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 treats 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, tissues.
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.
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.
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.
EENG354	Physiology for Biomedical Engineers	3	In this course the following subjects are treated: bone tissue, joints, muscular tissue, nervous tissue, spinal cord, brain, autonomic nervous system, cardiovascular system, digestive system, urinary system.
EENG424L	Medical Instrumentation I Lab	1	This laboratory course introduces the basic principles of medical instrumentation. The principle of operation and basic operation procedures are introduced. Basic medical instrumentation circuits are implemented and tested. Topics include: Blood pressure measurement, Heart rate monitors, Oximeters, Electromyography, Electroencephalography, Temperature monitoring, Ventilators, Doppler flow meters, and Laboratory safety.
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.

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.
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.
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. Radioactivity and biologic effect of ionizing radiation will be treated in the fifth part.
EENG414	Biocompatibility	3	This course covers the following topics. Biocompatibility standards including the role of material standardization and validation methods in evaluating biocompatibility, biodegradation and toxic kinetic, surface analysis of polymeric biomaterials, sterilization processes and residuals, cytotoxicity, interactions with blood, genotoxicity, carcinogenicity and reproductive toxicity, explants retrieval and analysis, assessment of biological safety, risk analysis.
EENG424	Medical Instrumentation I	3	The course covers the following topics. Basic concepts of medical instrumentation, basic sensors and principles, amplifiers and signal processing, biopotential electrodes, biopotential amplifiers, blood pressure and sound, measurement of flow and volume of blood, measurements of the respiratory system, chemical biosensors, clinical laboratory instrumentation, therapeutic and devices, electrical Safety.
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.
EENG474	Medical Imaging I	3	This course introduces imaging methods in medicine and biology. Covered medical imaging systems 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. Basic concepts in medical image processing and analysis will also be introduced.
EENG494	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.

EENG484	Acquisition & Microcontrollers in Biomedical Engineering	3	This course examines sensors employed for biological and biomedical applications. Focus will be concentrated on the components of data acquisition systems and particularly on the sensors which represent the first element of the data acquisition chain. 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 (eg., capacitive, potentiometric, photonic).
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
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. It also teaches introductory sequential systems specifically, latches, flip-flops and the design of basic synchronous counters.
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	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	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.
EENG484L	Acquisition and Microcontrollers in Biomedical Engineering Laboratory	1	This laboratory course is designed to implement biomedical signal sensing and data acquisition techniques. Experiments are designed to explore the sampling theorem including filtering and aliasing. Experiments are also designed to deal with signal conditioning and circuit trouble-shooting. Data acquisition is implemented using PIC microcontrollers, Arduino, and myDAQ. Programming is performed using LabView, Matlab, Arduino C, and Assembly

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
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,__electrical devices encountered in engineering. As the course name suggests, this course deals with the equilibrium of bodies that are either at rest__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.
CHEM200	General Chemistry	3	Basic principles of chemistry, electronic structure of the atom, chemical periodicity, molecular structure and bonding, acids and bases and the states of matter, rates of chemical reactions, and chemical equilibrium are covered in this course. Prerequisites: ENGL 150; CHEM, or S grade on the Chemistry Placement Test Prerequisites: CHEM160, ENGL101. Co-requisites: CHEM200L.
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-Savarat Law, Ampere s Law, Faraday s Law, Fluid Mechanics, Wave Motion, Sound Waves, Superposition and Standing Waves, Temperature, Heat, Laws of Thermodynamics.

ENGG450	Engineering Ethics and Professional Practice	3	Engineering Profession and Ethics 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 first semester 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 is designed to be an ideal introduction for anyone interested in exploring the various fields of engineering and learning how engineers work to solve problems. Students will be helped to decide which major within the school suits them better. The course aims to prepare students for success at LIU and beyond by teaching them important skills including: Technical problem solving and engineering design, teamwork, and communicating to diverse audience.

General Education Requirements			
Code	**Title**	**Credits**	**Description**
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.
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.