuit breakers, electromagnetic transients, economics of power supply.

**0610-458 Electric Power Distribution Engineering** (3-0-3)
(Pre-requisite: 0610-350)

Power distribution, load characteristics, distribution transformers, subtransmission networks, design of primary and secondary systems, voltage drop and loss calculations, capacitor applications, distribution system voltage regulation.

**0610-460 Communication Networks** (3-0-3)
(Pre-requisites: 0610-213; 0612-262; Completion of 100 credits)

Introduction to networking, network Protocols & Architecture, LAN/WAN, Circuit Switching and Packet Switching Networks, Network Design, Network Resource management, Networks' performance evaluation, and Network’s security.

**0610-462 – Selected Topics in Communication Networking** (3-0-3)
(Pre-requisites: 0610-460, or Consent of the Electrical Engineering Department).


**0610-470 Digital Control Laboratory** (0-3-1)
(Co-requisite: 0610-473)

Laboratory experiments related to the contents of 0610-473.

**0610-472 Control Theory II** (3-0-3)
(Pre-requisite: 0610-370, 0610-374)

Matrix Theory, eigenvalues and eigenvectors, diagonal form representation, jordan form matrix representation, state variables and state diagrams, solution of linear time, invariant state equations, controllability and observability, feedback design: state and output feedback design, observer design and observer-based control schemes, separation principle, case studies.

**0610-473 Digital Control** (3-0-3)

Pre-requisites: 0610-370; and (0610-318 or 0610-385); Co-requisite: 0610-374

Sampling and reconstruction, D/A and A/D converters, open loop discrete-time control systems, closed loop discrete-time control systems, stability of discrete-time control
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systems, design of digital controllers, design of estimators for discrete-time control systems, case studies.

0610-475 Industrial Control (3-0-3)
(Pre-requisites: 0610-370; 0610-374, Co-requisite: 0610-414)

Basic components of industrial control systems, design and Tuning of feedback controllers for industrial systems, advanced control techniques for industrial systems, multivariable industrial control, case studies.

0610-476 Nonlinear Control (3-0-3)
(Pre-requisite: 0610-472)

Introduction and fundamentals of nonlinear systems, phase plane analysis, Lyapunov stability, feedback linearization, sliding mode control, output feedback control, back stepping control, case studies.

0610-477 Optimization Techniques (3-0-3)
(Pre-requisite: 0610-312)

Introduction to optimization and Mathematical review, formulation of optimization problems, linear programming: the simplex method, duality, applications of linear programming, nonlinear programming: unconstrained single variable and multivariable optimization, constrained single variable and multivariable optimization, case studies.

0610-478 Intelligent Control (3-0-3)
(Pre-requisites: 0610-370; 0610-374)

Mathematics of fuzzy sets and logic, fuzzy rule based and fuzzy inference engines, Fuzzifiers and defuzzifiers, fuzzy systems and their properties, design of fuzzy controllers using clustering and table look-up scheme, introduction to other AI techniques.

0610-479 Adaptive Control Techniques (3-0-3)
(Pre-requisite: 0610-472)


0610-480 Introduction to Data Compression (3-0-3)
Pre-requisites: 0600-304; 0610-381; (0610-318 or 0610-385)

0610-482 Digital Communications (3-0-3)
Pre-requisites: 0610-381; and (0610-318 or 0610-385)


0610-483 Digital Communication Laboratory (0-3-1)
(Co-requisite: 0610-482)

Laboratory experiments related to 0610-482 course contents.

0610-485 Digital Signal Processing (3-0-3)
Pre-requisites: 0600-304; 0610-385)

Digital filters design: IIR and FIR. Windowing, frequency sampling, S-to-Z methods, frequency-transformation methods. Advanced digital signal processing topics: flow graphs, realizations, quantization effects, linear prediction, statistical and deterministic least squares filter design, finite length register effects and their optimization in digital filters, introduction to adaptive filtering. 2-dimensional filter design.

0610-486 Digital Signal Processing Laboratory (0-3-1)
(Co-requisite: 0610-485)

Laboratory experiments related to 0610-485 course contents.

0610-487 Radar Technology (3-0-3)
(Pre-requisite: 0610-381)


0610-488 Digital Image Processing (3-0-3)
(Pre-requisite: 0610-312)

An image model, sampling and quantization and basic relationships between pixels, Imaging geometry, two dimensional Fourier transforms, image enhancement: spatial, domain and frequency-domain methods, image restoration, image segmentation.
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0610-489 Artificial Neural Systems (3-0-3)  
(Pre-requisite: 0610-312)

Artificial neural system: preliminaries, fundamental concepts and models of artificial neural system, single layer preceptor classifiers, multi-layer feed forward networks, single layer feedback networks, associative memories, matching and self organizing networks, applications of neural algorithms and systems, neural network implementation.

0610-490 Special Topics in Electrical Engineering (3-0-3)  
(Pre-requisites: Completion of 110 Credits and only for Electrical Engineering students)

Formal classroom instruction of a new topic.

0610-495 Senior Project (0-9-3)  
(Pre-requisites: Consent of the Department)

The student undertakes an independent project (theoretical, and/or, practical, and/or research topics) under the supervision of a faculty advisor. The objective is to provide the student with an opportunity to integrate and apply the knowledge gained throughout his course in an actual problem. The student must document his study in a technical report and give an oral presentation.

EE 497 Engineering Design (3-0-3)  
(Pre-requisites: 0610-297;0610-334; Completion of 110 credit; Consent of the Department)

Application of basic sciences, mathematics and engineering sciences to the design, construction and operation of components, equipments or systems, consideration is given to realistic constraints such as economic, environmental, and social factors. Safety, reliability, aesthetics, and ethics are also considered.