School	
Major	Bachelor of Science in Electronic Engineering - Emphasis On Biomedical

Major Requirements			
Code	**Title**	**Credits**	**Description**
EENG304	Biology for Biomedical Engineers	3	This course represents an introductory level course to the organization of human life science. It covers the following subjects: molecules and cell organization, biological membranes, energy and metabolism, photosynthesis, cell division (mitosis and mycosis), DNA replication, protein synthesis, heredity, micro-organisms, and tissues.
EENG300	Electric Circuits II	3	This course introduces the techniques of AC circuit analysis, containing ideal and dependent sources. It also covers sinusoidal steady state power calculations, balanced three phase circuits and frequency selective circuits.
EENG301L	Electric Circuits Lab	1	This lab introduces experiments concerning designing, building, and testing DC and AC electric circuits which use resistors, capacitors, inductors, transformers, and OP-AMP. The objectives of this course are to: reinforce and complement the material covered in the course. It enhances the technical abilities of the students by engaging them in experiments that involve most common electric lab equipment such as multimeter, function generator, DC source and oscilloscopes. Also, this lab offers the ability to test electric circuits using schematics software (LTspice). The lab concludes with designing applications on Filters and OP-AMP.
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's; 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 that are related to the topics above. After that, each group of two students should have the tools to build combinatory circuits as small project which allow him to submit the design and complete it by simulation and implementation.
EENG350L	Electronic Circuits I Lab	1	This lab introduces experiments concerning designing, building, and testing electronic circuits which use diodes, BJTs, and MOSFETs. The objectives of this lab are to: reinforce and complement the material covered in the course. It introduces experiments related to the design, implementation, and test the characteristics of different types of diodes and verifies practically some of its applications. Moreover, BJT and MOSFET characteristics as well as their different types of amplifier configurations are going to be modeled, implemented and tested.
EENG350	Electronic Circuits I	3	This course includes the following topics: Semiconductors, P-N Junction: current-voltage characteristics, Diode models, Diode circuit applications. Bipolar junction transistor (BJT): structure, current-voltage characteristics, DC biasing, small-signal model, BJT amplifiers. Metal Oxide Semiconductor Field-Effect Transistor (MOSFET): structure, current-voltage characteristics, DC biasing, small-signal model, MOSFET amplifiers.

EENG354	Physiology for Biomedical Engineers	3	This course provides an introduction into the functions and structural properties of tissues, organs, systems of organs and the human body as an organism. The main part of the course is dedicated to the most important systems of organs (respiration, heart and circulation, nervous system, digestion, secretion, skeleton and muscles, immune system, reproductive system and sensory organs). Anatomy and physiology are discussed in a thematical order. Each topic is preceded by some comments concerning evolution and/or embryology. The content of the lectures is adapted to engineers and an emphasis is placed on medical terminology. In a supplementary part of the course, a few topics in applied physiology are presented.
EENG424L	Medical Instrumentation I Lab	1	This laboratory provides an understanding of the biomedical equipment and its safety. First it is dedicated to work on sensors and transducers then to work on equipment that measure and analyze physiological signals, breathing volumes and parameters. Therefore, in this lab the students apply all the principles learned in the course and start to have knowledge about the devices found in hospitals and clinics and can differentiate between the simple and high-tech equipment.
EENG385	Signals and Systems	3	This course introduces signals and systems, their types and properties, and their relation in the time and frequency domains. It covers signal and system modeling concepts, system modeling and analysis of LTI systems in time domain, the Fourier series, the Fourier transform and its applications, and the Laplace transformation and its applications.
EENG400	Electronic Circuits II	3	This course covers FET and BJT amplifiers frequency response. It also introduces the analysis and design of a variety of amplifier output stages, power BJT. Negative feedback topologies and stability issue. Oscillators, multivibrators, timer, and precision rectifiers.
EENG400L	Electronic Circuits II Lab	1	This laboratory experience learns to design and build more complicated circuits (systems) based on theoretical and analytical concepts. Design a complete electronic circuit system using different electronics components like OP-Amp, BJTs, MOSFETs and others to construct power amplifiers, oscillators and active filters in addition to many op Amp applications like adder, integrator, and differentiator. Moreover, this course deals with studying the high and low frequency response for the different types of transistors. Modeling the design of such circuits like active filters and oscillators using electronic simulators like LTspice takes a strong place in this course in addition to the different kinds of audio power amplifiers and then testing the completed circuit and verifying that it meets design specifications.
EENG404	Biophysics and Bioelectricity	3	This is an introductory course on biophysics for undergraduate students. The first part deals with properties of biologic materials. The second part treats the cellular and molecular biophysics and covers, in depth, the molecular phenomena related to biologic processes. Organ systems and the principles of physics in the processes of locomotion, blood and fluid flow, respiration, audition and vision are addressed in the third part. The fourth part deals with bioelectric phenomena such as resting and action potentials with their physical tools.
EENG414	Biocompatibility	3	This course examines the biocompatibility of a broad range of materials and their application to the rational design of biomaterials for implantable devices. It consists of three major parts: (I) biomaterial sciences as it relates to properties and characteristics of material used to design biomaterials, including polymers, metals and ceramics; (II) the materials response and interactions with the surrounding tissue such as material degradation including corrosion, dissolution, swelling/leaching, etc.; and (III) the “host response”: cellular, tissue-level, and systemic responses to implanted devices, including thrombosis, wound-healing and cytotoxicity.

EENG424	Medical Instrumentation I	3	This course provides an introductory overview of the multi-disciplinary field of medical instrumentation. It introduces the application of elementary electronics and mechanics principles to the analysis of physiological and living tissues and fluids. After active participation in this course and an effort to learn the material, the student will be able to recall the general characteristics, principle of operation, and will be asked to offer new bioengineering ideas and interventions, discuss and present them by applying the course and lab material of Biomedical Instrumentation rigorously and clearly explains the latest developments and basic engineering principles of the entire spectrum of biomedical devices ranging from their physiological basis to diagnostic and therapeutic devices in medical imaging systems.
EENG388	Electromagnetic Fields and Waves	3	This is a comprehensive undergraduate course on electromagnetic fields and waves, discussing general Electro-magnetic Theory and covering the following topics: Vector analysis: Vectors in different coordinate systems, including Divergence, Gradient and Curl operators. The Electrostatic topics include: Coulomb's Law, Gauss's Law, Joule's Law and Electric Forces and Electric Potential. The Magneto-statics include: Biot-Savart's Law, Ampere's Law and Magnetic Forces and Torques. Finally, in Dynamic fields, the topics include Maxwell’s equations, Faraday's Law and Plane Wave Propagation.
EENG474	Medical Imaging I	3	This course introduces imaging methods in medicine and biology. Medical imaging systems to be analyzed include conventional X-ray, computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine (PET and SPECT), and ultrasound. Each of these modalities will be introduced from basic physical principles to the process of image formation. Also, basic concepts in medical image processing and analysis will be introduced. The course includes three hours of lecture per week that will involve actual medical imaging devices. A course project will allow students to explore real world applications of the course material.
EENG494	Senior Project	3	This course integrates the knowledge acquired in the various courses of the undergraduate curriculum to an open-ended design effort and applies the knowledge gained to the solution of a contemporary engineering problem. Students improve oral and written communication skills, gain familiarity with available technical literature, and experience the life cycle of a design project within a group environment. Many projects include practice in the use of computers and relevant support software while solving a design problem. Students work together as a team to accomplish common goals and be able to participate in regional and national competitions.
EENG484	Acquisition & Microcontrollers in Biomedical Engineering	3	This course examines data acquisition and microcontroller systems and principles. In addition, the course offers a review of sensors employed for biological and biomedical applications. Focus will be concentrated on the components of data acquisition systems and particularly on the Pic16 microcontroller and the Arduino platforms. A broad range of biosensors, whose role is to convert information from one form of energy to electrical signals, will be introduced. In this case the final form for the information will be an electrical signal but the transducers themselves could be optical, mechanical, etc., and operate in a number of different ways (e.g., capacitive, potentiometric, photonic). The course will offer hands-on critical knowledge needed for biomedical instrument development.

EENG250	Electric Circuits I	3	The course provides an introduction to Electrical and Electronics Engineering. The course has been designed to introduce fundamental principles of circuit theory commonly used in engineering research and science applications, the Concepts of voltage, current, power, resistance capacitance and inductance. Circuit analysis techniques such as Kirchhoff's Laws, node voltages, and mesh currents. Thevenin's and Norton's equivalent circuits, in addition to special circuits with op-amp and the response of 1st order RL and RC circuits.
CENG250	Digital Logic I	3	This course introduces the concepts of digital logic operations and design. The course teaches fundamentals of digital logic design through the use of 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, decoder, encoder, comparator, multiplexer and de-multiplexer circuits in combinational systems.
EENG354L	Physiology for Biomedical Engineers Lab	1	This lab deals with the structure of the human body. It includes the study of tissues, skeletal, muscular, nervous, cardiovascular (Heart), digestive and urinary systems. It is presented using microscopic slides, human skeletal models, anatomical models, drawings, and dissections.
EENG435	Control Systems	3	This is an introductory course to control systems. Covered topics include: open-loop and closed loop feedback systems, mathematical modeling of control systems, block diagrams, transfer functions and state-space representations, modeling of electrical and mechanical systems, PID controllers, transient and steady-state response analyses, stability analysis of dynamic systems, control systems analysis by the Root-Locus method, design of Lead and Lag compensators, and control systems analysis and design by the frequency-response method.
EENG435L	Control Systems Lab	1	This lab introduces experiments concerning designing, building, and testing control Systems which use analog controller circuits, electronics and technical lines circuits, speed, light and temperature control circuits. The 70082 and 70083 control system boards they cover experimentally as a virtual lab for the study of control system components and circuits. Each student will become familiar with all applications with open and closed loop control systems. The objectives of this course are to: The control Systems laboratory is an integral part of the course, and it reinforces and complements the material covered in the course. This is an introductory course in control systems theory. It is designed for students to not only learn about the basic control elements and how to connect them in circuits and find their solutions, but in doing so; he will also learn several basic mathematical techniques that will allow him to solve ordinary linear differential equations.
EENG484L	Acquisition and Microcontrollers in Biomedical Engineering Laboratory	1	This lab exposes the students to gain more knowledge about the Arduino technology and how it can be used to measure and sense physical parameters, to display those parameters in various methods, and in order to actuate certain devices. It also allows the students to be familiar with the Arduino programing language and enables them to write the necessary codes. The students will be also able to sketch the circuits they want to run using Fritzing software.

Core Requirements			
Code	**Title**	**Credits**	**Description**
MATH310	Probability & Statistics for Scientists & Engineers	3	The course is intended to provide you with the basic probabilistic and statistical concepts with related computational and analytic skills for three main purposes: 1) To become an integrated part of the student scientific education. 2) To give the student an adequate ability for comprehending and interpreting many non-deterministic situations. 3) To appreciate the wide range of applications of such concepts to real-life situations.

MATH210	Calculus II	3	This is the second course in the Calculus sequence. The course material includes logarithmic, exponential, and trigonometric functions, their inverses and their derivatives, integration techniques, improper integrals, sequences, infinite series, tests of convergence, alternating series, power series, polar coordinates and its application.
MENG250	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, 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.
CHEM200	General Chemistry	3	This course is a first semester course, intended for students who desire to acquire the basic principles in chemistry. The emphasis of the course will be on the fundamental principles of general chemistry, which include terminology, qualitative concepts and quantitative skills. The general topics included in this course are: Quantum Theory of the Atom; Electrons and Periodicity; Bonding; Molecular Geometry; Hybridization; Acid/base Chemistry; Kinetics and reactions mechanism and Solubility and Complex ion equilibria.
CSCI250	Introduction to Programming	3	This course introduces the basic concepts and principles of structured programming in Java. It starts with 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. In this lab, students solve programming problems by using primary data types, selection and repetition structures, methods and arrays. This lab is an opportunity for the students to have direct help when needed from the instructor, but it is not sufficient for practice; students should practice with more exercises on their own.
MATH220	Calculus III	3	The course consists of two parts: Multivariable calculus and vector calculus. The multivariable calculus is the extension of calculus in one variable to calculus in more than one variable: (quadric surfaces, partial differentiation, multiple integration). Vector calculus applies calculus to the concept of vector fields.
MATH225	Linear Algebra with Applications	3	This course provides an introduction to linear algebra topics. Emphasis is placed on the development of abstract concepts and applications for vectors, systems of equations, matrices, determinants, vector spaces, multi-dimensional linear transformations, eigenvectors, eigenvalues, diagonalization and orthogonality. The concepts of linear algebra are extremely useful in physics, economics and social sciences, natural sciences, and engineering.
MATH270	Ordinary Differential Equations	3	This course provides an introduction to ordinary differential equations and their applications. The contents of this course include first order equations, separable, exact, and linear equations, second and higher order differential equations, systems of differential equations, series solutions, and Laplace transformation.
PHYS220	Physics for Engineers	3	This course is designed to provide an overview of calculus based introductory physics, which is a requirement for all undergraduate engineering students. It offers an introduction to mechanical oscillations and mechanical waves, exploring different wave phenomena such as interference of mechanical waves, reflection and refraction of light, in addition to image formation.

ENGG450	Engineering Ethics and Professional Practice	3	Engineering Ethics and Professional Practice is a complete study course on the role of ethics in engineering in their historical, philosophical and professional contexts. The course examines the impact of ethical theories and their application to issues encountered in the engineering profession, such as employee rights, whistleblowing, safety, risk and liability, professional responsibility to consumers and employers, conflicts of interest, codes of ethics, legal obligations, environmental and social responsibility. Through the use of real and hypothetical case studies, the course focuses on developing analysis techniques and applying them to ethical problems through independent critical thinking and moral sensitivity.
ENGG200	Introduction to Engineering	3	Introduction to Engineering is a first-year course designed to help students explore the world of engineering by introducing them to what engineers do, the fundamental principles that form the basis of their work, and how they apply that knowledge within a structured design process. The course gives the student an opportunity to apply those concepts by developing a prototype system as part of a team. The course also enables the student to develop technical presentation skills.

General Education Requirements

Code	Title	Credits	Description
ARAB200	Arabic Language and Literature	3	ØªØªØ£Ù□Ù□ Ù□Ø§Ø¯Ø© Ø§Ù□Ù□ØºØ© Ø§Ù□Ø¹Ø±Ø¨Ù□Ø© Ù□Ø¢Ø¯Ø§Ø¨Ù□Ø§ Ù□ØºÙ□Ø± Ø§Ù□Ù□ØªØ®ØµØµÙ□Ù□ Ù□Ù□ Ø«Ù□Ø§Ø«Ø© Ø£Ù□Ø³Ø§Ù□ Ø£ØØ¯Ù□Ø§ Ù□ØªÙ□Ø§Ù□Ù□ Ø¯Ø±Ù□Ø³Ø§Ù□ Ø£Ø³Ø§Ø³Ù□Ø© Ù□Ù□ Ø§Ù□Ù□ØÙ□ Ù□Ø§Ù□ØµØ±Ù□ Ù□Ø§Ù□Ø¨Ù□Ø§ØºØ©. Ù□Ø§Ù□Ø«Ø§Ù□Ù□ Ù□ØªÙ□Ø§Ù□Ù□ Ù□Ø¨ØØ« Ù□Ù□ Ø§Ù□Ø£Ø¯Ø¨ Ù□Ø§Ù□ØªØÙ□Ù□Ù□. Ø£Ù□Ø§ Ø§Ù□Ù□Ø³Ù□ Ø§Ù□Ø«Ø§Ù□Ø« Ù□Ù□Ù□Ø¹Ø§Ù□Ø¬ Ø¨Ø¹Ø¶ ØªÙ□Ù□Ù□Ø§Øª Ø§Ù□ØªØ¹Ø¨Ù□Ø± Ù□Ø§Ù□ØªÙ□Ø§ØµÙ□.
CULT200	Introduction to Arab - Islamic Civilization	3	ØªÙ□Ù□Ø«Ù□Ù□ Ø§Ù□ØØ¶Ø§Ø±Ø© Ø§Ù□Ø¹Ø±Ø¨Ù□Ø© Ø§Ù□Ø¥Ø³Ù□Ø§Ù□Ù□Ø© Ù□Ø§ØØ¯Ø© Ù□Ù□ Ø£Ù□Ù□ Ø§Ù□ØØ¶Ø§Ø±Ø§Øª Ù□Ù□ Ø§Ù□ØªØ§Ø±Ù□Ø® Ø¨Ù□Ø§ Ø£Ù□Ø¬Ø²ØªÙ□ Ù□Ù□ Ø¥Ø¨Ø¯Ø§Ø¹Ø§Øª Ø¹Ù□Ù□Ù□Ø© Ù□Ø«Ù□Ø§Ù□Ù□Ø© Ù□ØØ¶Ø§Ø±Ù□Ø© Ø«Ø±Ù□Ø© Ø£Ø«Ø±Ù□Ø§ Ø§Ù□Ø¹Ø¸Ù□Ù□ Ù□Ù□ ØªØ§Ø±Ù□Ø® Ø§Ù□Ø¨Ø´Ø±Ù□Ø©. Ø¨Ù□Ø´Ù□Ù□Ù□ Ù□Ø°Ù□ Ø§Ù□Ù□Ø§Ø¯Ø© Ø§Ù□Ø¯Ø±Ø§Ø³Ù□Ø© Ù□Ù□Ø¯Ù□Ø©Ù□ Ø£Ø³Ø§Ø³Ù□Ø© Ù□Ù□ØªØ¹Ø±Ù□ Ù□Ù□ Ø¹Ø±Ø¨Ù□ Ø¹Ù□Ù□ ØªØ§Ø±Ù□Ø® Ø-Ø¶Ø§Ø±ØªÙ□Ø□ Ù□Ø§ Ù□Ù□Ù□ØªØ®Ø± Ø¨Ù□Ø§ Ù□ØØ³Ø¨Ø□ Ø¨Ù□ Ù□Ù□Ø¬Ø¹Ù□ Ù□Ù□Ù□Ø§ ØØ§Ù□Ø²Ù□Ø§ Ù□Ø³ØªÙ□Ù□Ø¶ Ø¨Ù□ Ù□Ø§Ø¨Ù□Ù□Ù□Ø§ØªÙ□ Ù□Ù□Ø¯Ø±Ø§ØªÙ□ Ø§Ù□Ø¹Ù□Ù□Ù□Ø© Ø§Ù□Ù□Ø§Ù□Ù□Ø© Ù□Ø¥Ø¹Ø§Ø¯Ø© Ø§Ù□Ø§Ø³ØªÙ□Ù□Ø§Ø¶ Ø§Ù□Ø-Ø¶Ø§Ø±Ù□. Ù□ØªØØ±Ù□ Ø§Ù□Ù□Ø§Ø¶Ù□ Ù□Ù□Ù□Ø§ Ø¯Ù□Ù□ Ø´Ø¹Ù□Ø±Ù□ Ù□Ø§Ø¹Ù□ Ù□Ù□Ù□Ø§Ø□ Ø¹Ù□Ù□ Ø£Ù□Ù□ Ù□Ø°Ø§ Ø§Ù□Ù□Ù□Ù□Ø±Ù□Ø± Ø§Ù□Ø¯Ø±Ø§Ø³Ù□ Ù□ØØ§Ù□Ù□ Ø£Ù□Ù□ Ù□Ø³ØªØ«Ù□Ø± Ø§Ù□Ù□Ø¹Ù□ Ø§Ù□ØØ¶Ø§Ø±Ù□ Ù□Ø§Ù□Ø«Ù□Ø§Ù□Ù□ Ø¹Ù□Ø¯ Ø§Ù□Ø·Ù□Ø§Ø¨ Ø§Ù□Ø¹Ø±Ø¨Ø□ Ù□Ù□Ø³ØªÙ□Ø¯ Ù□Ù□Ù□Ø°Ø§ Ø§Ù□Ù□Ø®Ø²Ù□Ù□ Ù□Ù□ØµÙ□Ø¹ Ø£Ù□Ù□Ù□Ù□Ø§ Ø¬Ø¯Ù□Ø¯Ù□Ø§ Ù□Ù□Ù□Ø³ØªÙ□Ø¨Ù□.
ENGL201	Composition and Research Skills	3	This course builds upon the skills acquired in pre-requisite courses mainly ENGL 151 to further develop students' critical thinking and academic writing competencies. Students will read and respond to a variety of texts from different disciplines and produce a research paper using analytical and critical skills in response to texts.
ENGL251	Communication Skills	3	Workplace Occupational Writing is an advanced interdisciplinary writing course emphasizing workplace and technical communication and editing appropriate to diverse professions. It incorporates practice and study of selected types of discourse employed in professional writing situations, preparing students for different systems of writing in their professional lives. Examples from the writing of workplace professionals are analyzed and used as models to demonstrate the transition from academic to professional writing.

ENGG300	Engineering Economics	3	This course covers the fundamentals of Engineering Economics for engineering professionals to match engineering practice today. It recognizes the role of the engineer as a decision maker who has to make and defend sensible decisions. It emphasizes on the analytical consideration of money and its impact on decision making as well as on other factors such as environmental and social factors and tasks. By the end of the course students will be equipped with basic analytical skills for solving problems of an economic nature real-world example.