No	*Subject*	*Description* *First year / First term*
1	Technical English language I	English language by using medical and technical expressions by using short sentences. Teaching the students how to express ideas with short and simple direct language.
2	Mathematics I	Teaching calculus with engineering examples and solving engineering problems by using mathematics (calculus and liner algebra). Principles and differentiations and matrixes.
3	Computer principle I	Introduction to basic skills and problem solving involved with computer hardware, operating systems, and application programs with a special emphasis on conventions and skills.
4	Electrical Circuits I	Teaching the students the basic of electrical engineering by using the main references in this field of engineering.
5	Engineering Drawing	Teaching the students the basic principles on engineering drawing in general aspects by using the traditional drawing tools.
6	Engineering mechanics I	Teaching the students the main aspects in mechanics as an entrance to study the mechanics of the human body in static and dynamic situations.
7	Workshops I	In this subject teaching the students the basics of different working fields like forging
8	Introduction of biomedical engineering	This course is designed to orient the new BME student to the Biomedical Engineering. Students will be introduced to BME faculty and their research. The four specialization areas will be discussed: Bio Systems, Bio Electronics and Signals, Bioinstrumentation and Biomaterials. This course will make students ace the first engineering problem.

No.	*Subject*	*Description* *First year / second term*
1	Technical English language Π	Medical engineering language through studying medical reports and engineering catalogues for medical instruments and some engineering analysis for papers.
2	Mathematics Π	The student will learn about the integration, and methods of integration, and some engineering examples.
3	Computer principle Π	Teaching how to build a program using flow charts and applying the flow chart using C++ or Visual basic.
4	Electrical Circuits Π	Teaching the students the applied electronics regarding the medical devices.
5	Engineering Drawing	Engineering drawing in general aspects by using the traditional drawing tools and using sophisticated medical parts by using AutoCAD.
6	Engineering Mechanics Π	studying the loads and stress in human body parts and shapes
7	Workshop Π	In this subject teaching the students the basics of different working fields like forming.
8	Introduction of biomedical engineering II	This course is designed to complete the first part. Different fulfillments and supporting specialization areas will be discussed like: Tissue Engineering Clinical Engineering, Advanced Medical Technologies in addition to modeling and simulations. The final form of solution will be clear for the engineering problem. Al students will be finally could think and perform as a biomedical engineer.

No.	*Subject*	*Discretion Second year / First term*
1	Mathematics III	Principles of advance calculus. Vector calculus, Partial derivative and some related concepts, application of Laplace transformations; and power series .
2	Digital logic	Experiments in digital logic and computer design and implementation using TTL integrated circuits including SSI, MSI and LSI ALUs. Design and implementation of several interfacing tasks; interfacing with simple I/O devices using latches, buffers, and parallel adapters; parallel and serial interfacing to printers and scanners.
3	Strength of material I	Structure property relationships for mineralized connective tissues of human body. Discussion centers on various types of bone (e.g lamellar, woven) and teeth with an emphasis on modeling for biomechanical behavior, both in vitro and in vivo.Topics include elastic models for born (isotropic and anisotropic), theories of yielding and fatigue, strength properties, composite and hierarchical models, and models of bone remodeling/modeling
4	Anatomy and physiology I	This course offers the introduction to anatomy, terms of description and movements, basic anatomical structures, osteology of the upper limbs, joints of the shoulder girdle.
5	Material science	In this course student will have the opportunity to learn something about the fundamentals of the structure/properties relationships of all types of materials (ceramics, metals and their alloys, polymers and composites thereof). COURSE OUTCOME: 1. Demonstrate an ability to analyze crystalline structures, and calculate Miller Indices, packing factor and density of selected unit cells, non-crystalline behavior, and anisotropy. 2. Show the application of materials microstructure in the design of materials and their processing to obtain required properties. 3. Demonstrate the effect of materials microstructure at the atomic scale on the engineering properties of materials. 4. Demonstrate an ability to analyze strengthening by strain hardening, solid solution and grain size reduction, and use of Hall Petch relation, etc. 5. Develop an experiment to characterize materials properties for an engineering application .
6	Computer aided drawing	Teaching the student how to use Auto CAD package to build a model to fit the original design by using mathematical simulation.
7	Thermodynamic	Explaining the principles of thermodynamics preparing the students to study the rule of thermodynamics in biomedical subjects.
8	Medical physics	Medical Physics (also called biomedical physics or medical biophysics or applied physics in medicine) is generally speaking the application of physics concepts, theories and methods to medicine or healthcare. Medical physics departments may be found in hospitals or universities.

No.	*Subject*	*Discretion* *Second year / Second term*
1	Mathematics IV	In this course the student will learn about the definition of ordinary differential equations and methods of solution and its applications.
2	Computer application	This Couse support the students with numerical tools that allow to build mathematical models and how to simulate the models by using a programming language
3	Strength of material II	The fundamentals of bio materials parts according to the loads that applied during static and dynamic loads
4	Anatomy and physiology II	Studying the anatomy and physiology of the hip joint and osteology of the femur, thoracic cage organization, functional anatomy of respiration and diaphragm, the heart, the conductive system, aorta, pulmonary trunk.
5	Fundamentals of biomaterial	Biomaterials will concentrate on fundamental principles in biomedical engineering, material science, and chemistry. This course will examine the structure and properties of hard materials (ceramics, metals) and soft materials.
6	Bio fluid	Properties of fluid and units, fluid statics(definitions and variation), basic equations(continuity, Euler's, Bernoulli, energy), introduction to human bio fluid, properties of bio fluid in the human body (blood, venous, capillary, tissue, arterial), pulsatile flow in large arteries, bio fluid human system, pulmonary system and respiration.
7	Manufacturing process	This course support the students with the main manufacturing processes and methods and there advantages and disadvantages.
8	Biochemistry	Advances in Medicinal Chemistry contains four intriguing and detailed accounts of the close interface between synthetic chemistry,structure-activity relationships, biochemistry, and pharmacology

No.	*Subject*	*Description* *Third year / First term*
1	MEMS Design	Use of MEMS in biotechnology, instrumentation, robotics, manufacturing and other applications. Synthesize and design high performance MEMS that satisfy the requirements and specifications imposed. Integrated approaches applied to design and optimize MEMS including: integrate microelectromechanical motion devices, ICs, and micro sensors. Recent advances in biomedical applications of MSMS. Course will require a design using CAD tool for a biomedical MEMS-based micro integrated system.
2	Biomechanics I	The selection, processing, testing and performance of materials used in biomedical application with special emphasis upon tissues engineering. Topics include material selection and processing, mechanism and kinetics of materials degradation, cell-materials interaction and interface; effects of construct architectures on tissue growth; and transport through engineered tissues. Examples of engineering tissues for replacing cartilage, bone, tendons, ligaments, skin and liver will be presented.
3	Engineering Analysis	Introduces detailed description of the engineering design process and relevant information necessary for designing biomedical devices. The primary focus of the course is student design projects with applications in biomedical engineering. Covers presentation skills, communication skills, group dynamics, concept generation, product analysis, specifications, evaluation, design validation, clinical trials, regulation, liability, ethics, and case studies.
4	Medical instrumentations	Introduces the principles of medical instrumentation. Covers biomedical sensors and transducers; temperature, displacement, acoustical and radiation measurements; bio-potential amplifiers and signal processing; origin of bio-potentials; bio-potential electrodes; measurement of bio-potentials such as ECG, EEG and EMG; blood pressure measurements; electrical safety.
5	Biosignals and biosystems	Principles of biosignal processing. Linear time invariant systems; continuous time systems, application of Laplace and Fourier transforms to medicals linear systems; Discrete time systems; Z-transform; discrete Fourier series and fast Fourier transform; computer applications system function; frequency response and simulation in the frequency domain.
6	Human rights	In order to be able to adhere to human rights and defended by seeking legal methods to protect it, to Admen full knowledge of its contents and its borders and ways of protection and guarantees, and we will discuss the subject in the first two sections of the Human Rights.
7	Medical electronics	Introduction to Semiconductors, Diode types, circuits and applications, Bipolar Junction Transistors (BJT) types and biasing circuits, Field effect transistors (FET), Small-signal BJT and FET amplifiers, Multistage amplifiers, Frequency response of amplifiers, Introduction to differential amplifiers, Medical applications of diode circuits and transistor amplifiers.

No.	*Subject*	*Description* *Third year / Second term*
1	MEMS Evaluation	General evaluation methodologies. Evaluation of MEMS, micro system and microelectromechanical motion devices utilizing MEMS testing and characterization. Performance evaluation matrices, comprehensive performance analysis and functionality. Applications of advanced software and hardware in MEMS evaluation.
2	Biomechanics II	Description of micro- and macro-anatomy of bone, its embryology, and would healing, traditional bone grafting materials. In vitro methods and animal wound models for designing and developing bone regeneration therapies.
3	Numerical Analysis	Fundamentals of numerical analysis and include an introduction to matrices with an applications.
4	Democracy and freedom	In order to be able to adhere to human rights and defended by seeking legal methods to protect it, to Admen full knowledge of its contents and its borders and ways of protection and guarantees, and we will discuss the subject in the first two sections of the Human Rights.
5	Biomedical signals process	Identification and verification reliability element indices and systems for various model types partition period to the failure and between failures with respect on medical instrument specifies, warranty of patient's safety and medical device service Reliability exams, statistic acceptance of reliability, preventive maintenances systems of reliability operation exams.
6	CAD/CAM	Selected topics in mechanical design, computer aided engineering computer aided design, computer aided manufacturing and computer integrated manufacturing. Software Design: Mechanical desktop. Computerized Numerical control CNC machine and g-code programming.
7	Medical electronics II	Introduction to Semiconductors, Diode types, circuits and applications, Bipolar Junction Transistors (BJT) types and biasing circuits, Field effect transistors (FET), Small-signal BJT and FET amplifiers, Multistage amplifiers, Frequency response of amplifiers, Introduction to differential amplifiers, Medical applications of diode circuits and transistor amplifiers.
8	Biomaterial inspection	Materials integrity and de-formulation, Rheological properties and performance, Mechanical testing of materials in devices .

No.	*Subject*	*Description* *Fourth year / First term*
1	Introduction to Nano technology	Introduction to Nanotechnology provides a broad overview of nanotechnology, discussing the fundamental science of nanotechnology and its applications to engineering, biomedical fields. The course provides a background of the understanding, motivation, implementation, impact, future, and implications of nanotechnology. The course will also discuss specific applications of nanotechnology in electronic devices, biomedical fields.
2	Mechatronics	Mechatronics refers to a flexible, multi-technological approach for integration of mechanical engineering, computer engineering, electronics and information sciences. Mechatronics is essential in the design of intelligent products. It allows engineers to transform their virtual concepts into real life applications. It is a relatively new concept relating to the design of systems, devices and products aimed at achieving an optimal balance between basic mechanical structure and its overall control.
3	Nuclear Medicine	Radiopharmaceuticals for radioisotope imaging , Radioisotope imaging equipment , Single photon and positron emission tomography.
4	Design of medical devices	Addresses a unique rule of biomaterial in medical device design and the use of emerging biomaterials technology in medical device. The need to understand design requirements of medical devices based on safety and efficacy will be addressed. An expected device failure due to synergistic interactions from chronic loading, aqueous environments and biologic interactions. Testing methodologies to assess accelerated effects of loading in physiologic-like environments. Evaluate biomaterials and their properties as related to design and reliability of medical devices.
5	Neurobiology engineering	Introduces the theory of neural signaling. Students will learn the fundamental theory of cellular potentials and chemical signaling, the Hodgkin Huxeley description of action potential generation, circuit representations of neurons and be able to derive and integrate equations describing the circuit as well as design computer models.
6	Engineering statistics	Basic concepts of probability; conditional probability, statistical independence, total probability and Baye's Theorem; Random variables: introduction, discrete and continuous, probability mass and density functions, cumulative distribution function, and moments; Common discrete and continuous distributions; Functions of random variables; Descriptive Statistics: Describing and summarizing data sets, Histogram, Statistical distributions; Inferential statistics: hypothesis testing, significance levels, and t-test; Analysis of variances (ANOVA) and Linear regression.
7	Medical radiography	the use of electromagnetic radiation to create images of the body fromwhich medical diagnoses can be made. Initially referred to 'plain' Xray other forms of diagnosticimaging such as ultrasound,CT and MRIscanning.Used in medicine to provide images of bone, softtissue and internal organs to aiddiagnosis and monitor the effects oftreatment, e.g. the healing of a fracture or muscle tear.

No.	*Subject*	*Description* Fourth year / Second term
1	NEMS Design	This course covers the fundamental topics in Nano-Electro-Mechanical systems. These topics are listed as the following, which allow students to gain understanding on principles of assorted NEMS devices, mechanics, electrical circuits needed for NEMS device design, and NEMS technologies.
2	Genetic device	This senior-level course is a comprehensive survey of genetic devices. These DNA-based constructs are comprised of multiple "parts" that together encode a higher-level biological behavior and perform useful human-defined functions. Such constructs are the engineering target for most projects in synthetic biology. Included within this class of constructs are genetic circuits, sensors, biosynthetic pathways, and microbiological functions.
3	Nuclear medicine techniques	This course consists of the following parts: nuclear medicine; Gamma camera and its components; radioactive materials: their nature, generation, physical characteristics, and applications in medical imaging; the procedures and steps of most of functional investigation undertaken in nuclear medicine such as brain scan, blood-flow imaging, infarction imaging, ventilation perfusion imaging, gastrointestinal examinations, venography, renogram, bone and bone marrow scans, thyroid scan, and tumor scan. The course also consists of basic knowledge of electronic and physical methods used for image construction, acquisition, presentation and processing.
4	fabrication of medical devices	Addresses a unique rule of biomaterial in medical device design and the use of emerging biomaterials technology in medical device. The need to understand design requirements of medical devices based on safety and efficacy will be addressed. An expected device failure due to synergistic interactions from chronic loading, aqueous environments and biologic interactions. Testing methodologies to assess accelerated effects of loading in physiologic-like environments. Evaluate biomaterials and their properties as related to design, and reliability of medical devices.
5	Biomedical Acoustics	Nature and characteristics of sound ,Production of speech ,Physics of the ear , Mechanisms of interaction of ultrasound energy with biological tissues, including therapeutic Applications of ultrasound
6	Introduction to Robotics	Local sensing of knee force, torque, and position. • Natural gait with hydraulic swing phase dynamics control: Assistive Assistive technologies technologies Robots and machines that improve the quality of life of disabled and elderly people, mainly by increasing personal independence.
7	Bio imaging system	This course emphasizes the technical aspects of making quantitative measurements of structure and function using different imaging methods, including special imaging methods as well as approaches to image analysis algorithms, and the use of modeling or data analytic techniques for assessing function.

No.	*Subject*	*Description Fifth year / First term*
1	Project	Biomedical students discuss a medical problem in their specialized field and try to provide solution to it either hardware or software or both. Also students are able to develop or design new simple medical devices.
2	Medical informatics	An interdisciplinary effort between molecular biology and computer science aimed at extracting the relevant biological information from the genome, and understanding not only the DNA itself, but the RNA and protein sequences that it encodes. Generally an overview of data mining, data analysis and computational methods of DNA/RNA and proteins as well as major applications and research areas.
3	Bio compatibility and toxicity	This subject give a good information about the chemical reactions and environment, inside the human body and the allowed of ions in the human body environments, this come also studied the tests and investigations, that done to determine the ability to use the devices inside the body.
4	Nano mechanics	Latest scientific developments and discoveries in the field of Nano mechanics, i.e. the deformation of extremely tiny (10-9 meters) areas of synthetic and biological materials. Lectures include a description of normal and lateral forces at the atomic scale, atomistic aspects of adhesion, Nano indentation, molecular details of fracture, chemical force microscopy, elasticity of individual macromolecular chains, intermolecular interactions in polymers, dynamic force spectroscopy, biomolecular bond strength measurements.
5	Biomedical sensor	Theory and principles of biosensor design and application in medicine and biology. Analysis and selection of physical, electrical, mechanical, thermal transduction mechanisms, which form the basis of the biosensor design. Principles and fundamental properties of transducers (dynamics, linearity, hysteresis, and frequency range).transducer interfacing and signal conditioning, material biocompatibility, and packing. Selected examples: micro fluidics, bioelectronics, pressure sensors, temperature sensors and electrochemical sensors.
6	Writing skills	Writing reports regarding some case studies and advanced technologies.
7	Cardiology	This course will provide students with an introduction to biotechnology in an engineering context. Topics to be covered include nucleic acid structure and function, DNA replication, transcription, translation, chromosome.

No.	*Subject*	*Description* *Fifth year /Second term*
1	Project	Biomedical students discuss a medical problem in their specialized field and try to provide solution to it either hardware or software or both. Also students are able to develop or design new simple medical devices.
2	Image Processing	Introduce the student to analytical tools and methods which are currently used in digital image processing as applied to image information for human viewing. Then apply these tools in the laboratory in image restoration, enhancement and compression.
3	Engineering biomedical physiology	This course introduces students to the physiology of human organ systems, with an emphasis on quantitative problem solving, engineering-style modeling, and applications to clinical medicine. The course will begin with a review of basic principles of cellular physiology, including membrane transport and electrophysiology, and then take a system-by-system approach to the physiology of various organ systems, including the cardiovascular, pulmonary, renal, and endocrine systems. Throughout, the course will feature extensive discussions of clinical conditions associated with dysfunction in specific physiological processes as well as the role of medical devices and prostheses. This course is geared towards upper-division bioengineering students who wish to solidify their foundation in physiology, especially in preparation for a career in clinical medicine or the biomedical device industry.
4	Catheter and notaries surgery tools	Introduces principles of therapy and function of medical therapeutic tools. Covers Pacemakers, defibrillators, pump oxygenators, total artificial heart, lithotripsy, artificial kidney, anesthesia machine, ventilators, electrosurgical units, physical therapy equipment, radiotherapy equipment, ultrasound therapy, laser therapy, electrical stimulators, aids for the blind, cochlear implants, infant incubators and intelligent drug delivery systems.
5	Advance Medical devices	This course dealing with the new and advanced medical devices that designed and prepared to cover a special operations and treatment.
6	Surgery for engineering	Fundamental skills and principles of surgery devices. Operating rooms design and sterilization. Computer assisted surgery technologies, including surgical navigation, image guidance and robotic surgery.
7	Hospital engineering	Data and dataflow in hospital, type of data, models of presentation, general ledger, cost accounting, evaluation techniques, budgeting and analysis, material management, inventory control. Introduction to management of health care information systems. Fundamentals, management of information systems, planning of projects, attendance of projects, system analysis, system evaluation, selection of systems, implementation of systems, finishing a project.