

AI-AHLYIYA AMMAN UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING

COURSE DESCRIPTION
of
ELECTRICAL ENGINEERING PROGRAM

Number of Credit Hours: 160 Cr. Hr.

Course Labeling Code

Faculty	Code	Department Code	Year Level	Field Subject	Serial	Number
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Example:

0	8	7	4	2	0	4
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08 Faculty of Engineering Code.

7 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.

Courses Descriptions in English Language:

A0161201 English Communication Skills {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: A0161200 English Language (Remedial)

A0161101 Arabic Communication Skills {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: A0161100 Arabic Language Remedial

A0161401 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

A0161301 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

A0161501 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

A0161701 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

A0161601 Contemporary Issues {3} [3 – 3]

Prerequisite: None

A0411601 Legal Culture and 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

A0161603 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

A0161901 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

A0161703 Archaeology and Tourism in Jordan {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

A0181100 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

A0612303 Community Health {3} [3 – 3]

Prerequisite: None

A0871103 Principles of Renewable Energy {3} [3 – 3]

Introduction to renewable Energy include Photovoltaic, Wind power, Micro hydropower, Biomass energy, Waste power, Solar thermal power, Geothermal power, Ocean energy (tidal, tide-flow and wave), Ocean energy (OTEC).

Prerequisite: None

A0161602 Critical thinking Skills {3} [3 – 3]

Prerequisite: None

A0161801 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

A0111101 Mathematics (1) - {3} [3-3] (For Faculty of Engineering

students) Functions and Models: Four ways to represent a function, Trigonometric Functions, Exponential Functions, Inverse Functions and Logarithms; Limits and Derivatives : The Limit of a Function, Continuity, Limits at Infinity, Horizontal Asymptotes, Derivatives of Polynomials and Exponential Functions, Hyperbolic Functions; Applications of Differentiations : L'Hospital's Rule and Indeterminate Forms, Maximum and Minimum Values, Optimization Problems; Integrals and Applications : The Definite and Indefinite Integrals, The Substitution Rule, Areas between Curves, Volumes, Volumes by Cylindrical Shells.

Prerequisite: None

A0111104 Mathematics (2) – {3} [3-3] (For Faculty of Engineering students):

Techniques of Integration: Integration by Parts, Integration, Trigonometric Integrals, Trigonometric Substitution, Integration by Partial Fractions, Strategy for Integration, Improper Integrals; Polar Coordinates and its Applications; Sequences and Series: Sequences and Series Convergence Tests, Maclaurin's and Taylor's Formulas, Applications on Sequences and Series.

Prerequisite: A0111101 Mathematics (1)

A0111201 General Physics (1) – {3} [3-3] (For Faculty of Engineering

students) Units Physical Quantities; Vectors; Motion in One Dimension; Motion in Two Dimensions; The Laws of Motion: Force and Interaction, Newton's laws, Mass and Weight, Friction; Energy of a System: Work, Kinetic Energy, Potential Energy, Power; Momentum Impulse and Collisions; Dynamics of Rotational Motion: Torque, static, Conditions for Equilibrium, Center of Gravity; Fluid Mechanics: Static Fluid, Dynamic Fluid ; Oscillatory Motion; Wave Motion.

Prerequisite: None

A0111202 General Physics (2) - {3} [3-3] (For Faculty of Engineering students)

Electrostatics: Electric Charges, Coulomb's Law, Electric fields; Gauss's law; Electric potential; Capacitance and Dielectrics; DC-Circuits: Current, Resistance, Electromotive Force; Magnetostatics: Magnetic Field, Magnetic Forces; Sources of

Magnetic Field; Electromagnetic Induction; Inductance; Alternating Current Circuits; Electromagnetic Waves.

Prerequisite: A0111201 General Physics (1)

A0111203 General Physics lab - {3} [3-3] (For Faculty of Engineering students)

Experimental error and data analysis; Measurements; Force Table; Motion in One and Two Dimensions; Newton's Second Law; Friction; Work and Energy; Simple Harmonic Motion: Simple Pendulum, Spring Mass system; Electricity: Ohm's Law, and Kirchhoff's Law.

Co-requisite: A0111201 General Physics (1)

A0111301 General Chemistry {3} [3-3]

Matter Classification and Properties: Elements, Atoms, Ionic and Covalent Compounds; Measurements and Dealing with Numbers; Periodic Table Chemical Calculations; Chemical Reactions in Solutions; Redox Reactions; Electronic Structure of Atoms; Basics of Chemical Bonding and Structure of Molecules; Properties of Gases, Liquid and Solid State; Intermolecular Forces; Solutions and Concentrations; Physical Properties of Solutions; Kinetics: To Study The Rates of Reactions, Acid-Base Equilibrium, pH Measurements, Thermo Chemistry and Thermodynamics, Energy and Chemical Changes.

Prerequisite: None

A0112101 Linear Algebra {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: A0111102 Mathematics (2)

A0811201 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: A0331700 Computer Skills (Remedial)

A0811202 Engineering Workshops {1} [1 – 2]

Workplace safety and use of tools; basic skills of measurements; basic skills of hand filing, welding, carpentry, sheet metal fabrication, and household electric circuits.

Prerequisite: None

A0812201 Communication Skills and Professional Ethics {3} [3-3]

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: A0161201 English Communication Skills

A0831201 Engineering Drawing {2} [2 – 4]

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

A0832101 Differential Equations {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: A0111102 Mathematics (2) (to be passed)

A0832102 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: A0111101 Mathematics (1)

A0833101 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: A0112101 Linear Algebra

A0872301 Electric Circuits (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: A0111202 General Physics (2)

A0872302 Electric Circuits (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.

Prerequisite: A0872301 Electric circuits (1) (to be passed)

A0872304 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: A0872301 Electric Circuits (1)

Co-requisite: A0872302 Electric Circuits (2)

A0872501 Electromagnetics {3} [3 – 3]

Basic vector algebra and vector calculus; Coordinate systems and transformation; Electric field: Coulomb's law, electrostatic field, electric potential, electric flux density, Gauss's law and boundary value problems, capacitor and energy density in electrostatic fields; Maxwell's equation; Magnetic field: steady electric current, Biot-Savart law and magneto-static fields, magnetic flux density, Ampere's law, magnetic vector potential, magnetic forces, inductance and energy density in magneto-static fields, ferromagnetic material and magnetic circuits; Time-varying fields and Maxwell's equations; Electromagnetic waves: characteristics, speed, power and polarization.

Prerequisite: A0111202 General Physics (2) (to be passed)

A0873503 Electrical Machines {3} [3 – 3]

Principles of Electromagnetic circuit; Single-phase transformers: ideal, practical transformer, equivalent circuit, auto-transformer; Three-Phase Transformer: Types, Connection; AC Machinery Fundamentals: Principle of work, rotating magnetic field; Three phase induction motors: Principle of work, properties an performance, starting, speed control; Synchronous Machines: Construction, Internal Generated Voltage, Equivalent Circuit; Operation Modes: Alone, Parallel; Synchronous Motors: Steady state operation, starting.

Prerequisite: A0872302 Electric Circuits (2)

A0873504 Electrical Machines Lab. {1} [1 – 2]

DC Machines: Motors, Generators; Transformers: Single phase, Three-phase Transformers; Three-phase Synchronous Machines: Motors, Generators; Three-phase Induction Motors: Squirrel Cage Rotor, Wound Rotor (Slip-ring); Single-phase Motors.

Co-requisite: A0873503 Electrical Machines

A0874301 Power Electronics {3} [3 – 3]

General introduction; Power semiconductor Switches: Features, Characteristics and Classification of Diodes, Transistor, Thyristor and others; Quality Assessment and Parameters of AC & DC Waveform; Single-Phase and Three-Phase Rectifier Circuits; Uncontrolled, Fully-Controlled, and Semi-Controlled Converters; AC/AC Converters (AC Voltage Regulators); DC/DC Converters (DC Choppers); DC/AC Converters (Inverters); Applications of Power Electronics.

Prerequisite: A0822502 Electronics

A0874302 Power Electronics Lab. {1} [1 – 2]

Single-Phase Half-Wave Rectifiers: Controlled, and Uncontrolled; Single-Phase Full-Wave Rectifiers: Controlled, and Uncontrolled, and Semi-Controlled; Three-Phase Half-Wave Rectifiers: Controlled, and Uncontrolled; Three-Phase Full-Wave Rectifiers: Controlled, and Uncontrolled, and Semi-Controlled; Regulators; Invertors.

Co-requisite: A0874301 Power Electronics

A0874501 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: A0823401 Signals and Systems

A0874502 Control Systems Lab. {1} [1 – 2]

Open-Loop and Closed-Loop Systems; Servomechanism Principles; Transient Response; Closed-Loop Position and Velocity Control Systems; The Effect of Gain, PI, PD, and PID Controls on System Performance; Control Systems for First and second order differential equations; Frequency Response Measurements; Analogue Computer Simulation of Control Systems.

Corequisite: A0874501 Control Systems

A0874503 Electrical Power Systems (1) {3} [3 – 3]

Structure of modern power systems, Basic concepts; Per unit system; Power transmission lines; Characteristics and Performance of power Transmission Lines; Load flow studies; Formulation of ZBUS Matrix; Symmetrical Fault Analysis; Symmetrical components; Unsymmetrical Fault Analysis; Symmetrical components.

Prerequisite: A0873503 Electrical Machines

A0874504 Electrical Power Systems (2) {3} [3 – 3]

Review of Synchronous Generator (SG): Simplified models of SG for steady state and transient analysis; Basic Mathematical models for Power System Stability (PSS): Formal Definition of PSS, Classification of PSS, The Swing Equation, Transient Power-Angle Curve, The generalized swing equation with damping; Small signal (static) stability: Linearization of Swing Equation, Roots of Characteristic Equation, Undamped and damped Frequency of Oscillation, State Variable Form; Transient stability: Equal-Area Criterion and its applications to faults, Numerical Integration of the Swing Equation; Voltage Stability: Comparison of angle and voltage stability, Mathematical formulation of static voltage stability problem, Tools for voltage stability analysis, Reactive power flow and voltage collapse, Dynamic Vs. Steady-state Analysis of Voltage Stability; Power System Security: Security function, System state classification, Security analysis, Contingency Analysis, Contingency Analysis using Sensitivity Factors, Line Loadability; Computer applications to all studied topics using Matlab.

Prerequisite: A0874503 Electrical Power Systems (1) (to be passed)

A0874505 Electrical Power Systems Lab. {1} [1 – 2]

Transmission Line Parameters and Performance; Transformers: Voltage, Current; System Faults; Protection Systems; Power System Performance in Steady – State and PS Transient.

Prerequisite: A0874503 Electrical Power Systems (1)

Co-requisite: A0874504 Electrical Power Systems (2)

A0874506 Renewable Energy Systems {3} [3 – 3]

Conventional and renewable energy sources; Possible approaches for conversion of sunlight into electricity; Statistics on world installations of renewable energy systems and costs; Environmental considerations; Wind turbines (WTs) and Wind characteristics: Types of WTs, Power in the wind, Impact of tower height, Maximum rotor efficiency, Average power in the wind; WT generators: Review of induction generators, Fixed- and Variable-speed WTs, Types of Control systems, Typical wind generation configurations, Estimates of produced electrical energy, WT power curve, WT economics, Environmental impacts of WTs; Solar radiation: Properties of light, Solar Radiation in Space and the Earth's Surface, Solar angles, solar radiation measurements, calculation of average monthly insolation on a tilted surface, Peak Sun Hours; Physics and electrical characteristics of solar PV Cells: Basic semiconductor physics, Equivalent circuit for a solar cell, The I–V curve under STC, Bypass diodes and blocking diodes, Types of PV cells; Grid-connected PV systems: Principal components, Configurations of inverters and PV arrays, Interfacing with the Utility, DC and AC rated power, STC efficiency of PV module or array, Estimating PV energy production, PV System sizing (Design), PV System economics; Computer applications to all studied topics using Matlab.

Prerequisite: A0874301 Power Electronics

A0874503 Electrical Power Systems (1)

A0874507 Renewable Energy Systems Lab {1} [1 – 2]

Solar energy; photovoltaic devices; energy conversion; solar beam measurement; solar cell characterization; unit characterization; Fundamentals of wind aerodynamic properties; dynamic behavior of wind turbines and generated energy; wind speed and quality analyzers.

Corequisite: A0874506 Renewable Energy Systems

A0874508 Design of Lighting and Electrical Installations {3} [3 – 3]

Residential and Commercial building wiring; blueprint reading, branch circuit and feeder installations, service entrance installations; Lighting: Illumination basic concepts, parameters and units, types and characteristics of lamps and luminaries, Indoor lighting design and public road lighting design; Low-voltage installations with TT earthing system of panels and boards; Single line diagram electrical safety; Special electrical installations: Fire alarm systems, Closed-Circuit Television.

Prerequisite: A0874503 Electrical Power Systems (1)

A0874509 Design of Lighting and Electrical Installations Lab. {1} [1 – 2]

Identify structural equipment; Training on domestic and industrial installations; Fault detection; safety systems and electrical protection installations; phone system for the entrances of buildings combinations; Fire alarm systems; Closed-Circuit Television; Lighting design and evaluation of lighting devices combinations.

Co-requisite: A0874508 Design of Lighting and Electrical Installations

A0874601 Field Training {3} [*]

Practical experience to be gained through working for eight continuous weeks in an accredited establishment.

Prerequisite: Pass of 115 Cr. H.

A0875501 Power Systems Protection {3} [3 – 3]

Protection objectives; Basic components of PSP; Current transformers; Voltage transformers; Protective relay; Circuit Breaker and trip circuit; Basic requirements of PSP; Primary and back-up protection; Various principles of power system protection; Types of relay based on relay operation mechanism; Overcurrent relays: Basic types of overcurrent relays, Time-current curves of time delay relays, Relay coordination, Protection of a Three-phase Feeder; Distance relays: Introduction to simple impedance distance relay and its R-X diagram, Impact of fault arc resistance, MHO distance relay, Three-stepped Distance Protection, Distance protection of a three-phase line; Differential Protection: Simple Differential Protection, Percentage Differential Relay, Power transformer protection; Rotating machinery protection: Stator faults, Phase fault protection, Ground fault protection, Rotor faults; Bus protection: Differential

Protection of Buses, Selection of CT ratios in case of bus protection, External and internal fault, Actual behavior of a protective CT, Circuit model of saturated CT, Stability ratio of high impedance bus differential scheme, Protection of three-phase buses; Computer applications to all studied topics using Matlab.

Prerequisite: A0874503 Electrical Power Systems (1)

A0875502 Design of Electrical Power Systems {3} [3-3]

Design of three-phase generators, generating stations, transmission lines and substations. Commercial and industrial electrical systems.

Prerequisite: A0874504 Electrical Power Systems (2)

A0875601 Graduation Project (1) {1} [1 – 2]

Each student (or a team of students) may choose from a list of research projects, and is/are supervised by a faculty member in the department. Project (1), which represents the first phase of the graduation project, requires gathering the practical and theoretical resources needed for the completion of graduation project (2).

Prerequisite: A0874601 Field Training (to be passed)

A0875602 Graduation Project (2) {2} [2 – 4]

The student implements and finalizes the work described in project (1). After full implementation of the project's goals, the student must present a comprehensive report on the entire graduation project to an examining committee.

Prerequisite: 0875601 Graduation Project (1)

A0812101 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: A0111101 Mathematics (1)

A0812401 Digital Logic Circuits {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: A0111101 Mathematics (1)

A0812402 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.

Co-requisite: A0812401 Digital Logic Circuits

A0813201 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: A0111101 Mathematics (1)

A0813402 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: A0812401 Digital Logic Circuits

A0814401 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: A0813402 Microprocessor

A0814403 Microprocessors and Embedded Systems Lab {1} [1-3]

The embedded systems and microprocessors laboratory is assigned to some other engineering departments. The lab combines related topics of the embedded systems lab and microprocessors lab that are useful to medical engineering students. The lab incorporates a number of experiments relevant to Intel 8086/8088 microprocessor and Microchip PIC microcontrollers

Prerequisite: A0813402 Microprocessor

Co-requisite: A0814401 Embedded Systems

A0822502 Electronics {3} [3-3]

Semiconductors: conduction in materials, intrinsic and extrinsic semiconductors, semiconductor electrical properties, Semiconductor propagation process, p-n diode forward and reverse biased, V/I Static Characteristics, Temperature Effects, Diode's Models, Junction Capacitance and Switching Time, Diode types: Zener, LED and Photodiode; Diode Applications: Rectification, Clipper, and Clamper Circuits, Voltage Multipliers; Bipolar Junction Transistors: C-B, C-C and C-E Characteristics, DC and AC Analysis, BJT Applications: BJT as a Switch and Amplifiers; Field-Effect Transistor: V/I Characteristics of JFET and MOSFET, DC and AC Analysis; frequency response of transistor amplifiers, high and low frequency response; differential amplifiers; operational amplifiers: linear and nonlinear operational-amplifier analysis and design; passive and active filters.

Prerequisite: A0872301 Electric Circuits (1) (to be passed)

A0823401 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, properties 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: A0872302 Electric Circuits (2)

A0823403 Analog Communications {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: A0823401 Signals and Systems (to be passed)

A0823404 Analog Communications Lab. {1} [1 – 2]

Filters; Amplitude modulation (AM) and demodulation; Frequency modulation (FM) and demodulation; Sampling and Aliasing effect; Pulse code modulation (PCM); Error detection and correction, Digital modulation: Frequency shift keying (FSK), Phase shift keying (PSK), and Frequency shift keying (FSK).

Co-requisite: A0823403 Analog Communications

A0823502 Electronics Lab. {1} [1-2]

Diode characteristics and applications. BJT characteristics and DC biasing. FET characteristics and DC biasing. BJT amplifiers. Operational amplifiers. Multistage amplifiers. Differential amplifiers. Frequency response. Feedback techniques.

Co-requisite: A0822502 Electronics

A0823503 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.

Prerequisite: A0822502 Electronics

A0823504 Digital Electronics Lab. {1} [1-2]

A 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.

Co-requisite: A0823503 Digital Electronics

A0824401 Digital Communications {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: A0823403 Analog Communications.

A0825501 Communication Electronics {3} {3-3}

Transmitter and receiver performance; noise performance in communications electronics; Noise Figure; sensitivity; nonlinear behavior/performance of nonlinear devices: harmonics; blocking and desensitization; intermodulation products; intermodulation distortion; one dB compression point (P1dB); third order intercept point (IP3); communication circuits at RF; PIN diodes; variable capacitance diodes; oscillators; mixers; RF power amplifiers; RF low noise amplifiers and IF amplifiers; Phase Locked-Loop.

Prerequisite: A0824401 Digital Communications

A0824302 Wireless Communications {3} [3 – 3]

This course includes fundamentals of wireless communication, the design, performance analysis, and fundamental performance limits of wireless communication systems. This course provides an overview of current and future wireless systems, wireless channel models including path loss, shadowing, and statistical multipath channel models.

Prerequisite: A0824401 Digital Communications

A0874510 Electrical Drives {3} [3 – 3]

Introduction to electric drive systems: elements of modern electrical drives, dynamics of motor-load system, load and motor torque-speed characteristics, steady state stability, thermal consideration; power electronic converters in electrical drives; DC Motors and Feedback Controller; AC Machines and Space Vectors; Drives for Synchronous Machines; Induction Machines; Reluctance Drives; modeling of electric drives systems; braking of electric motors (dc and induction motors); drives of stepper motors.

**Prerequisite: A0873503 Electrical Machines
A0874301 Power Electronics**

A0875503 Distributed Generation and Smart Grids {3} [3 – 3]

Traditional and new concepts of power systems; Possible benefits and drawbacks of Distributed Generation; DG definitions; Types of DG; Interface with the grid; Point of common coupling (PCC); Hosting capacity of DG; Impact of DG on power flow: Steady state voltage rise, Voltage profile for multi-bus radial feeder, Methods for steady state voltage regulation, Estimation of hosting capacity, Evaluation criteria, Power losses; DG impact on hosting grid under fault conditions: DG impact on balanced fault levels, DG impact on unbalanced fault levels, Behavior of DGs under fault conditions; Power Quality in presence of DG: Long duration voltage variation, Short duration voltage variation, Harmonics, Harmonic producers, Individual and total harmonic Distortion, Effect of harmonics on power system components; DG and Smart Grids: Definitions, Structure, Advantages, Smart grids worldwide, Microgrids, Smart grids and information technology; Computer applications to all studied topics using Matlab.

Prerequisite: A0874504 Electrical power system (2)

A0875504 Computer applications in electrical power system

Computer applications in power systems planning, power flow solution and control, computer application on power system fault analysis, computer

Prerequisite: A0874503 Electrical Power Systems (1)

A0875505 High Voltage Engineering {3} [3 – 3]

Introduction in insulating materials and their application. Breakdown of insulating materials: gases, liquid and solid dielectrics. Generation and measurement of high voltages and currents. Insulation coordination in electrical power systems. High voltage testing of electrical equipment.

Prerequisite: A0874503 Electrical Power Systems (1)

A0875506 Power Systems Reliability {3} [3 – 3]

Introduction: the basic components of electrical power systems, basic definitions of reliability; Mathematical fundamentals for reliability analysis; Methods of reliability analysis: analytical methods and computer modeling methods for quantitative assessment of reliability; Reliability analysis of generation, transmission and distribution systems; Economics of reliability: Consumer Losses, Economic Indicators of Reliability, Cost-Benefit Estimation Process to Improve the Reality of Network Reliability.

Prerequisite: A0874503 Electrical Power Systems (1)

A0875507 Power Systems Economics {3} [3 – 3]

Introduction containing general economic concepts; Power stations economics; Optimal dispatch of generation; Optimal power flow; Economics of transmission and distribution lines; Evaluation of electrical power projects; Impact of power system restructuring on its economics.

Prerequisite: A0874503 Electrical Power Systems (1)

A0875508 Power Systems Security {3} [3 – 3]

Introduction; Security analysis; Contingency Analysis; DC Power Flow; The DC Power Flow – Generalization; Contingency Analysis using Sensitivity Factors; Generation shift sensitivity factors (G-Factors); Line outage sensitivity factors (L-Factors); Line Load ability; Methods for enhancing power systems security.

Prerequisite: A0874503 Electrical Power Systems (1)

A0875509 Power Systems Restructuring {3} [3 – 3]

Key points of electricity market liberalization: unbundled structure, competition, studies of new paradigms, market efficiency; Supply and demand modeling: definition, bidding and demand profiles, marginal cost, utility cost, revenue and benefit, complex bids for a multiple period market; Energy contracts and market mechanisms: spot market vs. open energy market, forward and futures contracts, bilateral trading: long term - over the counter - electronic trading, pool trading: market clearing price - impact of demand elasticity and price CAP, risk management: price volatility - call & put options - contracts for difference, examples; Transmission pricing & congestion management.

Prerequisite: A0874503 Electrical Power Systems (1)

A0813201 Engineering Economy and Management

A0875603 Selected Topics in Electrical Engineering {3} [3 – 3]

The objective of this course is to introduce advanced and new topics in one of the areas of electrical engineering. The topics can be changed from one semester to another by the Department Council.

Prerequisite: Department Council Decision.

A0161100 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

A0161200 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

A0331700 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