

Bachelor of Science in Electrical 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،أحدھا 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	
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	MATH220, MATH225

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 Lagrange polynomial, divided differences, cubic spline interpolation, Trapezoidal and Simpson's rules, composite and Simpson's rules, Romberg integration, adaptive quadrature methods, gaussian 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	MATH210
Electricity, Electric Field and Electric Potential, Magnetism, Biot-Savart 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 and Architecture Lab	1cr	CENG350	CENG405

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 Thevenin 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	EENG300, 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	1cr.	EENG350	EENG400
EENG430	Electromagnetic Fields and Waves	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
EENG440	Electric Machine I	3crs	EENG300	EENG430
Review of the mechanical and electromagnetic fundamentals such as force, torque, energy, power, Ampere's law, Faraday's law, magnetic equivalent circuit, induced voltage and the operation of linear DC machine. Real, reactive, and apparent power in ac circuits. Transformers: Types, construction, principles and operation of ideal and real single-phase transformers, turns ratio, equivalent circuit, performance characteristics, per-unit system, voltage regulation and efficiency, transformer taps, auto- transformers, three-phase transformers, instrument transformers. DC machines: Construction, commutator action, armature windings, effect of armature reaction, interpoles and compensating windings, internal generated voltage and torque equations of real DC machines, classifications, performance equations of generators and motors, starting and speed control of DC motors.				
EENG460	Introduction to Power Systems	3	EENG300	
Examines power systems under balanced three phase steady state normal operating conditions; power quantities and the per unit system, power transformers, transmission line parameters, steady state operation of transmission lines, the power flow problem, control of power flow and fast decoupled power flow.				
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.				
EENG487	Digital Signal Processing	3crs	EENG385	EENG487L
Fundamentals of digital signal processing, covering: discrete time linear systems, quantization, and sampling, Z-transforms, Fourier transforms, FFTs and filter design, Multirate signal processing and filter banks.				

EENG487L	Digital Signal processing Lab	1 cr.	EENG385	EENG487
EENG491	Electric Machines II	3crs.	EENG440	EENG491L
The polyphase induction motor; Principles and construction, synchronous speed, torques, equivalent circuit, power relationships and the linear induction motor. Starting, control and testing of induction motors. Synchronous Generators; Principles and construction, equivalent circuit, tests, power and torque expression and parallel operation of alternators. Synchronous motors; Principles and construction, starting, equivalent circuit, power expression and power factor correction, and a comparison with induction motors. Single phase induction motor; construction, equivalent circuit, starting and testing.				
EENG491L	Electric Machines II Lab	1 cr.	EENG440	EENG491
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.				
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.				
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.				
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.				
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				
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 Electrical 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.			
Major 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
EENG511	Power System Analysis and Design	3crs	
This course introduces a comprehensive approach when dealing with unbalanced and faulted systems using the concept of the symmetrical components. It also provides an overview of the basic electrical protection equipments and control when short circuits occur. Transient operation and stability are discussed as well.			
EENG521	Industrial Power Distribution	3crs	
Distribution system layout, distribution transformers, distribution equipment, distribution substations and distribution line construction. Also covers systems of industrial distribution, low-voltage bus way, and over current protection.			
EENG541	Microcontrollers Principles and Applications	3crs	
After completing this course, the student will be able to understand the PIC (Peripheral Interface Controller) series microcontrollers, which are complete microcomputer control systems on a single chip, and exciting devices in the field of electronics control. Two microcontrollers are to be studied: In the first part we will study the PIC16F84A microcontroller and in the second part will study the PIC16F877A microcontroller. This course includes the external and internal architecture, the instruction set, the programming techniques and the interface techniques of the microcontrollers.			
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	1 cr.	EENG550
EENG558	Digital Control Systems	3 cr.	
After completing this course, the student will be able to understand the modern Digital Control Systems, their typical composition and principles of actions, analysis and design of these systems and digital implementation of controllers.			
EENG561	Power Generation and Control	3crs	
Characteristics of power generation units, economic dispatch of thermal units, transmission losses, unit commitment, generation with limited energy supply, hydrothermal coordination, production cost models and control of generation.			
EENG562	Low Voltage Power Distribution and Utilization	3crs	
This course deals with the practical aspects of low voltage power distribution and utilization.			
EENG571	Power System Modeling	3crs	
Synchronous machine theory and modeling, synchronous machine parameters, constant flux linkage model, Transmission lines equivalent circuit, load modeling concepts, modeling of excitation systems, modeling of steam and prime movers.			
EENG572	Power System Transients	3crs	EENG511
Fundamentals, Duhamel's integral, simple switching transients, damping, abnormal switching transients, transients in three-phase circuits, principles of transient modeling, modeling power apparatus and lightning.			

EENG611	Power System Transmission	3crs	EENG521	
This course is divided into two parts: electrical and mechanical design and analysis. The electrical part includes topics such as basic concepts, extended review of overhead transmission line parameters and steady state performance, underground cables and gas-insulated lines, power transmission by means of direct current. In the mechanical part, special attention is given to the construction of overhead transmission lines. Sag and tension of the cables are also included in the analysis.				
EENG621	Power System Stability	3crs	EENG571	
Fundamental concepts of stability of dynamic systems - State space representation – Stability of a dynamic system – Linearization – Analysis of stability - Small Signal stability of a single machine infinite bus system – Generator represented by the classical model – Effects of synchronous machine field circuit dynamics. Basic concepts related to voltage stability.				
EENG625	Industrial Electronics	3crs		
Process control principles, block diagram, evaluation, analog and digital processing, analog signal conditioning, digital signal conditioning, final control, discrete state process control and controller principles.				
EENG631	Essential Matlab for Engineers	3crs		
This course presents MATLAB both as a mathematical tool and a programming language, giving a concise and easy to master introduction to its potential and power. Stressing the importance of a structured approach to problem solving, the text gives a step-by-step method for program design and algorithm development. The fundamentals of MATLAB are illustrated throughout with many examples from a wide range of familiar scientific and engineering areas, as well as from everyday life.				
EENG640	Power System Protection & Switchgear	3crs	EENG511	
Study of power system faults and application of relays for power system protection. Review of symmetrical components as applied fault currents.				
EENG655	Electric Drives	3crs	EENG550	EENG655L
Complement EENG550 (controlled rectifiers, AC voltage controllers and static switches) and covers DC drives (single phase, three phase and DC-DC converter drives and control of DC drives), AC drives (Induction motor drives, control of induction motors, synchronous motor drives, control of synchronous motors and stepper motor control) and gate drive circuits.				
EENG655L	Electric Drives Lab	1 cr.		EENG655
EENG665	Power Plant Design and Construction	3crs	EENG561	
This course deals with the practical aspects of small diesel fuel power plant design and construction.				
EENG685	Electric Substations	3crs	EENG521	
Gas insulated substations, air insulated substations, high voltage power electronics substations, the interface between automation and the substation, substation integration and automation, substation grounding, lightning shielding.				
EENG695	Master's Thesis part I	3crs	EENG510, EENG511, EENG521, EENG550, EENG561, EENG571,	
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).				