Al-AHLIYYA AMMAN UNIVERSITY

FACULTY OF ENGINEERING

DEPRTMENT OF MEDICAL ENGINEERING

COURSE DESCRIPTION

of

MEDICAL 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 of 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 Civic 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 Skills {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

(0161301) Islam and Life {3} [3 – 3]

Introducing the concepts of Islam and Iman (Faith)and the difference between them; Morals: meaning, foundations, and outcomes; Freedom in Islam: concept, types, and margins. Family status and duties; Protecting intellectual freedoms; Concept of moderation in Islam; Causes of extremism, and the danger of terrorism; Islam and the people of the Book; the rights and duties of non-Muslims; economic life in Islam.

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

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

Differentiation and application; complex numbers; analytical geometry; methods of integration; infinite series; power series; vectors in three dimension; equations of line and plane in 3 dimensions; complex power series; complex integration.

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

Co-requisite: 0111202 General Physics (1)

0112102 Mathematics (2) {3}[3-3]
Partial derivatives; optimization and applications; Lagrange multiplier; double and triple integrals; solutions of higher linear ordinary differential equations ODE's; series solution of linear ODE's; partial differential equations; wave and heat equations; Laplace transform; Fourier series; methods of separation of variables.

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: 0112102 Mathematics (2)

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: 0111101 Mathematics (1)

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 Workshop {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} [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

0832501 Biomechanics (1) {3} [3-3]

Introduction to biomechanics, force and vectors, tensile and compressive forces, momentum and torque, analysis of systems in equilibrium, application of statistic to biomechanics, deformable body mechanics, stress and strain, elastic and plastic deformation .

Prerequisite: 0111202 General Physics (1)

0833301 Medical Electronics {3} [3-3]

Advanced applications of op-amps: integrator, differentiator, differential amplifier, instrumentation amplifier, rectifier and limiter; active and high order filters; oscillators: principles of oscillators, phase shift oscillator, Wien bridge oscillator, Colpitts oscillators and Hartley oscillator; power amplifiers and their classification.

Prerequisite: 0822205 Electronics

0833302 Simulation Lab. for Medical Engineering {1} [1-2]

This Lab provides a set of experiments using NI- Multisim and LabVIEW that aim to enhance student's skills in simulation field. These simulation softwares help to design, build and analyze some biomedical electronic circuits virtually as well as mathematical models; they 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: 0833301 Medical Electronics

0833502 Biomechanics (2) {3} [3-3]

Deformable body mechanics; stress, strain, elastic deformation, plastics deformation, hooks law; mechanical properties of biological tissues; Viscoelasticity, empirical models of Viscoelasticity, common characteristic of biological tissues; biomechanics of respiratory system; biomechanics of musculoskeletal system; intrinsic mechanical properties of the blood vessels.

Prerequisite: 0832501 Biomechanics (1) (to be passed)

0833503 Biomaterials {2} [2-2]

Introduction to biomaterials; bulk properties of materials; surface properties of materials; classes of materials: metals, polymers, hydrogels, bioresorbable, and biodegradable materials; ceramics and composites; tissue engineering; applications of biomaterials in medicine and dentistry.

Prerequisite: 0832501 Biomechanics (1)

0834401 Medical Instrumentation (1) {3} [3-3]

Introduction to electrical measurements and instrumentation; basic concepts in medical instrumentation; bio-potential electrodes; medical signals and measurements (ECG, EEG, EMG, EOG and ENG); blood pressure and flow measurements and instrumentation; heart sounds; cardiac output measurement techniques.

Prerequisites: 0922263 Physiology, 0833301 Medical Electronics

0834402 Medical Sensors and Biotelemetry {3} [3-3]

Principles of biomedical sensor design; biomedical sensors charactristics; biomedical sensors applications in medicine and biology: resistive, inductive, magnetic, ultrasonic, chemical, and optical sensors; biosensors; introduction to biotelemetry: analog and pulse modulation, demodulation techniques; basic telecommunication circuits designed for transmission of biomedical signals; transmitters and receivers; applications of telemedicine in health care.

Prerequisite: 0834401 Medical Instrumentation (1)

0834403 Medical Instrumentation (2) {3} [3-3]

Respiratory system instrumentation; audiometry; electronic patient monitoring systems; therapeutic and prosthetic devices; electrosurgery and operating room equipment; sterilization; chemical biosensors and clinical laboratory equipment; microprocessor interfacing and computer based instrumentation.

Prerequisite: 0834401 Medical Instrumentation (1) (to be passed)

0834404 Medical Instrumentation Lab {1} [1-3]

Medical signal conditioning and processing: signal calibration, signal amplification, filtration, medical signal measurements (ECG, EEG, EMG); heart rate measurement (visual and sound indicators); analogue to digital converter; safety analyzer; interfacing with computers

Co-requisite: 0834403 Medical Instrumentation (2)

0834405 Medical Sensors and Biotelemetry Lab {1} [1-2]

Introduction to medical sensors and medical measurement system using LabView and ELVIS II kit; sensing and detection of various physiological variables such as: temperature, force, blood pressure, heart rate, and heart sounds; signal modulation and demodulation techniques

(AM, FM) transmitter and receiver; signal sampling and reconstruction; telemetry applications in health care.

Prerequisite: 0834402 Medical Sensors and Biotelemetry

0834504 Medical Rehabilitation Engineering {3} [3-3]

Physiotherapy methods which are included under the following electrotherapy titles: usage of ultrasound waves in physiotherapy; usage of heat therapy; usage of electric current (both ac & dc) in physiotherapy; application of short radio frequency waves therapy; microwaves usage in physiotherapy; infrared radiation therapy; ultraviolet radiation; heliotherapy; hydrotherapy and oxygen dome therapy.

Prerequisite: 0833503 Biomaterials .
Co-requisite: 0834402 Medical Sensors and Biotelemetry.

0834505 Biomechanics and Medical Rehabilitation Lab {1} [1-2]

Experimental techniques for determining stress-strain curve; vibration analysis and force of skeletal muscles; measurement of young's modulus of biological tissue: bone, skin, and cartilage; fatigue test and body limb motion; sensory aids and functional electrical stimulators. Experiments of rehabilitation engineering are: physiotherapy data obtaining for human body, determination of radiated heat diathermy (in watt) from barred arm segment by applying Stefan-Boltzmann law; determination of body mass lost after hard exercise, determination of subcutaneous muscle temp by using Fourier's conduction heat law.

Co-requisite: 0834504 Rehabilitation Engineering

0834901 Field Training {3} [8weeks]

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

Prerequisite: Pass of 110 Cr.H.

0835406 Design Concepts in Biomedical Engineering {2} [2-2]

Engineering design procedures and relevant information necessary for designing biomedical devices; design concepts of projects in the biomedical engineering field: presentation skills, communication skills, team work, concept generation and documentation specifications, evaluation, design validation and clinical trials; regulations and ethics in biomedical engineering design

Prerequisite: None
Co-requisite: 0834403 Medical Instrumentation (2)

0835407 Medical Technology Management {3} [3-3]

Basic concepts of the management of medical technology in hospital settings including safety considerations, codes, standards, regulations; procedures in planning, acquisition, controlling, leading and supervision; other medical engineering practices in medical engineering departments and healthcare facilities.

Prerequisite: 0834403 Medical Instrumentation (2)

0835408 Medical Imaging Systems {3} [3-3]

Physical and medical introduction for properties and nature of produced image, of particular imaging system, probable instrumentation faults, safety precautions during routine work; systems are: Magnetic Resonance Imaging (MRI), imaging by radioisotopes and gamma camera, ultrasound imaging systems, projection X-ray, CT-Scan, Positron Emission Tomography (PET), Thermal Imaging Systems.

Prerequisite: 0834403 Medical Instrumentation (2)

0835507 Prosthetic and Artificial Organs {2} [2-2]

Extracorporeal devices: artificial kidney: artificial heart-lung machine; artificial liver; artificial blood; upper and lower extremities mechanics; essential parts in artificial limbs; degree of freedom; synchronization; joints

Prerequisite: None
Co-requisite: 0834504 Medical Rehabilitation Engineering

0835902 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: Completion of 120 Cr.H.
Co-requisite: 0835406 Design Concepts in Biomedical Engineering.

0835903 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: 0835902 Graduation Project (1)

0812401 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: None

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.

Co-requisite: 0812401 Digital Logic Circuits

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: 0812401 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.

Co-requisite : 0813414 Microprocessors and Embedded 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

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: 0872301Electric Circuits (1)

0823206 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 : 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.

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 circuits; application of 555 timer; DAC and ADC circuits.

Co-requisite: 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)

0824507 Digital Signal 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

0872301 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: 0111202 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.

Prerequisite: 0872301Electric Circuits (1) (to be passed)

0872303 Electric Circuits Lab. {1} [1 – 2]

DC circuits: Kirchhoff's voltage and current laws, network theorems, maximum power transfer; transient circuits: RL, RC, RLC; resonant circuits; magnetically coupled circuits; two-port networks.

Co-requisite: 0872302 Electric Circuit (2)

0873305 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: 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

0911567 General Chemistry for Engineers {3} [3-3]

Basic information about matter classification and properties, elements and atoms, ionic and molecular compounds; measurements, chemical reactions; electronic structure; properties of gases, intramolecular forces, concentrators; acids and bases; kinetics, energy and thermodynamics

Prerequisite: None

0911568 General Chemistry Lab. for Engineers {1} [1-2]

Introduction to laboratory safety rules; physical separation of mixtures: distillation, extraction, and recrystallization; empirical formula of compound; determination of acid and base in vinegar; indicators; buffers; measurement of PH; identification of chemical substances; solutions.

Co-requisite: 0911567 General Chemistry for Engineers

0921769 Biology for ME {3} [3-3]

Basic concepts of biology: cell structure and function, cell biochemistry and metabolism; molecular biology of the cell, biodiversity and genetics; biotechnology; vertebrate physiology.

Prerequisite: None

0921162 Anatomy {3} [3-3]

The objective of this course is to identify the normal structure and working knowledge of human body; this includes studying the structure of the cell, the basic human tissues and all systems of human body.

Prerequisite: 0921769 Biology for ME

0922263 Physiology {3} [3-3]

Introduction to physiology; human body; normal functions and mechanism of various physiological systems: nervous system, cardiovascular system, muscles system, blood, and respiratory system, normal functions and homeostasis, human nervous system, sensorysystem, gastrointestinal system, endocrine system, excretory system, and reproductive system.

Prerequisite: 0921162 Anatomy

0834506 Fluid Mechanics for ME {3} [3-3]

fundamental laws of statics, and dynamics applied to fluid; characteristics of fluids; conservation of mass, momentum, and energy as applied to fluids; laminar and turbulent flows; shear stress; applications of fluid mechanics to biological systems: human circulatory and respiratory systems, air flow in the lugs, blood flow in heart, arteries, veins.

Prerequisite: 0833502 Biomechanics (2)

0834303 Computer Applications in ME {3} [3-3]

Programming in MATLAB and LabVIEW; biomedical engineering related applications; data acquisition; biomedical signal processing; image acquisition; medical image processing.

Prerequisite: 0811201 Computer Skills (Engineering)

0835409 Laboratory Instrumentation {3} [3-3]

Study of the scientific bases and design strategies for preparatory and analytical laboratory instrumentation, blood cold chain laboratory equipment, histology and histopathology equipment, spectroscopy and spectrometry, blood cell counters and hematology analyzers, electro-analytical chemistry and blood gas instrumentation, chromatography techniques.

Prerequisite:: None
Co-requisite : 0834403 Medical Instrumentation (2)

0835508 Nanotechnology in ME

Introduction to nanotechnology; physics of the nanotechnology; controlled manipulation of size and shape, design and fabrication in nanotechnology; characterization; nanomaterials, nanomachines, nanodevices; biomedical applications of nanotechnology; manufacturing techniques.

Co-requisite: 0833503 Biomaterials.

0835904 Selected Topics in Medical Engineering {3} [3-3]

Current trends and developments in the field of biomedical engineering; contemporary issue in biomedical engineering; each semester will cover one topic which will be announced for students at the registration time.

Prerequisite: Department Approval

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: 0111101 Mathematics (1)

0874209 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 circuit; 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: 0822205 Electronics, 0823501 Signals and Systems

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 (hamzatwasl) and hamzaqat', alef following group waw, aliflayyinah ('flexible alif') and nunation (tanwin).

Prerequisite: None

0171100 English Language (Remedial) {0} [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, and 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 power point 2016; basics skills in Microsoft excel 2016.

Prerequisite: None