School	
Major	Bachelor of Engineering in Computer and Communications Engineering

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

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.
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.
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**
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.

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.
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.

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.
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.
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.

CENG375	Introduction to Database Systems	3	This course offers students an introduction to the design and programming of database systems. In particular, it covers the ER (Entity-Relationship) approach to data modelling, the relational model of database management systems (RDBMS) and the use of relational algebra and query languages such as SQL to create, modify__query the database. The role of relational algebra and the use of SQL in a programming environments, such as Java and/or PHP are briefly introduced. This course will also touch upon data normalization and the role of transaction management.
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.
CENG420	Web Programming and Technologies	3	" The course focuses on the design and development of web based applications using a number of currently popular tools and technologies. Moreover, the use of database as data repositories for multitier web applications is further explored. Topics examined include: introduction to HTML and CSS, client-side scripting (JavaScript and DOM), server-side scripting, database connectivity, sessio_n tracking, HTTP headers and their use, security and privacy risks."
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.
CENG415	Communication Networks	3	This course constitutes an introduction to fundamental concepts in the design and implementation of computer communication networks, their protocols and applications (FTP, SMTP, HTTP, etc.). Topics include: overview of network architectures and topologies, applications, reliable data transfer, transport, congestion and flow control, routing, and data link protocols, addressing, local area networks. The course offers also an overview of advanced topics such as wireless networks, and network management. Examples will be drawn primarily from the Internet (e.g., TCP, UDP, and IP) protocol suite.
CENG435	Mobile Application Development	3	This course focuses on the development of advanced mobile applications using Android platform. Students will be introduced to the Android environment will learn the necessary skills for creating, simulating and deploying Android applications. The topics include: Android platform installation, Android Manifest, user interfaces, data persistency, content providers, geo-locations, networking, messaging, messaging, services and deployment. Students are also exposed to business models and current trends in mobile application development.
CENG400	Computer Organization and Design	3	This course introduces fundamental concepts in computer organization and digital logic design, Topics include computer arithmetic, MIPS processor design, ALU design, data path and controls, pipelining, interrupts and exceptions, memory management and cache.

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.
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.
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.
CENG455L	Communication Networks Lab	1	Based on student theoretical knowledge in communication networks, this lab is designed to help them start practical experiences in Internet networking. Students will be introduced to packet tracer network simulator with which they will be able to build, configure, and manipulate a LAN, MAN and WAN networks. Moreover, students will be introduced to the major concepts of how to configure a real LAN network by running switches, routers, IPv4 and IPv6. Furthermore, basic client/server applications would be introduced and implemented.
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.
EENG537	Digital Communications	3	The course is an introduction to modern digital communications at a graduate/senior undergraduate level. It emphasizes a conceptual understanding of principles, techniques, and fundamental limits in digital communication systems. This course covers modulation for digital communications over additive white Gaussian noise (AWGN) channels; bandpass and lowpass signal representation; signal space representation of waveforms; modulation; demodulation; optimum receivers for AWGN channels; probability of error analysis; channel coding; synchronization; an introduction to digital communication through band-limited channels.

CENG595	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.
CENG557	Advanced Network Architectures	3	This advanced course will provide the student an outstanding knowledge of the most interesting advanced network architectures and technologies used nowadays for providing the different communication services. A good understanding of this course will also provide the student background knowledge on network design. Topics include: SONET/SDH and GFP, ATM Networks, QoS Metrics, IP QoS Generic , IP Intserv & Diffserv, Congestion Control in ATM Networks, Multi-Protocol Label Switching Architecture, Label Distribution Protocols, Optical , D35, Fibers and Components, Wavelength Routing Optical Networks, Optical Burst Switching, Broadband Access Network.
EENG587	Wireless Communication	3	This course introduces the applications and challenges of current and envisioned wireless systems, as well as the fundamental principles underlying wireless communications. Topics include: overview of current wireless standards, wireless channels characteristics and models, path loss, shadowing, noise, interference, link budget, flat and frequency selective properties of multipath fading, capacity limits, diversity and combining techniques, multiple antenna techniques MIMO and space-time coding, multicarrier modulation and orthogonal frequency division multiplexing OFDM, spread-spectrum and frequency hopping techniques, multi-user systems.
CENG460	Operating Systems	3	This is an introductory course in operating systems for students in computer and communications engineering. The course provides a solid theoretical foundation for understanding the concepts that underlie operating systems. The approach is to learn operating systems on three levels: the user level, the application program level, and the design and implementation of operating systems. Topics include: operating system structure, process management, process scheduling, multithreading, Inter-process communication, deadlocks, concurrency control and synchronization, protection, as well as an overview of memory management and strategies used for this purpose. While the course combines theory and practice, there will be a focus on practical demonstrations and extensive hands-on programming experience.
CENG470	Data Structures and Analysis of Algorithms	3	This course introduces the students to the basics of data structures (Stack, Queues, Lists, Trees, and Graphs) and principles of algorithms and abstraction programming. Algorithms relating to sorting, searching, and selection will be studied and analyzed. Algorithm analysis includes: worst and average case analysis, recurrences and asymptotes. Algorithm design includes: divide-and-conquer and greedy algorithms.
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).
CENG325	Software Applications and Design	3	This course introduces students to various topics in designing computer applications using an object oriented approach. Engineering students completing this course will be exposed to the concept, design, implementation, debugging, and testing of object oriented programs at an intermediate level. The course is practical and applications focused allowing the student to gain essential skills in developing engineering software applications.
CENG450L	Scripting Languages Lab	1	This lab course teaches engineering and statistical scripting languages such as MATLAB and Scala. These languages have important applications in modelling, simulation and analysis. The lab introduces the scripting languages in a problem based approach where common modelling and analysis problems are solved by the application of algorithms written in the taught languages.
CENG430L	Linux Lab	1	This lab course teaches scripting on modern platforms (e.g., RaspberryPi). Both Linux shell and other scripting languages (e.g. Python) are introduced. Topics covered in the lab include automation, interfacing and networking, etc...
ENGG515	Advanced Engineering Mathematics	3	This course covers core mathematical theories required by upper undergraduate__graduate engineering students. The course covers topics in operations research, graph theory, statistics and statistical inference that have a direct application to engineering applications.
CENG507	Embedded Systems	3	This course introduces the student to the development of embedded systems from the ground up. The student is introduced to advanced microcontrollers (e.g., ARM Cortex-M) platform and related application development tool chain that can be used for creating embedded systems. Design and implementation of real-time embedded systems. This is a practical, project oriented course that allows the student to gain the required skills for creating embedded systems and applications.
CENG685	Information Security	3	This course covers core concepts in developing and deploying secure information systems. The course focuses on the concepts described in international standards (such as the ISO/IEC 27000 series) for the definition, deployment, testing and integration of secure information systems. The course also guides the student through the contemporary issues related to privacy and security which are shaping the way information is being sought, created, exchanged, stored and exploited.
EENG637L	Advanced Digital Communication Lab	1	This course introduces students to a wide range of topics in Communications such as Digital Communications systems, Wireless and RF communication techniques. It includes the digital modulation schemes: ASK, FSK, M-ary PSK, M-QAM and the eye diagram analysis and illustration. It also covers the Advanced Digital communication techniques related to the Equalization function, Channel Estimation, Frame Detection, Orthogonal Frequency Division Multiplex (OFDM), timing synchronization and Channel Encoding/Decoding. The students are guided through hands-on experiments in Digital communications. These experiments lay emphasis on design aspects, performance analysis of different systems, methods and techniques. This Lab is based on LabVIEW Communications System Design Suite that offers a design environment closely integrated with NI software designed radio (SDR) hardware, USRP2901, for rapidly prototyping communications systems.