

| School             | School of Engineering            |         |   |
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| Major              | Electrical Engineering           |         |   |
| Major Requirements |                                  |         |   |
| Code               | Title                            | Credits | Description   |
| EENG495            | Senior Project                   | 3       | This project is a requirement for graduation with the B.S. in Engineering degree. Proposed by the supervising faculty, projects are geared towards integrating several topics covered in the curriculum. Students will have the opportunity to exercise research, experimentation, implementation and technical writing skills. Students typically work in teams; each team agrees on a project with the supervisor. The project scope must be adjusted to match at least a 3 credit load per team member. The project concludes with a demonstration, a presentation and a technical report all of which are appraised by a committee of faculty members.  |
| CENG400L           | Microcontroller Applications Lab | 1       | This lab introduces projects concerning Microcontrollers architecture , instruction sets, and applications. Introduction to programmable PIC18F4550. Serial/Parallel Bus Interfacing with PIC. Assembly/C Language. ISIS Proteus Software: simulation. MPLAB Software: Editing, compiling, simulating and programming. C18 Compiler. Writing code programs. The functions: Timer, PWM, LCD, RTC, MCP, A/D, D/A, seven segment display. The main objective of this laboratory is to cover experimentally all the applications on the Microcontroller. It is an integral part of the preceding course, and it reinforces and complements the material covered in the course. It is designed for you to not only learn about the basic architecture of a Microcontroller, how to program them and show up their results, but in doing so; you will also use them in performing your undergraduate and graduate senior projects that allow you to have a good career. |
| EENG458            | Digital Control Systems          | 3       | 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.   |
| EENG360            | Introduction to Power Systems    | 3       | 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.   |
| EENG435L           | Control Systems Lab              | 1       | The Control Systems Lab is concerned with the following topics: introducing MATLAB and its Control Systems Toolbox; plotting the pole-zero configuration in s-plane for a given transfer function; determining the transfer function for a given closed loop system in block diagram representation; plotting the unit-step response of given transfer function and finding the maximum overshoot, peak time, rise time and delay time; calibrating a PID Controller; plotting the root locus of a given transfer function and locating closed loop poles for different values of gain; plotting the bode plot of a given transfer function and finding the gain and phase margins; plotting the Nyquist plot for a given transfer function and discussing closed loop stability, gain and phase margins.   |
| EENG435            | Control Systems                  | 3       | 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.   |

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| EENG482  | Electrical Systems Simulation    | 3 | This introductory course presents numerical techniques implemented in MATLAB/Simulink for the solution of problems encountered in electrical engineering. Some of the major topics in this course include electric circuit analysis, electric machines modeling and computation of electromagnetic fields. Students are required to use Matlab extensively, both in laboratory sessions as well as for completing assignments. In addition to teaching the students the fundamental theory associated with each topic, the course also aims to present real-world engineering power system applications. In fact, Matlab capabilities can be effectively used for programming power system analysis applications using Simulink sub-library SimPowerSystem. Students can then parameterize existing models using MATLAB variables and expressions and then design for the electrical power network in Simulink. |
| EENG440  | Electric Machines I              | 3 | 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.     |
| EENG388  | Electromagnetic Fields and Waves | 3 | This is an introductory course in Electromagnetics covering Vector analysis, Electrostatics, Magnetostatics, Maxwell's equations and Plane Wave Propagation.  |
| EENG400L | Electronic Circuits II Lab       | 1 | The topics covered by this Lab course are MOSFET and BJT frequency response, feedback amplifier operation and characteristic, oscillators and multivibrators, power amplifier DC operation, voltage and power Gain. Spice simulation and breadboard implementation will be used.  |
| EENG400  | Electronic Circuits II           | 3 | 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.  |
| EENG385  | Signals and Systems              | 3 | Signal and system modeling concepts; system modeling and analysis in time domain; the Fourier series; the Fourier transform and its applications; the Laplace transformation and its applications; analysis and design of analog filters, MATLAB for analog signal processing.  |
| EENG350L | Electronic Circuits I Lab        | 1 | The topics covered by this Lab course are amplifier characteristics, Diode Characteristics & Circuit Applications, Zener Diode Characteristics & Circuit Applications. Also, MOSFET and BJT Characteristics and Amplifiers will be covered. Spice simulation and breadboard implementation will be used.  |
| EENG350  | Electronic Circuits I            | 3 | Electrical signals and amplifier models. Semiconductors. P-N Junction: current-voltage characteristics. Diode models. Diode circuit applications. Metal Oxide Semiconductor Field-Effect Transistor (MOSFET): structure, current-voltage characteristics, DC biasing, small-signal model, MOSFET amplifiers. Bipolar junction transistor (BJT): structure, current-voltage characteristics, DC biasing, small-signal model, BJT amplifiers.   |

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| EENG491  | Electric Machines II                 | 3 | This course provides students with in depth knowledge of electrical machinery theory. It teaches students the technique necessary for solving any equivalent circuit for any AC machine including Induction, Synchronous three-phase machines, and single-phase induction machines. Analysis and calculations for finding the voltage regulation and efficiency of those machines are also included.   |
| EENG300  | Electric Circuits II                 | 3 | 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 in addition to Operational amplifiers (Op-amps).   |
| EENG301L | Electric Circuits Lab                | 1 | The Electric Circuits Lab introduces the students to circuit simulation tools, DC circuit analysis techniques such as nodal, mesh, Thevenin, Norton, & superposition, and transient circuit analysis of RC, RL, & RLC circuits.  |
| EENG410L | Power Electronics I Lab              | 1 | This lab introduces experiments to investigate characteristics of power devices and power conversion techniques; power diodes, transistors (BJT, MOSFET, IGBT), thyristors, DIAC, and TRIAC. The objective of this course is to cover experimentally all experiments on COM3LAB Board 7016, to simulate by using PSPICE software, and to implement power electronics circuits on a breadboard.   |
| EENG410  | Power Electronics I                  | 3 | This course introduces a comprehensive overview of different power electronics components and applications. It also present converters used for DC machinery control (rectifiers, choppers) used in most applications. Their structures, switching techniques, harmonic content and performances are discussed   |
| EENG465  | Electrical wiring and Installation   | 3 | This course provides students with in depth knowledge of electrical installation theory. It introduces basic rules and schemes of both domestic (Residential, office, Mall) and industrial (Power system, Switchboard and upward) electrical installation. It treats all types of earthing, cable sizing, protection, switchgears, lighting principals, wiring, bus bars, lightning, load calculation and make students familiar with different universal standards such NEC code, NFPA, British standard BS, French standard NFC Standard, IEC Standard. in order to be able to design an electrical wiring map and panel board map for different projects: Industrial _residential (Hospital, manufacturer, airport, villa).   |
| CENG380  | Microprocessors and Microcontrollers | 3 | This course introduces students to the principles of Microcontroller design and applications. Students will be introduced to the PIC microcontroller architecture, specifically the PIC 18F family. Moreover, the course introduces programming using assembly language and C. Topics introduced will include: Looping, branching, arithmetic and logical operations, timer, interrupts, Parallel I/O.   |
| CENG352L | Digital Logic Circuits Lab           | 1 | This lab introduces experiments concerning designing, simulating and testing digital logic circuits, which uses Combinational Logic Design; Decoders and Encoders, Multiplexers, signed number notations and arithmetic; binary addition/subtraction circuits; PLA, PAL, theory of sequential circuits; timing diagrams; analysis and synthesis of D, JK, and T flip flop based sequential circuit; Design with D and JK flip-flops. The objective of this course is to cover experimentally all experiments on Com3lab boards (70017 & 70018) that are related to the topics above. After that, each group of two students should have the tools to build combinatory circuits, where those circuits will be given as small projects where each group should write down the design and complete the implementation. |

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| CENG300  | Fundamentals of Digital Logic Design | 3 | This course is an introductory to logic design for students in computer and electrical engineering. The course stresses fundamentals and a large number of design problems. 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. |
| EENG491L | Electric Machines II Lab             | 1 | This lab introduces experiments concerning designing, building, and testing the electric machines circuit that describe the principles and construction of different types of transformers, DC generators, DC motors, Control of DC motors; Speed control, braking, DC motor starters; Starting, control and testing of induction motors. Synchronous Generators; Principles and construction, equivalent circuit, tests, power and torque expression and parallel operation of alternators. Asynchronous motors; Principles and construction, starting, equivalent circuit.   |
| EENG250  | Electric Circuits I                  | 3 | 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. Prerequisites: ENGL051. Co-requisites: MATH210   |

### Core Requirements

| Code    | Title   | Credits | Description  |
|---------|---|---------|--|
| MATH310 | Probability & Statistics for Scientists & Engineers | 3       | The concept of probability and its properties, descriptive statistics, discrete and continuous random variables, expected value, distribution functions, the central limit theorem, random sampling and sampling distributions, Hypothesis testing. Prerequisite: MATH 170   |
| IENG300 | Engineering Project Management                      | 3       | This course covers the fundamentals of project management for engineering professionals. It reviews the project management framework in organizations and covers in-depth the tools and techniques used in initiating, planning, executing, monitoring, controlling and concluding a project to achieve the set goals within schedule and budget targets. Real life engineering project examples are used to demonstrate the application of project management concepts to engineering projects. The course is aligned with the Project Management Institute's (PMI's) Project Management Body of Knowledge (PMBOK) and helps learners to prepare for PMI certification exams. Prerequisites: ENGL201. |
| MATH210 | Calculus II   | 3       | 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. Prerequisites: MATH160  |
| MENG250 | Mechanics I (Statics)                               | 3       | This course treats only rigid-body mechanics and forms a suitable basis for the design and analysis of many types of structural, mechanical, 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. Prerequisites: ENGL051. Co-requisites: MATH210.  |

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| MENG225  | Engineering Drawing & CAD        | 3 | 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_a tool,_they may represent the first step of design (Design of tools and machines).   |
| CSCI250  | Introduction to Programming      | 3 | This course introduces the basic concepts and principles of structured programming in Java. It starts by an introduction to Java showing its syntax and the structure of a program in Java then teaches simple data types, control structures, methods, arrays, and strings.  |
| CSCI250L | Introduction to Programming Lab  | 1 | This course is a co-requisite for the Introduction to Programming course (CSCI250). The students apply in the lab the fundamentals of programming, explained in CSCI250, by solving lab exercises. The objective of the lab is to implement programming problems using basic data types, selection and repetition structures, methods and arrays.   |
| MATH220  | Calculus III                     | 3 | 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 | 3 | 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  | 3 | 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. Prerequisite: MATH 220.  |
| PHYS220  | Physics for Engineers            | 3 | 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.  |

### General Education Requirements

| Code    | Title                                       | Credits | Description  |
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| ARAB200 | Arabic Language and Literature              | 3       | This course is a comprehensive review of Arabic Grammar, Syntax, major literature and poetry styles, formal and business letters.  |
| CULT200 | Introduction to Arab - Islamic Civilization | 3       | 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 Prerequisites: ENGL051, ENGL101, ENGL151.   |
| ENGL201 | Composition and Research Skills             | 3       | 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. Prerequisites: ENGL150, ENGL151. |
| ENGL251 | Communication Skills                        | 3       | 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.   |