School	
Major	Bachelor of Engineering in Electronics Engineering

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

Core Requirements			
Code	**Title**	**Credits**	**Description**
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.
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
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.
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.
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

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.
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.
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.
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
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.
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.

CENG335	Digital Logic II	3	This course is an extension of Digital Logic I. The course extends the coverage of sequential circuit concepts and building blocks with the main focus being on understanding the design of the Arithmetic Logic Unit (ALU). The course focuses on well known problems solved by the application of digital logic design methods and components. This course also introduces the student to a hardware programming language (VHDL).
CSCI300	Intermediate Programming with Objects	3	The course emphasizes the principles of Object Oriented Programming using the Java Programming Language. It starts by an introduction to creating applications using Java. Then the course introduces how to define classes and declare objects and discusses the main topics related to object oriented programming (constructors, methods, dependency, aggregation, inheritance, and polymorphism). Finally, the course introduces exception handling as well as writing to and reading from files.he course emphasizes the principles of Object Oriented Programming using the Java Programming Language. It starts by an introduction to creating applications using Java. Then the course introduces how to define classes and declare objects and discusses the main topics related to object oriented programming (constructors, methods, dependency, aggregation, inheritance, and polymorphism). Finally, the course introduces exception handling as well as writing to and reading from files.

Major Requirements			
Code	**Title**	**Credits**	**Description**
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.
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.
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.
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.

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.
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.
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.
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.
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
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.
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.
EENG447	Analog Communication Systems	3	This course provides a thorough understanding of the principles of analog communication systems for undergraduate students in electrical and computer communications engineering. The course covers basic background material on linear systems and noiseless modulation, spectral density and correlation of deterministic and random analog signals, thermal noise and white noise models, linear and angle modulation, interference, feedback demodulators, and noise effects in modulation systems. In addition, the course introduces programming applications in Matlab/Simulink.
EENG467L	Analog Communication Systems Lab	1	This course introduces the principles of communication systems including spectral density of deterministic and random analog signals, thermal noise and white noise model, amplitude and angle modulation, generation and detection schemes, effects of noise, and digital transmission through the additive white Gaussian noise channel. In addition, the course will cover some programming applications in Matlab/Simulink.
EENG405	CAD Tools for Electronics	3	This course provides the students with knowledge and skills of the tools used in electronics projects. These tools are mainly for simulation, PCB and layout design. Examples of these tools are OrCAD, Multisim, Eagle, Cadence, ADS, etc
EENG459L	Electronic Systems Lab	1	Design, simulation and implementation of Electronic systems such as Opamp Applications, Filters, DAC and ADC.
EENG459	Electronic Systems	3	Opamp Applications and Limitations, Active Filters, Nonlinear Circuits, Signal Generators, Voltage References, DAC and ADC
EENG500	Industrial Systems Automation and Control	3	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.
EENG500L	Industrial Systems Automation and Control Lab	1	This lab introduces Programmable Logic Controllers__PLC's in both simulation and experimental environments. Starting with introduction and basic ON/OFF contacts, it switches to series and parallel circuits designed using the contacts. Two-way circuits are introduced, latching and self-latching circuits are discussed and impulse relays are tested. The students learn to pulse a cycle on rising oe falling edge as well as designing and using timers and counters in PLC projects. Multiple "real" applications are performed containing projects controlling heat of an oven, flashing lights, memory usage, conveyor belts and star-delta motor starters. The lab also teaches the student to use WinProladder software using both LADDER language and STEP instructions.
EENG512	Electronics for Communication Systems	3	Introduction to Electronic Communication; Amplitude Modulation Fundamentals and Circuits; Frequency Modulation Fundamentals and Circuits; Digital Communication Techniques; Radio Transmitters; Communication Receivers; Multiplexing and Demultiplexing.

EENG612	Introduction to VLSI	3	CMOS Logic, Fabrication, Verification, and Testing. MOS Transistor Theory. Delay. Power. Interconnection. Combinational and sequential Circuit Design.
EENG612L	Introduction to VLSI Lab	1	This course provides basic applications in CMOS circuit design using adapted integration tools. It covers the main steps of schematic acquisition and simulation, layout placement and routing, and final check rules before fabrication. The course proposes many application examples going from a component level to a complete circuit simulation and implementation.
EENG551	Analog Integrated Circuit Design	3	Integrated-circuits devices and modeling. Design of basic analog circuits, such as current sources and mirrors, differential amplifiers. Basic amplifier circuits, CMOS Opamps, opamp stability and frequency compensation. Feedback.EENG551 Analog Integrated Circuit Design Lab
EENG551L	Analog Integrated Circuit Design Lab	1	Design, simulation, and Layout of Analog Integrated Circuits using CAD tools.
EENG595	Capstone Project	6	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.
EENG461	Digital Electronics	3	This course brings to the students expertise to design high-performance digital integrated circuits such as semiconductor physics, integrated circuit processing, transistor-level design, logic-level design, system-level design, testing. Also, important system-level concepts such as timing, pipelining, clock distribution, and system building blocks are dealt with in detail, but the emphasis is on transistors.
EENG461L	Digital Electronics Lab	1	The aim of this lab course is to design basic digital circuits with BJT and MOS transistors. Examples of basic digital circuits are NOT, NAND, NOR, gates, etc. It covers also the characterization of the circuits such as frequency, power consumption, fan-in, fan-out, etc. Hardware equipment and simulation tools are used.
ENGG499	Practical Experience	4	Eligible students should register this practical experience in order to complete requirements for graduation. The training facility may be a firm or a research lab external to the university. Registering for this course requires pre-approval of the training facility of choice by the department chair. At the end of the training, the student should submit a report describing the training activities completed for evaluation and credits. Note that the minimum time to be spent at the facility should not be less than 9 weeks with at least 180 working hours.
EENG527	Digital Signal Processing	3	The objective of this course is to build a good understanding of the principles of Digital Signal Processing starting from the theoretical analysis of Discrete Time Systems up to the design and implementation of Digital Filters. Topics include: Analog to Digital Conversion, sampling, quantization, coding, Z-transform and its applications, structures for FIR and IIR systems, design and implementation of Filters using: window, frequency sampling and equiripple filter. In order to provide students with strong foundation of engineering practices and perform a practical application of the acquired knowledge, some design and simulation examples using Matlab are covered.