Bachelor of Science in Electronic Engineering Course Description

General Education Requirements Courses

ARAB200	Arabic Language and Literature	3crs		
This course is a comprehensive review of Arabic Grammar, Syntax, major literature and poetry styles, formal and business letters. تتألف مادة اللغة العربية وادابها لغير المتخصصين من ثلاثة اقسام،أحدها يتناول دروسا اساسية في النحو والصرف والبلاغة،والثاني يتناول مباحث في الادب والتحليل،أما القسم الثالث فيعالج بعض تقنيات التعبير والتواصل.				
CULT200	Introduction to Arab – Islamic Civilization	3crs	ENGL151	
The purpose of this course is to acquaint students with the history and achievements of the Islamic civilization. Themes will include patterns of the political and spiritual leadership; cultural, artistic, and intellectual accomplishments.				
ENGL201	Composition and Research Skills	3crs	ENGL151	
This course focuses on the development of writing skills appropriate to specific academic and professional purposes; the analysis and practice of various methods of organization and rhetorical patterns used in formal expository and persuasive writing; the refinement of critical reading strategies and library research techniques; and the completion of an academically acceptable library research paper.				
ENGL251	Communication Skills	3crs	ENGL201	
The objectives of this course are to improve students' writing skills for academic purposes by developing effective use of grammatical structures; analytical and critical reading skills; a sensitivity to rhetorical situation, style, and level of diction in academic reading and writing; and competence in using various methods of organization used in formal writing.				

Core Requirements

CHEM200	General Chemistry	3crs	CHEM160, ENGL101	
This course covers the basic principles of chemistry. An in-depth study of electronic structure of atom, chemical periodicity, chemical bonding and molecular structure. Chemical equilibrium will focus mostly on acid base, redox reactions and other complex ionic equilibria followed by many solution reactions such as precipitation of buffers. The final part of this course describes the basic principles of thermodynamics of various states of matter, electrochemistry, and the kinetic aspects of chemical reactions.				
CSCI250	Introduction to Programming	3crs	ENGL051	CSCI250L
This course introduces structured programming using the C++ programming language, in the Win32 Console environment. The course teaches simple data types, selection and loop structures, functions, arrays, and strings and pointers. It is expected that enrolled students already know how to operate a computer, install programs, as well as willing to practice at home. At course's end the student will be able to write, test, and debug Structured C++ programs for the Win32 Console, using such advanced C++.				
CSCI250L	Introduction to Programming Lab	1cr		CSCI250
IENG300	Engineering Project Management	3crs		ENGL251
Provides the fundamental concepts of engineering project management. Introduces mathematical and software tools for organizing, planning, scheduling, monitoring, and controlling engineering projects. Demonstrates an application of these techniques in real life projects.				
MATH210	Calculus II	3crs	MATH160	
The course material includes hyperbolic functions and their inverses and their derivatives integration techniques, improper integrals, sequences, infinite series, power series, Taylor and Maclaurin series and application of power series. The mathematical software Maple will be introduced and used in support of the comprehension of the material.				
MATH220	Calculus III	3crs	MATH210	
This text covers basic topics on infinite series, lines and planes in space, cylinders and quadric surfaces, functions of several variables, limits and continuity, Partial derivatives, chain rule, directional derivatives, Gradient vector, tangent planes, double and triple integrals, areas, moments, center of mass, volumes, double integrals in polar forms, triple integrals in cylindrical and spherical coordinates, line integrals, vector fields Green's theorem, surface integrals, Stokes theorem, and the divergence theorem. Students are required to solve extensive number of problems and computer assignment using the mathematical software package Maple.				
MATH225	Linear Algebra with Applications	3crs	MATH160,MATH160T	
Introduction to the systems of linear equations and matrices, Gaussian eliminations, matrix operations, inverses, types of matrices, determinants and their applications, vector spaces, subspaces, linear independence, basis and dimension, rank and nullity, inner product spaces and orthogonal bases, eigenvalues and eigenvectors, applications from other disciplines such as physics, computer science, and economics.				

MATH270	Ordinary Differential Equations	3crs	MATH210	
First-order equations, linear and non-linear differential, linearization, numerical and qualitative analysis, second-order equations, existence-uniqueness theorem, series solutions, Bessel's and Legendre's functions, Laplace transforms, systems of differential equations, applications and modeling of real phenomena.				
MATH310	Probability and Statistics	3crs	MATH220, ENGL201	
Descriptive statistics, the concept of probability and its properties, counting methods, conditional probability, discrete and continuous random variables, expected value, distribution functions of random variables, the central limit theorem, random sampling and sampling distributions, Hypothesis testing.				
MATH360	Advanced Engineering Mathematics	3crs	MATH270, MATH225	
The topics covered in this course are: Fourier Series, Fourier Integrals and Transforms, Partial Differential Equations, the heat and the wave equation, and Laplace's equation, analytic functions, Cauchy-Riemann equations, harmonic functions, Cauchy's theorem, integral representation formulae, Power series of analytic functions, zeroes, isolated singularities, Laurent series, poles, residues, use of residue calculus to evaluate real integrals, use of argument principle to locate fractional linear transformations, and conformal mapping.				
MATH375	Numerical Methods for Scientists and Engineers	3crs	CSCI250, MATH270, MATH225	
Newton-Raphson Methods, Secant Methods, Interpolation and Langrage polynomial, divided differences, cubic spline interpolation, Trapezoidal and Simpson's rules, composite and Simpson's rules, Romberg integration, adaptive quadrature methods, guassian quadrature, Runge-Kutta method, multisteps methods; implicit and explicit methods, predictor-corrector methods, Gauss-siedel, LU-decomposition, QR-factorization, finite difference methods for linear and nonlinear problems, numerical solutions to systems of differential equations, Runge-Kutta methods for systems.				
MENG225	Engineering Drawing & CAD	3crs		
This course consists in two parts: 2 D and 3D. It can be defined as a tool in order to generate accurate drawings due to scales in 2 D and in 3 D. It focuses on drawings related to engineering. Drawings may be "descriptive", describing an object or a tool, or they may represent the first step of design (Design of tools and machines).				
MENG250	Mechanics I; Statics	3crs	ENGL051	MATH210
This course treats only rigid-body mechanics and forms a suitable basis for the design and analysis of many types of structural, mechanical, or electrical devices encountered in engineering. As the course name suggests, this course deals with the equilibrium of bodies that are either at rest or move with constant velocity. Therefore, this Statics course provides the students with the principles that treats the Statics of particles and rigid bodies, trusses, frames, machines; centroids, centers of gravity; and friction.				
PHYS220	Physics for Engineers	3crs	PHYS160, ENGL101	
Electricity, Electric Field and Electric Potential, Magnetism, Biot-Savarat Law, Ampere's Law, Faraday's Law, Fluid Mechanics, Wave Motion, Sound Waves, Superposition and Standing Waves, Temperature, Heat, Laws of Thermodynamics.				

Major Requirements

Course Code	Name	Credits	Prerequisite(s)	Co-requisite(s)
CENG300	Fundamentals of Digital Logic Design	3crs	EENG250	
This course gives an introduction to digital logic design with an emphasis on practical design techniques and circuit implementations. Topics include Boolean algebra, theory of logic functions, mapping techniques and function minimization, logic equivalent circuits and gate transformations, base conversion number notations and arithmetic; binary addition/subtraction circuits, decoder, encoder, comparator, Multiplexer and demultiplexer. Introduction to sequential circuits: Latches and flip-flops, state table and state equations, analysis of sequential circuits, Moore and Mealy state Machine. The basic notions of the gate-based circuits including gate delay propagation, Flip-Flop timing and programmable implementation are also described. Finally, the principle and the use of registers are introduced.				
CENG350	Digital Logic Systems	3crs	CENG300, CSCI250	CENG352L
This course introduces students to the principles of Microcontroller design and applications. Students will be introduced to the PIC microcontroller architecture, specifically the PIC 18Fxx2. Moreover, the course introduces programming using assembly language and C. Topics introduced will include: Arithmetic operations on microcontrollers, Timers: PWM and Capture/Compare modes, Interrupts, Asynchronous/Synchronous IO: USART, SPI, I2C.				
CENG352L	Digital Logic Systems Lab	1cr	CENG300	CENG350
CENG405	Microprocessor Organization and Architecture	3crs	CENG350	CENG405L
This course introduces fundamental concepts in computer organization and digital logic design, including computer arithmetic, MIPS processor design including ALU, datapath and controls, pipelining and Pipeline Hazards, Interrupts and Exceptions, virtual memory.				
CENG405L	Microprocessor Organization	1cr	CENG350	CENG405

	and Architecture Lab			
EENG250	Electric Circuits I	3crs	ENGL051	MATH210
Introduce techniques of DC circuit analysis (Node, Mesh, Superposition, & Source Transformation) containing ideal and dependent sources. Covers real power calculations, perform equivalent resistive circuits. Introduce concept of Thevinin and Norton equivalent circuits, basic concept of mutual inductance, and determine the transient responses of RL, RC, parallel and series RLC.				
EENG300	Electric Circuits II	3crs	EENG250	EENG301L
Introduce techniques of AC circuit analysis, containing ideal and dependent sources. Covers sinusoidal steady state power calculations, balanced three phase circuits, frequency selective circuits and two-port circuits.				
EENG301L	Electric Circuits Lab	1cr	EENG250	EENG300
EENG350	Electronic Circuits I	3crs	EENG250	EENG300, EENG350L
Semiconductor Diodes including Zener diodes and LEDs. Diode Applications including rectification, clipping, clamping, voltage regulation and voltage multiplier circuits. Bipolar Junction Transistors including construction and configurations. DC Biasing of BJT's, BJT AC analysis including Modeling. Field Effect Transistors including construction and types, FET Biasing, FET Amplifiers				
EENG350L	Electronic Circuits I Lab	1 cr.	EENG250	EENG350
EENG385	Signals and Systems	3crs	MATH270, EENG300	
Examine classification of signals and systems, impulse response and convolution, properties of LTI systems, Laplace transform; properties, system analysis, application of Laplace transform in circuit analysis. The properties of the z-transform. System analysis using the z-transform. Fourier representation of signals; Fourier series and Fourier transform.				
EENG400	Electronic Circuits II	3crs	EENG350	EENG400L
This course deals with BJTs and FETs frequency response analysis, examines operational amplifiers theory in order to discover its performance and applications, namely: Voltage summing, buffers, controlled sources, instrumentation circuits and active filters. The course also treats power amplifiers of different classes (Class: A, B, C and D). Finally, Voltage controlled oscillators, PLL and Digital to analogue converters will be also presented as well as the Analysis and design of different types of oscillators.				
EENG400L	Electronic Circuits II Lab	1 cr.	EENG350	EENG400
EENG425	Fundamentals of Optoelectronics	3crs	EENG350	EENG425L
This course describes the Basic operating principles of various types of optoelectronic devices which play important roles in commercial and communication electronics; light-emitting diodes, injection lasers, and photodetectors. It also introduces Step index fiber, graded index fiber, single mode and multimode fibers with their features. Also photodiodes and PN junctions will be explored as well as Polarizatrion and modulation of Light.				
EENG425L	Fundamentals of Optoelectronics Lab	1crs	EENG350	EENG425
EENG430	Electromagnetic Fields and Wav	3crs	PHYS220, MATH360	
This is an introductory course in Electromagnetics covering Vector analysis, Electrostatics, Magnetostatics, Maxwell's equations and Plane Wave Propagation.				
EENG435	Control Systems	3crs	EENG300, EENG385, MATH270	EENG435L
Introduction to Control Systems. Open and Closed-loop feedback systems. Modelling of dynamic. Block diagrams and signal flow graphs. Transient and steady state response analysis. Root-Locus analysis,. stability of control systems. Control system design (Lead, Lag, and Lead-Lag compensation), Frequency response analysis techniques. PID, PD and P correctors.				
EENG435L	Control Systems Lab	1 cr.	EENG300, EENG385, MATH270	EENG435
EENG450	RF Electronics	3crs	EENG350	
Design of RF integrated circuits for communications systems, primarily in CMOS. Topics include; Design of matching networks and low-noise amplifiers at RF, passive and active filters, mixers, modulators, and demodulators; review of classical control concepts necessary for oscillator design including PLLs and PLL-based frequency synthesizers. Design of low phase noise oscillators. Design of high-efficiency (e.g., class E, F) RF power amplifiers, coupling networks. Behavior and modeling of passive and active components at RF. Narrowband and broadband amplifiers; noise and distortion measures and mitigation methods. Overview of transceiver architectures				
EENG466	Analog Integrated Circuits	3crs	EENG400	
Analysis and design of MOS analog integrated circuits, emphasizing quantitative measures of performance and circuit limitations. Evaluation of circuit performance by means of hand calculations and computer-aided circuit simulations. Design of operational amplifiers and transconductance stages, broadband amplifiers, biasing circuits, and voltage references. Feedback amplifier design.				

EENG475	Digital Integrated Circuits	3crs	EENG400	**EENG485L**
EENG480	Electromagnetic Wave Propagations	3crs	EENG430	
This is an advanced course in Electromagnetics. Topics covered are: Transmission Lines, Waveguides, Antennas, Electromagnetic Interference, and Microwave Engineering.				
EENG485L	Analog and Digital Integrated Circuits Lab	1cr.	EENG400	EENG466, EENG475
EENG495	Senior Project	3crs	EENG350, CENG350	
This course concentrates on providing the students with technical skills, writing skills and oral skills. Technical skills are achieved by applying engineering physical laws to real life problems. Writing skills must be achieved through teaching the students standards used in technical reports and Journals. Furthermore, The project is defended by the students before a committee. The senior project outcomes are physical, analytical or numerical models.				

Remedial courses

Course Code	Name	Credits	Prerequisite(s)	Co-requisite(s)
CHEM160	Freshmen Chemistry II	3crs		
This course will cover the fundamental principles of chemistry such as the properties of gases and mass relationship in chemical reactions, atomic structure and bonding, molecular geometry, periodic properties and chemical reactions of elements. The basic concepts of chemical equilibrium, chemical kinetics, thermochemistry and electrochemistry will be also covered.				
Course Code	**Name**	**Credits**	**Prerequisite(s)**	**Co-requisite(s)**
MATH160	Calculus I	3crs		
This is the first course in Calculus. The topics of this course include rate of change, limits, continuity, inverse functions, trigonometric and hyperbolic functions, derivatives, chain rule and parametric equations, implicit differentiation, mean value theorem, curve plotting, indefinite integral, differential equations, integral rules, integration by substitution, estimating with finite sums, Reimann sums and definite integral, application to area, distance, volume and arc-length, fundamental theorem of calculus, and definite integrals, applications of integrals, volume by slicing and rotation about an axis, length of plane curves.				
Course Code	**Name**	**Credits**	**Prerequisite(s)**	**Co-requisite(s)**
PHYS160	College Physics	3crs		
This course is designed to provide an overview of algebra based introductory physics, which is a requirement for most undergraduate science major students. The scope of this course is to provide the basic understanding of mechanics, electricity and magnetism, and optics as described in the table shown below. It is recommended for students to be up to date in preparation and doing home works on time. If you are behind for one lecture it would be difficult to make it up for the rest of the semester.				
Course Code	**Name**	**Credits**	**Prerequisite(s)**	**Co-requisite(s)**
ENGL051	Basic English Skills	7crs		
This course instructs students in reading fluency, vocabulary, writing conventions, and academic skills necessary for university level. In this integrated skills class, students read and discuss texts on high-interest and current topics. The readings expose students to various genres of writing. Students focus on learning strategies for faster and better reading, such as skimming, scanning, predicting, inferring, analyzing and synthesizing information, while increasing their vocabulary building skills. Writing exercises connect to reading texts or themes and progress from controlled to free writing. Students learn to develop, organize and edit their work. Lower level students focus on the basic skills of paragraph writing while advanced students work toward gaining full competence in writing for academic or professional purposes.				
Course Code	**Name**	**Credits**	**Prerequisite(s)**	**Co-requisite(s)**
ENGL101	Introduction to Oral and Written Skills	7crs		
This course instructs students in reading fluency, vocabulary, writing conventions, and academic skills necessary for university level				
Course Code	**Name**	**Credits**	**Prerequisite(s)**	**Co-requisite(s)**
ENGL151	Advanced Writing Skills	6crs		
This course instructs students in reading -writing fluency, vocabulary, writing conventions, and academic skills necessary for university level.				

Master of Science in Electronic Engineering
Course Description

General Elective Requirements

ENGG500	Engineering Economics	3crs		
Basic concepts, Interest rate, types of compounding, economic equivalence, present and future value, capital recovery, net present value, rate of return, payback period and benefit cost ratio, investment appraisal, equipment replacement and retirement, depreciation and taxes, preparation and presenting an economic feasibility study.				
ENGG650	Engineering Profession and Ethics	3crs		
The practice of engineering in various disciplines; career development; administrative processes in the profession; ethical considerations; the relationship of engineering to society. Responsibility of professional engineers for public health and safety in the workplace. The technology-society relationship in a historical context; the nature of technological change and its consequences; the engineer's role in the control of technology and sustainable development; the responsibility of engineers for health and safety in the workplace, The development of the engineering profession; professional registration and the code of ethics; the duties and responsibilities of engineers; the engineer and the law.				

Core Requirements

EENG510	Programmable Logic Controllers	3crs		EENG510L
After completing this course, the student will be able to understand the PLC (Programmable Logic Controllers), which are small computers, dedicated to automation tasks in an industrial environment. The PLC's are programmable power control systems dedicated for electromechanical and electrical systems control: relay control, analog (pneumatic, hydraulic) governors, timing, measurements, control and regulation.				
EENG510L	Programmable Logic Controllers Lab	1 cr.		EENG510
CENG531	Computer Interfacing Circuits	3crs		CENG531L
This class is a course in computer interfacing which assumes no prior knowledge of the subject. The course begins with a discussion of signal processing techniques, including topics in noise reduction, A/D converters, and digital filters. These techniques are illustrated both in hardware as well as simulated in software using the LabVIEW graphical programming environment. The course will continue with the development of data acquisition applications with Graphical User Interfaces (including pop-ups, buttons, graphics, etc) using the LabVIEW development system, and topics regarding interfacing the software systems to physics hardware devices. The hardware information will be covered in a series of class note handouts. There is a small component of the course where we discuss the inner structure of the computer, central processor units, internal command structures, and interrupt/port structures. The course will consist of lectures and lab sessions. Lectures will cover theory and will provide concrete examples that will be useful in the lab. The Lab exercises are a mandatory part of the course and compromise a large fraction of the course grade.				
CENG 531L	Computer Interfacing Circuits Lab	1cr.		CENG531
EENG550	Power Electronics	3crs		EENG550L
Examines power devices and power conversion techniques; power diodes and circuits, diode rectifiers, power transistors, DC-DC converters (choppers), DC-AC converters (PWM inverters), thyristors and resonant pulse inverters				
EENG550L	Power Electronics Lab	1cr		EENG550

Major Requirements

EENG512	Electronics for Communication Systems	3 crs		
Introduction to Electronic Communication; Amplitude Modulation Fundamentals and Circuits; Frequency Modulation Fundamentals and Circuits; Digital Communication Techniques; Radio Transmitters; Communication Receivers; Multiplexing and Demultiplexing.				
EENG552	Microfabrication Technology	3 crs		
Crystal Growth. Silicon Oxidation. Photolithography, Etching, Diffusion, Ion Implantation, Film Deposition, Process Integration, IC Manufacturing, Future Trends and Challenges.				
EENG557	Fiber-Optics	3 crs		
Introduction to State-of-the-art optical fiber communication systems; components, concepts, and systems design techniques required for planning, design, and installation of fiber-optic communication systems. Single and multimode LED and semiconductor lasers, detectors, connectors and splices, terminal and repeater electronics, wavelength division multiplexing optical amplifiers and solutions, and systems architecture for				

point-to-point and local area networks. Direct detection, heterodyning, laser modulation formats; receiver analysis and fiber modeling; digital error probabilities Laboratory work on fiber and electronic measurements.				
EENG560	Transducers, Sensors and Actuators	3 crs		
Types of sensors; thermistors, thermocouples, gas thermometers, vapor pressure thermometers, liquid expansion thermometers, solid state temperature sensors, position sensors, velocity sensors, acceleration sensors, strain sensors, force and pressure sensors, torque sensors, flow sensors, photo detectors, pyrometers, light and infrared sensors, touch and tactile sensors and proximity sensors.				
EENG612	Introduction to VLSI	3 crs	EENG552	EENG612L
CMOS Logic, Fabrication, Verification, and Testing. MOS Transistor Theory. Delay. Power. Interconnection. Combinational and sequential Circuit Design.				
EENG612L	Introduction to VLSI Lab	1 cr.		EENG612
EENG622	Photovoltaic Energy Systems	3 crs.	EENG550	
Photovoltaic Systems examines the direct conversion of solar energy to electricity. This course provides a hands-on approach to the design and installation using national electric standards codes for grid and off grid systems of a typical photovoltaic system. Topics include photovoltaic (PV) cell physics, types of PV cells, PV system components, and PV energy storage.				
EENG632	Antennas	3 crs	EENG512	
Radiation from small antennas, linear antenna characteristics, arrays of antennas, impedance concepts and measurements, multi-frequency antennas, and aperture antennas. The student will also learn to calculate and use these metrics through the study of specific antennas such as center-fed dipoles, monopoles, loops, phased arrays, broadband antennas, Yagi antennas, traveling wave antennas, and aperture antennas. The Student will have the opportunity to use industry standard software to design a practical antenna, and use equipment to conduct some antenna measurements during the course.				
EENG652	RF Integrated Circuit Design	3 crs	EENG612	
Matching Networks and RF Specifications. Low Noise Amplifier (LNA) Design. Mixers. RF Oscillators. Phase-locked Loops (PLL) for RF. RF Amplifiers.				
EENG662	Analog Filter Design	3 crs	EENG612	
First- and second- order Filters. Classical low pass approximations (Butterworth, Chebyshev, …). Frequency transformation. Sensitivity.				
EENG695	Master's Thesis Part I	3crs	EENG510, EENG531, EENG512, EENG550, EENG552, EENG557, EENG560	
The Master's Project course is six credits practical and research course. The master project is spread over two semesters. Students are requested to conduct a research relevant to the field of specialty; ending up with a thesis describing methodology; applications and results. The course also includes producing a prototype of the research subject (numerical model, or physical application).				
EENG695	Master's Thesis Part II	3crs	Master Thesis (Part I)	
The Master's Project course is six credits practical and research course. The master project is spread over two semesters. Students are requested to conduct a research relevant to the field of specialty; ending up with a thesis describing methodology; applications and results. The course also includes producing a prototype of the research subject (numerical model, or physical application).				
Major Elective				
EENG505	Introduction to MEMS Technology	3crs		
This course will combine lecture and laboratory work to provide students with a practical knowledge on the development of micro systems dedicated for a wide variety of applications. This course presents the fundamentals of modeling and analysis of MEMS with a specialized focus on electro-statically actuated systems, silicon-based integrated MEMS, miniaturization and low-cost production of sensors and actuator systems with broad applications in data storage, biomedical systems, inertial navigation, micromanipulation, optical display and micro fluid jet systems. The course covers such subjects as materials properties, fabrication techniques, basic structure mechanics, sensing and actuation principles, circuit and system issues, packaging, calibration and testing. Topics include fundamentals of solid mechanics, electrostatics, and analytical and numerical methods for analyzing multi physics systems. Students will develop a basic knowledge of Microsystems that is of sufficient depth to begin reading, understanding, modeling, and developing microsystems.				

EENG541	Microcontrollers Principles and Applications	3crs		
This course provides an understanding of PIC microcontrollers; it presents the basic elements of a microcontroller (A/D and D/A conversion, I/O, timing, Expansion methods, and development systems). The course also deals with the programming model and instruction set, assembler directives, writing and debugging microcontroller, assembly language routines, microcontroller memory system, microcontroller applications.				
EENG542	Mixed Signal Circuit Design	3crs		
Sampling and Aliasing. Analog Filters. Digital Filters. Data Converter SNR. Data Converter Design. Basics. Noise-Shaping Data Converters. Bandpass Data Converters. A High-Speed Data Converter.				