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 II**	Medical engineering language through studying medical reports and engineering catalogues for medical instruments and some engineering analysis for papers.
2	**Mathematics II**	The student will learn about the integration, and methods of integration, and some engineering examples.
3	**Computer principle II**	Teaching how to build a program using flow charts and applying the flow chart using C++ or Visual basic.
4	**Electrical Circuits II**	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 II**	studying the loads and stress in human body parts and shapes
7	**Workshop II**	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	**Anatomy and physiology**	Study of the basics of human anatomy and physiology including anatomical terminology, cells and tissues, body membranes
2	**Biomechanics**	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	**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.
5	**Mechanical Design**	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.
6	**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.
7	**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.
8	**design and application of biomaterial**	Development of global perspective of interdisciplinary issues (biology, materials science, chemistry, and engineering) involved in biomaterials, learn how to design, synthesize, evaluate, and analyze biomaterials, Critical thinking and analysis, Communication of ideas; communication to coordinate work and Familiarization with biomaterials literature.

No.	*Subject*	*Description* *Third year / Second term*
1	**Anatomy and physiology**	Introduces deleted description the skeletal system and muscular system.The nervous system, special senses, the cardiovascular system, ECG, the respiratory system, urinary system.
2	**Biomechanics**	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	**Advance electronics**	Advance electronics should focus on the following subjects: history of electronics, analog and digital signals, circuits with both of AC and DC signals, power supplies and rectifiers , small signal amplifier, common emitter and stabilized common emitter circuits, cascade amplifiers, and comply and frequency response and negative feedback, operations amplifiers, bipolar power supplies, inverting amplifier, non- inverting amplifier.
8	**Advanced Biomaterials**	This topic will cover materials classes (metals, ceramics, polymers, composites) and addressed with emphasis upon the material types and material properties pertinent to their use in implanted medical devices. As well as the structure and properties of biologic tissues and biocompatibility. Specific implant applications will be addressed.

No.	*Subject*	*Description* *Fourth year / First term*
1	**Histology**	fundamentals of preparing tissue slides for examination by pathologists. prepare samples of human, animal or plant tissue for analysis by pathologists. Histology techniques include the steps needed to process, embed and fix tissue samples onto slides. In addition to lectures, classes include lab time so that students may practice using instruments and staining techniques for creating slides.
2	**Microsystem and nanotechnology**	Overview of semiconductors materials. Semiconductors devices application actuators control system and sensors. Instruction and hands-on semiconductor process in clean-room environment, including two sided wet and dry lithography for microelectronics, micro sensors and MEMS. Micro fabrication principles and elements, epitaxial growth, oxidation, thin film deposition. Lithography, etching, doping and LIGA micromachining and process integration.
3	**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.
4	**Design of medical device**	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	**Neourobiology 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	**Artificial limbs 1**	General principles of tissue engineering includes aspects of cell isolation and propagation; matrix selection; construct creation, manipulation, and implementation, and evaluation of resulting repairs. Applications: skin replacement, cartilage tissue repair, bone tissue engineering, nerve regeneration, corneal and retinal transplants, ligaments and tendons, blood. Substitutes artificial pancreas, artificial lever, tissue integration with prosthetics, vascular grafts, and cell encapsulation angiogenesis

No.	*Subject*	*Description* *Fourth year / Second term*
1	**Diseases of bones and joints**	Examines the principle of materials science and cell biology underlying the design of medical device, artificial organs and scaffolds for tissue engineering. Molecular and cellular interaction with biomaterials is analyzed in terms of cellular processes such as matrix synthesizes degradation and contraction. Principles of wound healing and tissue remodeling are used to study biological responses to implanted materials and devices. Additionally, this course examines criteria for restoring physiological function of tissue and organs and investigates strategies to design implants and prostheses based on control biomaterial-tissue interactions.
2	**Biotribology**	Friction, types of friction, law of static and dynamic friction, theories and types of wear, wear measurements, friction measurements, types of lubrication method boundary, fluid film (hydrodynamic and squeeze film lubrication), types of biotribology lubrication, elastichydrodynamic lubrication ,weeping self-lubrication,boosted lubrication, lubrication mechanism in human joints.
3	**Nuclear medicine techniques**	This course consists of the following parts: investigations of 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	**Bio-electromagnetic**	Electrostatics, dielectrics, conductors, capacitance, the steady magnetic, time varying fields, laplace and poisson s equation, introduction to plane and EM waves.
6	**Bio Statistic**	Biostatistics is essential to ensuring that findings and practices in public health and biomedicine are supported by reliable evidence. This course covers the basic tools for the collection, analysis, and, presentation of data in all areas of public health. Central to these skills is assessing the impact of chance and variability on the interpretation of research findings and subsequent recommendations for public health, practice and policy. Topics covered include: general principles of study design; hypothesis testing; review of methods for comparison of discrete and continuous data including ANOVA, t-test, correlation, and regression.
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.
8	**Artificial limbs II**	General principles of tissue engineering include aspects of cell isolation and propagation; matrix selection; construct creation, manipulation, and implementation, and evaluation of resulting repairs. Applications: skin replacement, cartilage tissue repair, bone tissue engineering, nerve regeneration, corneal and retinal transplants, ligaments and tendons, blood. Substitutes artificial pancreas, artificial lever, tissue integration with prosthetics, vascular grafts, and cell encapsulation angiogenesis.

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	**Biocompatibility**	This is an introductory course in the designing and evaluation of prosthetics (artificial limbs), and orthotics (braces and splints).Biocompatibility of materials used in Orthopedic and dental applications.
4	**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.
5	**Drug delivery**	Engineering principle and biological considerations in designing drug delivery systems for medicals uses. The concept of biocompatibility and its implication in formulation controlled release devises are illustrated. Emphasis on the use of biodegradation materials to design drug delivery systems for site-specific applications.
6	**Writing skills**	Writing reports regarding some case studies and advanced technologies.
7	**Cell biotechnology**	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
8	**Medical Radiography**	the use of electromagnetic radiation to create images of the body from which medical diagnoses can be made. Initially referred to 'plain' X-ray, other forms of diagnostic imaging such as ultrasound, CT and MRI scanning. Used in medicine to provide images of bone, soft tissue and internal organs to aid diagnosis and monitor the effects of treatment, e.g. the healing of a fracture or muscle tear.

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	**Nutrition**	This course will focus on the nutrition effect on the human health and its effect on many disease, using food as therapy and its direct and indirect effect on the human body different functions.
4	**Tissue engineering**	General principles of tissue engineering include aspects of cell isolation and propagation; matrix selection; construct creation, manipulation, and implementation, and evaluation of resulting repairs. Applications: skin replacement, cartilage tissue repair, bone tissue engineering, nerve regeneration, corneal and retinal transplants, ligaments and tendons, blood. Substitutes artificial pancreas, artificial lever, tissue integration with prosthetics, vascular grafts, and cell encapsulation angiogenesis.
5	**Transport phenomena**	The dynamics of the heart and blood vessels. Pulsatile blood flow, microcirculation, and muscle mechanics. Modeling of boundary value problems in cardiovascular engineering. Tissue Engineering in cardiovascular application: Artificial Heart and Blood.
6	**Fiber Optics**	This subject, cover the topics: semiconductor materials and properties, energy Bands, mechanisms of conducting, photo electrical phenomenon junctions, applications of optics in medical devices.
7	**Hospital engineering**	Definitions, management, planning, coordination , planning fields, fundamentals of hospital building , basic criteria in hospital design , planning and organization criteria , hospital design stages , hospital types , systematic medical hierarchal relations , essential medical components, hospital sections , general services , medical information system.