Al-AHLIYYA AMMAN UNIVERSITY

FACULTY OF ENGINEERING

DEPRTMENT OF COMPUTER ENGINEERING

COURSE DESCRIPTION
of
COMPUTER ENGINEERING PROGRAM

Number of Credit Hours: 160 Cr. Hr.

Course Labeling Code

Faculty	Code	Department Code	Year Level	Field Subject	Serial	Number

Example:

0	8	2	4	2	0	4

08 Faculty of Engineering Code.
 2 Department Code.
 4 Year Level.
 2 Field subject.
04 Serial Number on the course in the Field.

Course Information

Course Name {No. of Credit Hours} [Lectures – Contact Hours]

Example: Power Electronics {3} [3-3]

{3} 3 Credit Hours.

[3-3] 3 Lectures, 3 Contact Hours a week.

0121181 English Language Communication Skills (1) {3} [3-3]

Grammar: question tags, modals, future forms, articles, adjectives, adverbs, if structures; vocabulary: relationships, work, activities, media, war, sport; writing skills: essay, notes, messages, application letters; basic and advanced reading skills; basic and advanced listening skills; verbal skills: oral presentations, arguments.

Prerequisite: **0171100 English Language (Remedial)**

0161101 Arabic Language Communication Skills (1) {3} [3 – 3]

Language levels: phonological level, grammatical level, rhetorical level, orthographic level, comprehension and speaking; grammar exercises, nominal sentences, verbal sentences, kana and its sisters, Inna and its sisters, dual, masculine plural, feminine plural, indeclinable nouns, vocative, appositives; exercises in morphology, present participle and past participle; spelling and punctuation, dictionaries, listening and speaking.

Prerequisite: **0161100 Arabic Language (Remedial)**

0161200 Military Sciences {3} [3 -3]

The establishment and development of the Hashemite Kingdom of Jordan; the history of the Arab Legion; peacekeeping troops; preparing the nation for defense and liberation.

Prerequisite: **None**

0161201 National Education {3} [3 – 3]

Concepts and terms; Geography of Jordan; contemporary political history of Jordan; Jordanian Society; Jordanian constitutional and democratic life; Jordanian national institutions; challenges facing Jordan; threats to civic life: fanaticism, extremism, terrorism, violence; corruption: definitions, types, causes, impact, and prevention.

Prerequisite: **None**

0152102 English Language Communication Skills (2) {3} [3-3]

Grammar: comparisons, passives, reported speech, relative clauses, gerunds, infinitives; vocabulary: explore, excess, food, money, success, crime; writing skills: essay, formal letters, letters of complaint; basic and advanced reading skills; basic and advanced listening skills; verbal skills: oral presentations, arguments, oral complaints.

Prerequisite: **0121181 English Language Communication Skills (1**)

0161300 Islamic Culture {3} [3 – 3]

Definition of the culture, characteristics of the Islamic culture, Islamic culture and other cultures; the sources of Islamic culture: The Holy Quran, Sunna, the Arabic language, history of Islam; fields of Islamic culture: faith, worship, morals; challenges facing the Islamic culture: orientalism, globalization, secularism; young people and the impacts of foreign cultures, women and Islam, Islam and terrorism.

Prerequisite: **None**

0162102 Arabic Language Communication Skills (2) {3} [3 – 3]

Definition of the Arabic language and its levels; understanding and comprehending extracts; practicing syntax and morphology: the style of command and demands; unconditional morphology relevant to interrogative cases; "kad", [k&d] and its sisters; adjectival, exaggerated

expressions; adverbs of time and place, the forms of "al-haser" [al-haser]; dictation exercises; the conditions of writing "al-hamza" (the glottal stop); numbers; composition, essay writing, listening and spoken extracts.

Prerequisite: **0161101 Arabic Language Communication Skills (1**)

0162301 History of Jordan and Palestine {3} [3 – 3]

The geography of Jordan and Palestine, Jordan and Palestine in ancient times, general historical look, Jordan and Palestine in the Mamluki period, Jordan and Palestine during the First World War (1914- 1918), Emirate of East Jordan (Transjordan), constitutional and legislative life in Jordan, Palestine under the British Mandate, and Jordanian-Palestinian relations, Jerusalem: historical status.

Prerequisite: **None**

0411100 Human Rights {3} [3 - 3]

This course deals with identifying the basic concepts of human rights in an analytical way, and then realistic clarify of the international & regional means dealing with human rights such as treaties, recommendations and international means that are in the process of formation, such imperative rules & customs, this course also address realistically the content of human rights and the rights of the first generation such as right of living. The second-generation rights such as the right to work and third-generation rights such as the right of environment. This course deals with the international ways to protect human rights, whether legal means "reports, complaints of States and individuals, commissions of inquiry," or other means such as the use of economic pressure or political use of force - the theory of intervention for the benefit of humanity.

Prerequisite: **None**

0132200 Psychology and Life {3} [3 – 3]

Human behavior, fields of psychology, main approaches to human behavior. Introduce skills based on the understanding of human behavior, teaching students these skills related to the challenges facing students in their everyday life such as: problem-solving, self-confidence, coping with stress, mental health, establishing healthy relationships with others, motivation, and linking all these terms to real life through discussion and application.

Prerequisite: **None**

0143301 Entrepreneurship {3} [3 – 3]

Economic science definition: its objectives and the economic problem; The relation between the economic science and other sciences; Economic analysis methods; Production possibilities curve; National income accounts; Consumption; Investment; Saving; Unemployment; Inflation; Money and Banking; Financial and monetary policy and its role in dealing with the imbalanced economy through these policies; Economic development in terms of importance and objectives and economic planning to achieve such objectives; Demand and supply theory and consumer equilibrium; Cost and production theory; Producer equilibrium in different markets.

Prerequisite: **None**

0162302 Media and Public Relations {3} [3 – 3]

The nexus between media and society in terms of the social, political, economic and cultural power of the media, the role of the media in giving people the opportunity to express their opinions and promote international relations. Communication and public relations, communication and its types, levels, forms, properties, fields, activities, physical and nonphysical (symbolic) environment, and obstacles to the communicative process. Public relations: its beginnings, development, principles, bases, importance, functions, planning, activities.

Prerequisite: **None**

0561500 Tourism and Archaeology {3} [3 - 3]

Tourism definition; Classification of Tourism; The difference between tourist and other traveler's concepts, Travel types, The definition of Archaeology and archaeological sites: Archaeological surveys and excavations; Documentation; Jordan through the ages; Components of tourism in Jordan; Elements of tourist attractions in Jordan: Archeological sites, Natural sites, Natural reserves, Forests; Tourist movement and types in Jordan; Economical impact of tourism in Jordan.

Prerequisite: **None**

0161303 Sport and Health {3} [3 – 3]

Defining health and fitness: physical education, health education; the cognitive, emotional, skill-oriented, and social goals of physical education; the history of physical education: ancient, medieval, and modern ages, the Olympics, Athletics in Jordan: nutrition and exercising; athletic injuries: bone, joint , muscle, skin injuries;: special exercises for figure deformation; diseases related to lack of exercise: diabetes, obesity, being underweight, back pain, cancer; hooliganism: causes and recommended solutions for hooliganism.

Prerequisite: **None**

0162305 Environmental and Public Safety {3} [3 – 3]

The concept of the environment, its laws and relation to other sciences, primary and secondary components, cycle of elements in the natural environment, environmental problems, pollution of the environment, the problem of the depletion of environmental resources, principles of public health and diseases: the concept of public health, pathogens, viruses, bacteria, parasites, fungi, insects. The environment and pathology: organic, genetic, reproductive and psychological pathology. Nutrition and public health: types of food, malnutrition diseases, undesirable eating habits. The environment and public health from an Islamic perspective: Quranic verses and sayings of the Prophet.

Prerequisite: **None**

0162306 Science and Life {3} [3 – 3]

Origin and evolution of life: origin of universe, solar system formation and the origin of the earth, prebiotic chemistry, water for life sustenance contributions of polymer industry-natural and synthetic polymers, pharmaceuticals and cosmetics, generic and herbal drugs, drug abuse and its consequences.

Prerequisite: **None**

0161100 Arabic Language (Remedial) {3} [3 – 3]

The concept of language and its levels, comprehension and speaking; grammar exercises; nominal sentences, verbal sentences, kana and its sisters, inna and its sisters, masculine plural, feminine plural, singular, dual, numbers, appositives; punctuation marks, exercises in morphology (present and past participles); spelling issues (hamza/glottal stop writing): conjunctive hamza (hamzat wasl) and hamza qat', alef following group waw, alif layyinah ('flexible alif') and nunation (tanwin).

Prerequisite: None

0171100 English Language (Remedial) {3} [3-3]

Grammar: auxiliary verbs, the English tenses; vocabulary: relationships, media, places, appliances, activities; Writing Skills: paragraph writing, distinguishing between formal and informal letters; basic reading skills; basic listening skills; verbal skills: oral presentations, arguments, formal phone calls, restaurants recommendation.

Prerequisite: None

0331200 Computer Skills (Remedial) {3} [3-3]

IT Essentials: Introduction to Personal Computer, Computer Assembly, An Overview of Preventive Maintenance; Operating System (WINDOWS 10): Settings, Managing Folders and Files, Search; Basics Skills in Microsoft Word 2016; Basics Skills in Microsoft PowerPoint 2016; Basics Skills in Microsoft Excel 2016.

Prerequisite: None

0111101 Mathematics (1) {3} [3-3]

Review of basic algebra, functions, limits, continuity, derivatives of algebraic, trigonometric, exponential and logarithmic functions. curve sketching, related rates problems, maximum-minimum problems, indefinite integral, definite integral and applications with emphasis on engineering and pharmacy models.

Prerequisite: None

0111202 General Physics (1) {3} [3-3]

Physics and measurement; motion in one dimensions; vectors; motion in two dimensions; the laws of motion; circular motion; applications of Newton's laws; energy of a system; conservation of energy; linear momentum and collisions; rotation of a rigid object about a fixed axis; angular momentum; static equilibrium and elasticity; universal gravitation; fluid mechanics; oscillatory motion; wave motion; sound waves; superposition and standing waves; temperature; the first law of thermodynamics; the kinetic theory of gases; heat engines, entropy, and the second law of thermodynamics.

Prerequisite: None

0111203 General Physics (2) {3} [3-3]

Electric Fields; Gauss Law; Electric Potential; Capacitance and Dielectrics; Current and Resistance; Direct Current circuits; Magnetic Fields; Source of the Magnetic Field; Faraday's Law; Inductance; Alternating- Current Circuits; Electromagnetic Waves.

Prerequisite: 0111202 General Physics (1)

0111204 General Physics Lab. {1} [1-2]

Experimental Error and Data Analysis; Measurements; Vectors; Kinematics; Newton's Second Law; Friction; Centripetal Force; work and Energy; Hooke's Law; Simple Pendulum; Specific Heat of Metals; Determination of the coefficient of viscosity by Stoke's law; Archimedes Principle and Specific Gravity; Ohm's Law; Kirchhoff's Law; Wheatstone Bridge & Resistivity; The Oscilloscope, RC circuit

Prerequisite: **0111202 General Physics (1)**
Co-requisite: **0111203 General Physics (2)**

0112102 Mathematics (2) {3}[3-3]

Applications of the Definite Integral; Techniques of Integration; Hyperbolic Functions; Inverse Trigonometric Functions; L'hopital's Rule and Indeterminate Forms; Improper Integrals; Taylor's Formula; Sequences and Infinite Series and Applications with Emphasis on engineering models.

Prerequisite: **0111101 Mathematics (1)**

0811201 Computer Skills (Engineering) {3} [3-3]

The Basic Concepts of Programming using C++ language: C++ Programming; Controls Structures; Functions; Arrays; Pointers; An introduction to Classes and Objects.

Prerequisite: **0331200 Computer Skills (Remedial)**

0812101 Technical Writing {1} [1-1]

Identify and Write Technical and Scientific Reports in English; Focus on the Technical Side on Every Part of the Report; Practical Applications on Selected Topics.

Prerequisite: **0121181 English Language Communication Skills (1)**

0812102 Engineering Ethics {1} [1-1]

Engineering ethics; applied ethics and moral principles that apply to the practice of engineering; obligations on the shoulders of engineer towards society and towards its clients and his profession; ethics code engineering practice.

Prerequisite: **0121181 English Language Communication Skills (1)**

0832103 Engineering Mathematics (1) {3} [3-3]

Different Methods of Solving Ordinary Differential Equations Applicable to the First, Second and Higher-Order DEs, Linear and Nonlinear DEs, Homogeneous and Nonhomogeneous DEs. As an Engineering Application, Modeling of Some Engineering, Physical, and Social Problems will be given.

Prerequisite: **0112102 Mathematics (2) (to be passed)**

0832104 Engineering Mathematics (2) {3} [3-3]

Linear Algebra: Matrices, Vectors, Determinants, Solution of Linear Systems of Equations, Inverse of a Matrix; Matrix Eigenvalues Problems: Eigenvalues, Eigenvectors, and Diagonalization; Complex Analysis: Complex Numbers and Functions, Analytic and Harmonic Complex Functions, Exponential, Trigonometric and Logarithmic Complex Functions.

Prerequisite: **0832103 Engineering Mathematics (1)**

0832107 Engineering Statistics {3} [3-3]

Applications of Statistics in Engineering; Topics Include: Presentation and Treatment of Data; Introduction to Probability Theory and Probability Distribution (Discrete and Continuous); Counting Techniques; Sampling Theory; Statistical Estimation; Testing Hypothesis; Correlation; Regression Analysis.

Prerequisite: **0112102 Mathematics (2)**

0833105 Numerical Analysis {3} [3-3]

General Numerical Methods: Equation Solving Via Iteration, Interpolation; Numerical Integration, and Numerical Differentiation; Numerical Methods in Linear Algebra, Gauss Elimination, Least Squares Method, Numerical Methods for Differential Equations.
Prerequisite: 0832104 Engineering Mathematics (2)

0871101 Engineering Workshops {1} [1-2]

Workplace safety and use of tools; Basic skills of measuring and machining; Basic skills of welding; Household electric circuit installation; Basics of carpentry and its tools.
Prerequisite: **None**

0871102 Engineering Drawing {2} [1-3]

Use of Instruments; Lettering; Graphic Geometry; Orthographic; Isometric Drawing and Sketching; Sectional Views; Computer Aided Design; Applications in Civil, Mechanical, Architectural and Electrical Engineering.
Prerequisite: **None**

0812202 Object Oriented Programming {3} [3-3]

Introduction to Object Oriented Programming; Classes; Objects; Strings; Control Statements; Methods Arrays; Parameter Passing, Encapsulation, Inheritance, Polymorphism and An Introduction to The Graphical User Interface (GUI).
Prerequisite: **0811201 Computer Skills (Engineering)**

0812203 Object Oriented Programming Lab {1} [1-2]

The object oriented programming laboratory reinforces understanding of basic object oriented programming concepts and techniques (objects, classes and subclasses, methods) and their expression. The lab provides practice using object creation, initialization, message passing, class hierarchies, inheritance, polymorphism and templates. It also provides practice using non-object aspects such as loops and conditionals
Corequisite: 0812202 Object Oriented Programming

0812401 Digital Logic Circuit {3} [3-3]

Digital Numbering System and Information Representation: Arithmetic Operations, Decimal and Alphanumeric Codes, Binary Logic; Boolean Algebra: Identities, Functions and Manipulation, Standard Forms, Simplification, Logic Gates, Switch-Level and Logic CMOS Implementation, Integrated Circuits; Combinational Logic Design: Circuits (Gate Level), Design Hierarchy and Procedures, Computer-Aided Design, Combinational Two-Level and Multi-Level Implementations, Arithmetic (Add, Subtract, Multiply) and Other Popular Modules (Multiplexers, Encoders, Decoders); Programmable Logic Design: ROMs, PLAs,

PALs, FPGAs, Language-Directed Combinational Design (VHDL); Sequential Logic Design: Latches, Flip-Flops, State Machine Design and Minimization (Mealy and Moore Models); Design Problems.

Prerequisite: **0112102 Mathematics (2)**

0812402 Digital Logic Circuits Lab {1} [1-2]
The Digital Logic Circuits laboratory develops students with the ability of identifying the digital logic gates and combinational logic circuits such as adders, decoders. Students are also conducting experiment with memory elements (flip-flops) and sequential logic circuits.
Prerequisite : 0812401 Digital Logic Circuits

0813204 Computer Aided Design {1} [1-2]
This Lab provides a set of Experiments using NI- Multisim and NI-LabView that aims to enhance students skills in simulation field.These simulation software help to design ,build and Analyze some Electronic Circuits virtually as well as mathematical Models. It can also help students to implement their projects by converting the simulated Circuit schematic to printed Circuit board (PCB) or by dealing with some Data Acquisition systems (DAQ)
Prerequisite: **0811201 Computer Skills (Engineering)**

0813403 Advanced Digital Design {3} [3-3]
Overview of Digital Design; Two Level Minimization and Implementation Using PLAs/PALs; Combinational Logic Implementation Technologies; CAD Tools for Logic Minimization and Synthesis; Arithmetic Logic Circuits: Adders, Multipliers; Memory Elements and Clocking; Registers, Counters, Shifters; Memory: Random Access Memory , Read Only Memory; Synchronous Sequential Logic Design; Asynchronous Sequential Logic Design; Finite State Machine Optimization and State Assignment; Introduction To VHDL; VHDL Structural Modeling; VHDL Behavioral Modeling; Case Studies In VHDL.
Passing prerequisite: **0812401 Digital Logic Circuits**

0813404 Advanced Digital Design Lab {1} [1-2]
The advanced digital logic design laboratory develops students with the ability of identifying properties and usage of logic gates, flip-flops, digital standard components, and programmable logic devices; designing and implementing combinational and synchronous digital systems; using computer aided engineering (CAE) tools for designing and simulating of digital systems.
Prerequisite: **0813403 Advanced Digital Design**

0813405 Microprocessors {3} [3-3]
Introduction to the Microprocessor and Microcomputer; The Microprocessor and its Architecture; Addressing Modes; Instruction Set; Programming the Microprocessor using Assembly Languages; 8086 and 8088 Hardware Specifications: Memory Interface, Basic I/O Interface, Interrupts, Keyboard and Printer Interface, PPI 82C55, ADC, DAC and DMA Interface.
Prerequisite: **0812401 Digital Logic Circuits**

0813406 Microprocessors Lab {1} [1-3]

In Microprocessor's laboratory, students are introduced to a detailed explanation of the Intel Microprocessor 8086 and 8088 instruction sets, and how to develop programs by using assembly language which communicates directly with perepheral devices. As well as, how to apply and validate those codes using TASM Turbo Assembler Program, DOS and BIOS Function Call. In additon to that, the lab offers other facilities by being one of the computer labs which available to help students in projects preparation
Prerequisite: **0813405 Microprocessors**

0814104 Discrete Mathematics {3} [3-3]

Introduction to Discrete Mathematics: Logic, Relations, Functions, Basic Set Theory, Countability and Counting Arguments, Proof Techniques, Mathematical Induction, Graph Theory, Combinatorics, Discrete Probability, Recursion, Recurrence Relations, and Number Theory; The Fundamental Mathematical Tools Used in Computer Engineering as: Sets, Relations, and Functions; Propositional Logic: Predicate Logic, and Inductive Proofs, Summations, Recurrences, and Elementary Asymptotic; Counting and Discrete Probability; Undirected and Directed Graphs; Introductory Linear Algebra with Applications in Computer Engineering.
Prerequisite: **0832104 Engineering Mathematics (2)**

0814105 Engineering Numerical Applications {1} [1-2]

The use of tools and ready-made programs to improve student performance and ability to use the program like MATLAB in the field of solving mathematical and numerical functions, applications in engineering sciences and system design.
Prerequisite: **0833105 Numerical Analysis**

0814206 Algorithms {3} [3-3]

Topics include Functions Growth: asymptotic notation, standard notations; Sorting: Heap sort, Quick sort, Merge Sort; Bubble sort. Graph algorithms: Searching a Graph , shortest path; String Matching; NP Completeness.
Prerequisite: **0342102 Data Structure**

0814301 Computer Networks {3} [3-3]

Introduction: Uses and Classification of Computer Networks, Multiple Access Methods, Layered Network Structure, OSI and TCP/IP Reference Models, Network Standardization; Physical Layer: Basic Definitions Related to Digital Data Transmission, RS-232 C; Data Link Layer: Framing, Flow Control, Error Control, Slip and PPP Protocols; MAC Sub Layer: Repeaters, Bridges, Routers, Gateways; Network Layer: Routing Algorithms, Congestion Control.
Prerequisite: **0823502 Analog Communications**

0814407 Embedded Systems {3} [3-3]

Introduction to Embedded Systems; Introducing PIC 16 Series: Architecture Overview of PIC16F84A, The 16F84A Memory, Power Up and Reset; Building Assembly Programs: Introduction to Assemblers, 16 Series Instruction Set; Parallel Ports; PIC 16F87XA:

Architecture Overview, Special Memory Operations; The physical interface; Interrupts, Counters and Timers: Working with Interrupts, Counters and Timers, Watchdog Timer, Sleep Mode, Capture Mode, Compare Mode, PWM Module; Serial Communication; Data Acquisition.
Prerequisite: **0813405 Microprocessors**

0814408 Embedded Systems Lab {1} [1-2]

Introduction to Microcontroller-Based Embedded Systems; Introduction to PIC Microcontrollers; Input Output Ports; Software Generated Delays; Hardware Generated Delays (Timers) ; Interrupts; Physical Interface: Keypads, Motors, Seven-Segment Displays, LCDs; Pulse Width Modulation (PWM); Serial Communication; Analog to Digital Converters; Running the Experiments includes Connecting Electronic Circuits and Writing the Related Programs Using Assembly Language.
Prerequisite: **0814407 Embedded Systems**

0813414 Microprocessors and Embedded Systems {3} [3-3]

Introduction to Microprocessor and Microcomputer; The 8086/8088 Microprocessors and their Architecture; Addressing Modes; Instruction Set; Programming the Microprocessor using Assembly Languages; Introduction to Embedded Systems; Introducing PIC 16 Series: Architecture Overview of PIC16F84A, The 16F84A Memory; Building Assembly Programs: Introduction to Assemblers, PIC 16 Series Instruction Set; Parallel Ports; Interrupts; Counters and Timers.
*Prerequisite: 0*812401 Digital Logic Circuits

0814415 Microprocessors and Embedded Systems Lab {1} [1-3]

Identifying internal structure and operation of the Microprocessor Intel 8086/8088 and microcontroller PIC 16F877A; design methodology for software for each (Intel 8086&PIC16F877A); embedded system design application (simple project) with specific modules.
Prerequisite: 0813414 Microprocessors and Embedded Systems

0814409 Computer Organization & Design {3} [3-3]

Computer Performance; Register Transfer and Micro-operations; Basic Computer Organization and Design; Computer Instructions; Computer Arithmetic; Floating Point Arithmetic Processors; Micro-programmed Control; Central Processing Unit; Pipelining.
Prerequisite: **0813403 Advanced Digital Design**

0814410 Computer Architecture {3} [3-3]

This Course Focuses on the MIPS Processor: Instruction Set; Addressing Modes; Datapath and Control Unit Design; Pipelining: Pipeline Review, Pipeline Hazards; Memory Hierarchy: Caches, Cache Performance, Virtual Memory; Introduction to Multi-Processors; Cache Coherence Protocols; Introduction to FPGA and VHDL Programming; Implementing the Basic MIPS Architecture using FPGA.
Prerequisite: 0814409 Computer Organization and Design

0814411 Computer Architecture Lab. {1} [1-2]
The computer architecture laboratory develops students with the ability of identifying the modern computer system architecture and to exercise these principles to computer designs. The lab also provides practice using three primary building blocks of general-purpose computing systems: processors, memories, and networks.
Corequisite: **0814410 Computer Architecture**

0814901 Field Training {1} [8 continuous Weeks]
A practical experience to be gained through working for eight continuous weeks in accredited establishments.
Prerequisite: **Completion of 110 credit hours**

0815207 Database Systems {3} [3-3]
Database Concepts; Introducing Database Management Systems; Database Architecture; The Relational Data Model; Database Integrity;   Functional Dependencies and Normalization ; Entity-Relationship Diagrams; Relational Algebra ;SQL.
Prerequisite: **0814206 Algorithms**

0815302 Computer Networking Protocols   {3} [3-3]
Network Layer Protocols: Optimality principle, Routing Algorithms: Flow based, Distance Vector, Shortest Path, Broadcast; Congestion control Algorithms: Leaky Bucket, Traffic Shaping, congestion control in ATM; Internetworking Protocols: The Internet Network layer, IP Tunneling and Concatenated Virtual Circuits, IP datagram forwarding, encapsulation, fragmentation, and reassembly; Transport Layer Protocol : TCP and UDP , AAL layer in ATM. Internet protocols: IP, ARP, RARP, BOOTAP, ICMP, OSPF, BGP, CDIR, IPv6.
Passing Prerequisite: **0814301 Computer Networks**

0815303 Computer Networks Lab. {1} [1-2]
Contemporary Network Protocols and Experience in Using Automated Tools or Other Techniques to Analyze and Evaluate Security Mechanisms; Understanding Security Properties and Requirements: Authentication, Key establishment, and Fairness; Several Models and Tools Used in Security Analysis and Examine their Advantages and Limitations: Constraint Solving, Process Algebras, Protocol Logics, Probabilistic Model Checking, Game theory; Models Based on Logic Programming: Privacy Systems, Web Security, and Trusted Computing Architectures.
Prerequisite: **0815302 Computer Networking Protocols**

0815412 Operating Systems {3} [3-3]
General Introduction to the Techniques used to Implement Operating Systems and Related Kinds of Systems Software;   Process Management: Creation, Synchronization and Communication; Processor Scheduling; Deadlock: Prevention, Avoidance, and Recovery; Main Memory Management; Virtual Memory Management: Swapping, Paging, Segmentation and Page-Replacement Algorithms; Control of Disks and other Input/Output Devices; File System Structure and Implementation; Protection and Security; Distributed Systems.
Prerequisite: **0814410 Computer Architecture**

0815413 Intelligent Systems and Neural Networks {3} [3-3]
Introduction: Intelligent Systems, Terms and Concepts; Search; Agent Architectures; Machine Learning; Genetic Algorithms; Perception and Understanding: Vision, Speech, Natural Language Processing; Representation and Reasoning: Predicate Logic, Frames, Production Systems, Resolution Theorem Proving; Learning: connectionist Models, Symbolic Learning; Neural Networks: Feedback Neural Networks, Learning Methods, Classification Methods, Cellular Neural Networks.
Prerequisite: **0814206 Algorithms**

0815414 Distributed Systems and Parallel Processing {3} [3-3]
How to Distribute the Processing Across Platforms Using Remote Library Services; Distribute Data and Programs to Remote Machines; Take Advantage of Multiple Processers on a Single Machine and Manage Remote Tasks.
Prerequisite: **0815412 Operating Systems**

0815415 Distributed Systems and Parallel Processing lab {1} [1-2]
The distributed systems and parallel processing laboratory allows students to identify a computing environment which includes multiple workstations, PCs, and a cluster with multi-core machines. It also supports the experiments in areas of parallel and distributed computing: operating systems, parallel programming languages, applications, and networking activities.
Corequisite: **0815414 Distributed Systems and Parallel Processing**

0815902 Graduation Project (1){1}[1-2]
Students work in groups to conduct a graduation project in two phases, graduation project (1) is the first phase which includes developing proposal, literature review, problem identification, and data collection.
Prerequisite: **Completion of 120 credit hours**

0815903 Graduation Project (2) {1} [2 -4]
This Project completes and implements the work undertaken in project (1); after full implementation of the graduation project's goals, the student must present a comprehensive report and he must present his findings to an examination panel.
Prerequisite: **0815902 Graduation Project (1)**

0822205 Electronics {3} {3-3}
Introduction to Electronics; Semiconductors: Intrinsic and Extrinsic Semiconductors, Electrical Properties of Semiconductors, Diffusion Process in Semiconductors; The PN Junction Diode: Forward, Reverse Biased Junction, V/I Static Characteristics, Diode Types: Zener, LED, and Photodiode; Diode Applications: Rectification, Clipper, and Clamper Circuits, Voltage Multipliers; Bipolar Junction Transistors: CB and CE Characteristics, DC Biasing and Analysis; BJT Applications: BJT as a Switch, and Amplifier; Field-Effect Transistor: V/I Characteristics of JFET and MOSFET, DC Biasing and Analysis; Biasing of Transistor (BJT and FET); Single-Stage Amplifier; Cascaded BJT and FET Amplifiers;

Composite Transistor Stages; Operational Amplifiers and Applications; Differential Amplifier; Operational Amplifier Architectures; Frequency Response of Amplifiers; Negative-Feedback Amplifiers.
Prerequisite: **0872301 Electric circuits (1)**

0823101 Probability and Random Processes {3} {3-3}
Introduction to probability and random variables; statistics of random variable; random process; ergodicity and stationary; variance and autocorrelation function; power spectral density; filtering of random processes; Gaussian process: noise, narrow band random process.
Prerequisite: **0832107 Engineering Statistics**

0823206 Electronics Lab. {1} {1-2}
Diode characteristics; Clipping and Clamping Circuits: Half-Wave and Full-Wave Rectification; Zener - Diode and Voltage Regulation; BJT Characteristics and Biasing Circuits; FET Characteristics and Biasing circuits; BJT Amplifiers; Amplifier and its Configurations; BJT Amplifier; Characteristic of JFET; Measurement of H-Parameters of BJT; Frequency Response of Single and Multi-Stage Amplifier
Prerequisite: **0822205 Electronics**

0823207 Digital Electronics {3} {3-3}
Digital electronic signals and switches: digital signal, clock waveform, serial and parallel representation, applications of relay, diode and BJT as a switch; digital logic families: RTL, DTL, TTL, ECL, MOS and CMOS logic family, interfacing between families; timing circuits: bistable, monostable, astable circuits and 555-timers; interfacing to the analog world: DAC and ADC circuits, sample and hold circuits; memory concepts: RAM, ROM, magnetic and optical storage.
Passing Prerequisite: **0822205 Electronics**

0823208 Digital Electronics Lab {1} {1-2}
Characteristics of switching devices, characteristics of logic gates: RTL, TTL, and COMS, interfacing of TTL & CMOS gates ; analysis and design of multivibrators circuit; application of 555 timer; DAC and ADC circuits.
Prerequisite: **0823207 Digital Electronics**

0823501 Signals and Systems {3} {3-3}
Classification of signals, basic concepts of sampling, basic continuous-time and discrete-time signals; signal processing using MATLAB; classification of systems, properties of continuous-time LTI systems, convolution integral, proprieties of discrete-time LTI systems, convolution sum, difference equations; Laplace transform, transfer function; Fourier series; Fourier transform, frequency response of continuous-time LTI systems, power spectral density.
Prerequisite: **0832103 Engineering Mathematics (1)**

0823502 Analog Communication {3} {3-3}
Review of: Fourier transforms; spectra, filters, and Hilbert transform; analog modulation techniques: AM, FM and PM; band-pass noise representation: noise performance of analog modulation; FDM; super-heterodyne receiver.
Prerequisite: 0823501 Signals and Systems

0342102 Data Structure {3} [3-3]

Design and Analysis of Diverse Basic Data Structures both Sequentially and by Using Linked Representation for: Stacks, Queues, Lists, Trees, Graphs, Hashing; Recursion; Design and Analysis of Different Searching and Sorting Algorithms, Studying the Computational Complexities of these Algorithms.
Prerequisite: **0812202 Object Oriented Programming**

0874106 Engineering Economy and Management {3} [3-3]

Engineering Project Development; Decision Making; Basic Concepts of Capital Investment: Formulas and Applications, Rates of Return, Economic Feasibility of Projects (Net Future Value, Net Present Value, and Equivalent Uniform Cash Flow); Comparison of Mutually Exclusive Proposals; Benefit-Cost Ratio Method; Depreciation; Corporate Taxation; Resource Allocation.
Prerequisite: **0832107 Engineering Statistics**

0872301 Electric circuit (1) {3} {3-3}

Basic Components and Electric Circuits: Units and Scales, Current, Voltage, Power, Voltage and Current Sources, Ohm's Law; Voltage and Current Laws: Kirchhoff's Voltage, Kirchhoff's Current Laws; Nodal and Mesh Analysis; Techniques of Circuit Analysis: Linearity and Superposition, Source Transformations, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer; Energy Storage Elements: Capacitor, Inductor; Basic RL and RC Circuits: The Source Free RL Circuit, The Source Free RC Circuit, The Unit-Step Function; The RLC Circuit: The Source Free Parallel Circuit, The Over Damped Parallel RLC Circuit, Complete Response Analysis; Introduction to AC Circuits.
*Prerequisite***: 011202 General Physics (1)**.

0872302 Electric circuit (2) {3} {3-3}

Sinusoidal Steady State Analysis: Characteristics of Sinusoids, Forced Response to Sinusoidal Functions, The Phasor, Phasor Relationships for R, L, and C, Impedance, Admittance; AC Circuit Power Analysis: Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power and Power Factor, Complex Power; Three-Phase Circuits; Magnetically Coupled Circuits; Complex Frequency and Laplace Transform; Circuit Analysis in The s-Domain; Frequency Response; Two-Port Networks.
Passing Prerequisite: **0872301 Electric circuits (1)**

0872303 Electric circuits Lab. {1} {1-2}

DC Circuits: Kirchoff's Voltage and Current Laws, Network theorems, Maximum Power Transfer; Transient Circuits: RL, RC, RLC; Resonant Circuits; Magnetically Coupled Circuits; Two-Port Networks.
Prerequisite: **0872301 Electric circuits (1)**
Coerequisite: **0872302 Electric circuits (2)**

0874312 Control Systems {3} {3-3}

Concept of Control Systems; Open-loop and Closed-loop Systems; Mathematical Modeling of Physical Systems; Transfer Function and System Modeling Diagrams; Response Characteristics of Control Systems; Specifications of System Performance; Stability Analysis of Linear Control Systems; Routh's Stability Criterion; Time-domain Analysis of Control Systems; Design of Controllers and Compensators.
Prerequisite: **0823501 Signals and Systems**

0814208 Digital Image Processing {3} [3-3]

Introduction to Digital Image Processing; Digital Image Representation; Intensity Transformation and Spatial Filtering; Filtering in the Frequency Domain; Image Restoration and Reconstruction; Geometric Transformations; Color Image Processing; Morphological Image Processing; Representation and Description; Object Detection.
Prerequisite: **0823501 Signals and Systems**

0814209 Software Engineering {3} [3-3]

Full Cycle of a Software System Development Effort: Including Requirements Definition, System Analysis, Design, Implementation, and Testing; Special Emphasis is Placed on System Analysis and Design; The Design Phase Includes Development of a User Interface; A large Term Project Incorporates the Full Software Life Cycle.
Prerequisite: **0814206 Algorithms**

0814416 Microprocessor Systems {3} [3-3]

Continue the Study of Microprocessor Systems with Particular Emphasis on Current Approaches to Hardware and Software Organization of the Intel 286 Processor and Later; Real-Time Systems Based Microprocessor; Design and Applications; An Introduction to Signal Theory; Filtering Techniques and Control.
Prerequisite: **0813405 Microprocessors**

0815107 Selected Topics in Computer Engineering {3} [3-3]

Current trends and developments in the field of computer engineering; Contemporary Issue in computer engineering; Each semester will cover one topic which will be announced for students at the registration time.
Prerequisite: Department Approval

0815304 Computer and Network Security {3} [3-3]

Recent Advances in Computer Networks and System Security; Fast and Secure Network Systems; Secure Storage Systems; High Performance Intrusion Detection Systems, and Efficient Anti-Abuse Systems; Basic Concepts of Computer Security; Theory and Current Practices of Authentication; Authorization and Privacy Mechanisms in Modern Operating Systems and Networks.
Prerequisite: **0815302 Computer Networking Protocols**

0815417 Fuzzy Logic {3} [3-3]

Fuzzy Set Theory and Fuzzy Logics; Basic Concepts of Fuzzy Set Theory: Membership, Cardinality, Entropy and Set Operations (Union, Intersection, Complementation) are described; Fuzzy Sets are Interpreted in the Frame of Possibility Theory; A Brief Review of Boolean Logic and Multivalued Logic is Given; Fuzzy Logic Operations: AND, OR, NOT, Implication; Fuzzy Relations and Compositions are then Described; Triangular T-Norms; Conorms; and Generalized Aggregation Operators are also Covered.
Prerequisite: **0815413 Intelligent Systems and Neural Networks**

0824504 Digital Communication {3} {3-3}

Analog Pulse Modulation; PCM, DPCM, and Delta Modulation; TDM; Baseband Transmission; Nyquist Criteria; Matched Filter and Noise Performance; ISI; Line Coding and Partial Response Signaling; Equalization; Binary Bandpass Transmission: BASK, BFSK, BPSK and DPSK; Geometric Representation of Signals: Orthogonal Signals, Correlation Receivers and Signal Constellations; M-ary Band-pass Digital Transmission: ASK, PSK, FSK, QAM; Noise Performance and Bandwidth Efficiency; Synchronization.
Prerequisite: 0823502 Analog Communications.

0824507 Digital Signals Processing {3} {3-3}

Sampling and aliasing; review of discrete time signals and systems; z-transform and its application to the analysis of LTI systems; DSP using MATLAB; discrete-time Fourier transform (DTFT); frequency response of LTI systems; discrete Fourier transform (DFT); structures for FIR and IIR filters; introduction to design of digital filters; applications of DSP: speech processing and image processing.
Prerequisite: **0823501 Signals and Systems**
Prerequisite: None