NEAR EAST UNIVERSITY

DEPARTMENT OF Biomedical Engineering

Course and Program Outcomes Matrix

2021-2022

The educational objectives of the Degree Program in Biomedical Engineering reflect the mission of Near East University. The Bachelor of Science program in Biomedical Engineering prepares the students to achieve the following career and professional objectives.

- To acquire a strong foundation in Biomedical Engineering area relevant to the current needs of industry to allow them to successfully compete for demanding and high quality jobs
- Analyze problems, propose algorithmic solutions, and implement them correctly and efficiently by applying their knowledge of mathematics, computing, systems and development tools.
- Propose engineering solutions using the information and communication technologies for the related problems of industry and government.
- To acquire clear communication abilities, ethical and social responsibilities for teamwork.
- Make positive contributions to their community and society by applying skills and abilities learned during their undergraduate program in computer engineering
- Improve knowledge and skills through lifelong learning and graduate studies.

The individual courses are described below. These courses are offered by the Biomedical Engineering Department together with the objective of each module.

YEAR 1

MTH101 Mathematics I (course type: required) (4 Credits)
Course objective: This course aims to give advances of Calculus to students.
Course Content: Limits and continuity. Derivatives. Rules of differentiation. Higher order derivatives. Chain rule. Related rates. Rolle's and the mean value theorem. Critical Points. Asymptotes. Curve sketching. Integrals. Fundamental Theorem. Techniques of integration. Definite integrals. Application to geometry and science. Indeterminate forms. L'Hospital's Rule.

CHM104 Chemistry For Biological Sciences (course type: required) (4 Credits)
Course objective: By the end of this course, students should understand the fundamental concept of atomic theory, chemical equations, thermochemistry and hands-on laboratory works.
Course content: A basic course with emphasizing the metric system. Introduction to atomic theory, stoichiometry. The structural and physical properties of matter. Periodic relationship among elements and periodic table. Gaseous state. Thermochemistry. Energy and enthalpy. Electronic structure of atoms. Electrochemistry. Chemical bonding.

PHY101 General Physics I (course type: required) (4 Credits)
Course objective: Be able to know the basic laws of mechanics.To apply those laws for solving problems. To be able have his/her knowledge in the fields of other sciences and/or engineering. Understanding how physics approach and solve problems in mechanics.
Course Content: A basic physics course which study mechanic phenomenas. Topics include the description of motion, forces, gravitation, work, and energy, momentum, rotational motion, and Static equilibrium. Laboratory work is an important component of the course.

BME101 Introduction to Biomedical Engineering (course type: required) (3 Credits)
Course objective: This course is designed for biomedical engineering undergraduate students. The purpose of the course is to provide biomedical engineering background on technical

aspects.
Course Content: Brief introduction to the field of biomedical engineering is given; biomedical devices, medical instrumentation and medical imaging systems are introduced to familiarize the students for the upcoming years of study. Students are provided with overviews of the major physical techniques that engineers have used to explore in biomedical engineering level.

ENG101 English I (course type: required) (4 Credits)
Course objective: ENG 101 is designed to improve the students' presentation ability. Students are expected to do an oral presentation. At the end of the course they submitted their written projects.
Course Content: This course offers intermediate levels include wide range of grammatical structures and vocabulary of English in order to built onto the foundation established at the Preparatory School. This course aims to bring the students to a level that will enable them fulfill the requirements of main courses of their departments. Students will be encouraged to read a variety of texts as well as chapters from textbooks so that they can pursue their undergraduate studies at the university without major difficulty.

MTH102 Mathematics II (course type: required) (4 Credits)
Course objective: This course aims to give advances of Calculus to students.
Course Content: Plane and polar co-ordinates, area in polar co-ordinates, arc length of curves. Limit, continuity and differentiability of function of several variables, extreme values, method of Lagrange multipliers. Double integral, triple integral with applications. Line integrals, Green's theorem. Sequences, infinite series, power series, Taylor's series. Complex numbers.

Prerequisite: MTH101

PHY102 General Physics II (course type: required) (4 Credits)
Course objective: Be able to know the basic laws of electricity and magnetism. To apply those laws for solving problems. To be able to use his/her knowledge in the fields of other sciences and/or engineering. Understanding how physics approach and solve problems in electricity and magnetism.
Course Content: A basic physics course which study electric and magnetic phenomenas. Topics include electricity, magnetism, and direct current circuits. Laboratory work is an important component of the course.

Prerequisite: PHY101

AİT101 Principles of Atatürk and the History of Turkish Revolution I (course type: only for Turkish Students) (2 Credits)
Course objective: The aim of this course is to give detail introduction about the Turkish Republic History for Turkish students.
Course Content: Beside discussing the definition of the term " Revolution" by giving some examples such as French and Russian Revolutions, this course mainly focuses on the historical process that laid the basis of the foundation of Modern Turkey.In this context, after presenting a concise political history of the Ottoman Empire and its state mechanism, the political, social and economical developments between the Sultan Selim III Period (1789-1808) and the proclamation of Republic of Turkey by Mustafa Kemal Ataturk in 1923, are examined.

AİT102 Principles of Atatürk and the History of Turkish Revolution II course type: only for Turkish Students) (2 Credits)
Course objective: Besides the philosophical foundations of Ataturk's principles historic events up to the establishment of the Republic of Turkey, the basic meaning and form of interpretation in the light of contemporary developments founded on the Turkish modernization are the focus of this course.
Course Content: The political, social, economical and cultural transformation in the Republic of Turkey; The six principles of Atatürk and Kemalizm; Turkish Foreign Policy during the Atatürk period.

Prerequisite: AİT101

AİT103 Principles of Atatürk and the History of Turkish Revolution I (course type: only for Foreign Students) (2 Credits)
Course objective: The aim of this course is to give detail introduction about the Turkish Republic History for Turkish students.
Course Content: Beside discussing the definition of the term " Revolution" by giving some examples such as French and Russian Revolutions, this course mainly focuses on the historical process that laid the basis of the foundation of Modern Turkey.In this context, after presenting a concise political history of the Ottoman Empire and its state mechanism, the political, social and economical developments between the Sultan Selim III Period (1789-1808) and the proclamation of Republic of Turkey by Mustafa Kemal Ataturk in 1923, are examined.

AİT104 Principles of Atatürk and the History of Turkish Revolution II (course type: only for Foreign Students) (2 Credits)
Course objective: Besides the philosophical foundations of Ataturk's principles historic events up to the establishment of the Republic of Turkey, the basic meaning and form of interpretation in the light of contemporary developments founded on the Turkish modernization are the focus of this course.
Course Content: The political, social, economical and cultural transformation in the Republic of Turkey; The six principles of Atatürk and Kemalizm; Turkish Foreign Policy during the Atatürk period.

Prerequisite: AİT103

YİT101 Turkish for Foreigners I (course type: only for Foreign Students) (2 Credits)
Course objective: The aim of this course is to introduce Turkish Language for Foreign Students of NEU.
Course Content: Basic rules of Turkish, phonetics (sounds, alphabet reading rules), vocabulary (Recognition of words as words, relations between words), sentence information (sentence organizations, general structure and sentence types), reading-writing (reading rules and writing techniques, spelling rules, comprehension of speech and writing language, spelling rules.), reading-comprehension (reading comprehension techniques, applications on texts), listening (listening comprehension, listening to the notes of the necessary comments by making notes, students practice on the appropriate texts to their own profession), speech (Learning the techniques of speaking, learning some specific emphasis, intonation. Applying on appropriate texts. A1 has been started according to the level of international language.

TUR 101 Turkish Language I (course type: only for Turkish Students) (2 Credits)
Course objective: To teach the concepts of writing language and writing. Teach the formal

writings and develop the plan with applications.
Course Content: Definition and importance of language; the relationship between language and culture; written language and its features, external structure and rules in written expression, spelling rules and punctuation marks; plan, theme, point of view, helpful ideas, paragraph writing; concept of composition, composition writing rules and plans; composition, composition, paragraph review, composition correction studies, general expression disorders, thinking and expressing thoughts; various types of writing (memo, clause, story, criticism, novel, etc.).

YİT102 Turkish for Foreigners II (course type: only for Foreign Students) (2 Credits)
Course objective: The aim of this course is to improve Turkish Language for Foreign Students of NEU.
Course Content: Vocabulary of the Turkish (Recognition of words as words, relations between words), sentence information (sentence organizations, general structure and sentence types), reading-writing (reading rules and writing techniques, spelling rules, comprehension of speech and writing language, spelling rules.), reading (reading comprehension techniques, applications on the texts), listening (listening comprehension, listening to the necessary comments by taking note of the necessary comments on the students' own profession) applications, speaking (learning speech techniques, specific emphasis, learning shapes such as intonation, appropriate text Applications on the A1 level according to the international level.

Prerequisite: YİT101

TUR 102 Turkish Language I (course type: only for Turkish Students) (2 Credits)
Course objective: To improve written and oral expression. To develop scientific narrative and to gain the ability to produce scientific text.
Course Content: Written Expression, Method and Plan in Written Expression, Written Expression Practice, Scientific Texts (Article-Course Content Report-Criticism), Official Texts (Petition, Resume), Literary Genres, Essay, Column, Travel Writing, Biography, Story, Novel, Oral Literature, Oral Expression and Communication.

Prerequisite: TUR101

MTH113 Linear Algebra (course type: required) (3 Credits)
Course objective: This course aims to give details of Linear Algebra to students.
Course Content: System of linear equations: elementary row operations, echelon forms, Gaussian elimination method. Matrices: elementary matrices, invertible matrices. Determinants: adjoint and inverse matrices, Crammer's rule. Vector spaces: linear independents, basis, dimension. Linear mapping. Inner product spaces: Gram-Schmit ortogonalization. Eigenvalues and eigenvectors, Cayley-Hamilton theorem, diagonalization.

Prerequisite: MTH101

ENG102 English II (course type: required) (3 Credits)
Course objective: This course aims to bring the students to a level that will enable them to ful fill the requirement so the main courses of the departments. The ability to evaluate, analyze and synthesize information in written discourse will be highlighted. Documentation in writing will be introduced at the beginning of the course, in order to solidly establish the skill by the end. Students will learn the discourse patterns and structures to be used in different essay types that they need for real life, hands-on tasks like explaining process, organizing schedules, reporting or progress, or analyzing risk.

Prerequisite: ENG101

Course Content: This course will be a continuation of ENG 101, with greater emphasis on student autonomy, research skills and synthesizing ability. In Eng-102, the ability to evaluate, analyze and synthesize information in written discourse will be highlighted. Documentation in writing will be introduced at the beginning of the course, in order to solidly establish the skill by the end. Students will learn the discourse patterns and structures to be used in different essay types. Students will prepare essays: 1. An academic essay with proper documentation. 2. A project report to be prepared throughout the course, including a literature review (displaying analysis/synthesis skills, and documentation), a definition/elaboration of a problem (using definition, description, cause/effect and comparison/contrast patterns) and suggestions for solution (including personal views and argumentation). Local and regional topics, personalizing the research and viewpoints will be recommended to prevent plagiarism. Instructors will have to keep in close contact with the students to guide them throughout the process.

Prerequisite: ENG101

BME102 Biochemistry (course type: required) (4 Credits)
Course objective: This course is designed for engineering students. Students are also provided with overviews of the major physical and chemical techniques that engineers have used to explore life at the molecular level.
Course Content: Emphasis is placed on the realationship between molecular architecture and the functional properties of biomolecules, and the thermodynamic, unceasing, and self regulating nature of living processes.

Prerequisite: BME104

BME110 Medical English (course type: required) (3 Credits)
Course objective: Students will be able to demonstrate an understanding of the medical field professions and will be able to demonstrate the correct pronunciation and spelling of medical term
Course Content: Accurately describe the human body and associated components, conditions processes and process in a science-based manner. Learn words created using prefixes and suffixes in Latin and Ancient Greek. In medicine, their meanings and their etymologyare informed by the lananguage of origin.

MTH201 Differential Equations (course type: required) (4 Credits)

Course objective: Introducing first, second and higher order differential equations, and the methods of solving these equations. Emphasizing the important of differential equations and its engineering application. Introducing the Laplace transform and its applications in solving differential equations and other engineering applications. Introducing the series method in solving differential equations.

Course Content: Ordinary and partial differential equations. Explicit solutions, Implicit Solution. First-order differential equations, separable, homogenous differential equations, exact differential equations. Ordinary linear differential equations. Bernoulli differential equations. Cauchy-differential equations. High-order ordinary differential equations. Introduction to Laplace transforms. Introduction to series method for solving differential equations.

Prerequisite: MTH102

YEAR 2

BME202 Biomaterials (course type: required) (4 Credits)
Course objective: Understand the fundamental principals in biomedical engineering, material science and chemistry, and how they contribute to biomaterial development and performance.
Course Content: Introduction to biomaterials, Biocompatibility, The structure of solids, Imperfections in crystals, super cooled and network solids, Composite material structure, Characterization of materials, Mechanical thermal properties, Phase diagrams, Strengthening by Heat Treatments, Surface properties and adhesion, Electrical, optical, X-Ray Absorption, Acoustic and ultrasonic characterization of materials, metallic implant, Ceramic implant, Polymeric implant and composite materials.

ECC204 Electric Circuits (course type: required) (4 Credits)
Course objective: This course is designed for provide an understanding of the fundamentals and analysis of electric circuits.
Course Content: The course encompasses the fundamental concepts of electric circuits, such as Ohm's and Kirchhoff's laws. It develops into the circuit analysis techniques such as nodal and mesh analyses and the equivalent circuits. Energy storage elements and first order transient circuits are included in the course. The course also covers the analysis of sinusoidal circuits, including the power calculation.

Prerequisite: PHY102

ECC106 Introduction to Computer Programming (course type: required) (4 Credits)
Course objectives: The goal of this course is to help students know program language evolution and classification and basic computer architecture. Students will be able to solve basic numerical computation in binary, design and implement simple assembly language programs at the end of the course.
Course content: An introduction to fundamental concepts. Algorithms and flowcharts as tools of program design process. Basic program structure. Input/output statements. Control structures: Selection and repetition statements and arrays. Concept of modular programming: Procedures and Functions.

ENG201 Communication Skills (course type: required) (3 Credits)
Course objectives: To reinforces and consolidates the language and 4 skills that students have learned from earlier courses, as well as developing their level of knowledge, communicative capacity, and ability to analyse and reflect on language.
Course Content: Course on upper -intermediate and advanced levels include interesting and up-to-date topics, encouraging students to recognize the importance of acquiring a foreign language in a modern context; prepare them to for their future professional life.

Prerequisite: ENG102

BME210 Anatomy and Physiology (course type: required) (3 Credits)
Course objectives: Students learn the function and structure of the tissues, the nervous system, the skeletal system, the endocrine system, and the function of muscle from the cell level system to the level of the organism.
Course Content: Introduction to the subject of human anatomy and physiology. It covers

anatomy and physiology of the cell, tissues, the neurological system, the cardiovascular system, calculations related to the cardiovascular system, the respiratory system, calculations related to the respiratory system, the urinary system, calculations related to the urinary system, mechanisms of physiologic control and the digestive system.

BME250 Biostaistics (course type: required) (3 Credits)
Course objectives: Researchers in health sciences commonly use several statistical methods (linear regression, ANOVA, logistic regression, survival analysis, non-parametric methods, etc.) to examine biological problems. Earn statistical skills to read scientific articles in your field, understand the statistical methods used, and interpret the results yourself. Learn to use computers and software for statistical analysis.
Course Content: Probability and counting, permutation and combination. Some probability laws, Axioms of probability. Random variables and discrete distributions. Continuous distributions. Joint distributions. Mathematical Expectation, Some Discrete Probability Distributions, Some Continuous Probability Distributions. Biomedical science problem applications

Prerequisite: MTH101

BME260 Electromagnetic Theories (course type: required) (3 Credits)

Course objectives: This course is an undergraduate level electromagnetic theories course, which emphasizes as a basic for understanding on electromagnetic theories and their applications To provide a student with the necessary tools for the critical evaluation of existing and future electromagnetic phenomena. To teach the concepts and principles of constructions of electromagnetics. To enable a student to evaluate and choose a electromagnetic tools to match the problem.

Course Content:. The course focuses on an important role of electromagnetic theories in diverse areas of electromagnetic spectrum, electric filed and several point charges, electric flux, capacitors and capacitance, moving particles in the electric field, polarization, energy of capacitor, diverjans theorem, general situation of the induction.

Prerequisite: PHY102

ECC001 Digital Logic Circuits (course type: required) (4 Credits)
Course objectives: The aim of this course is to give the basics of Digital Logic Systems. Ability to use math and Boolean algebra in performing computations in various number systems and simplification of Boolean algebraic expressions. Ability to design efficient combinational and sequential logic circuit implementations from functional description of digital systems.
Course Content: Introduction to information representation, number systems and codes. Boolean algebra and logic gates. Simplification of switching functions. Combinational logic. Combinational circuit design with programmable devices. Introduction to sequential devices. Modular sequential logic. Analysis and synthesis of synchronous sequential circuits. Sequential circuits with programmable logic devices. Introduction to microprocessors programming.

Prerequisite: ECC106

ECC205 Basic Electronics (course type: required) (4 Credits)
Course objectives: The aim of this course is to educate students from all students of Engineering branches in order to understand the effectiveness of the Electronic Principles which are common in engineering applications.
Course Content: Semiconductors. The P-N junction diode, equivalent models, diode circuits, switching, rectification, DC power supplies, Zener diodes. The bipolar junction transistor, large-signal model. DC transistor circuit analysis, biasing. Common-emitter, common-collector and common-base configurations. JFET operation and biasing.

Prerequisite:ECC204

BME200 Internship I
An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks.
It develops a greater understanding about career options while more clearly defining personal career goals; experiencing the activities and functions of business professionals; refining oral and written communication skills and identifying areas for future knowledge and skill development.

YEAR 3

BME320 Biomechanics (course type: required) (3 Credits)
Course objectives: Identify a specific bone, ligament or muscle according to the name, anatomical position or function. Remember the general characteristics, material properties, the appropriate constituent model and the adaptation potential for the examined tissues and organs. Describe the relationships between structure and function in tissues and the effects / effects of these relationships. Analyze the forces in the skeletal joint for various static and dynamic human activities.
Course Content: This course is an undergraduate level biomechanics course, which emphasizes as a basis for understanding biomechanics and their applications. The course focuses on a important role of biomechanics in diverse areas of growth, development, tissue remodelling and homeostasis.Topics include cellular biomechanics, hemodynamics, the circulatory system, the interstitium, ocular biomechanics, the respiratory system, muscles and movement and skeletal biomechanics. This course covers the fundamental concepts of biomechanics (biology, fluid mechanics, thermodynamics, anatomy or physiology) behind the design of real biomedical problems with biomechanical concepts.

BME310 Biomedical Electronics (course type: required) (4 Credits)
Course objectives: In this course, students will learn especially about circuit analysis, amplifiers, operational amplifiers, diodes and transistors. Apply engineering and science knowledge to identify, formulate and solve problems in these areas.
Course Content: This course includes basic operational amplifier circuits, conductor diodes and transistors. Introduction to digital logic circuits is also provided. Throughout the course, electronic circuit boards are used.

Prerequisite: ECC205

BME301 Biomedical Sensors (course type: required) (4 Credits)
Course objectives: To introduce the student to different sensor applications in biomedical

devices, to enable the student to critically evaluate the sensor and transducer options in order to understand the mechanisms governing the reception and processing of physiological signals recorded from a human subject both in vivo and in vitro.
Course Content: The basis of biosensor design, analysis and selection of physical, optical, electrical, mechanical, thermal transduction mechanisms. The properties of transducers, dynamic linearity, hysteresis and frequency range. Biological elements, immobilization of biological components. Medical, biological and chemical sensors and transducers based on electrochemistry, optics, and solid- state devices.

BME311 Biomedical Instrumentation I (course type: required) (4 Credits)
Course objectives: The aim of this course is to introduce basic biomedical engineering technology to students. As a result, students can measure biological information from the human body, testing and / or understand the systems and devices that can achieve, you can design and evaluate them.
Course Content: Biomedical measurement systems, biopotential amplifiers, blood flow and pressure, clinical and laboratory instrumentation, ECG, EMG, EEG and electrosurgical systems are introduced in detail. Origins and characteristics of bioelectric signals, recording electrodes, amplifiers, chemical pressure and flow transducers, non-invasive monitoring techniques, and electrical safety. Students are provided with overviews of the major physical techniques that engineers have used to explore in biomedical engineering level.

ECC008 Signals and Systems (course type: required) (4 Credits)
Course objectives: Teaching the basic of Signals and Systems. To understand mathematical descriptions and representations of continuous and discreet time signals and systems.To develop input- output relationships for Linear Time Invariant Systems (LTIS). To understand the impulse response of a system and the convolution operator.To teach analysis of the signals in time domain, z domain and frequency domain. To teach Fourier and Laplace Transform analysis for continuous- time LTIS. To teach z- Transform analysis for discrete time systems. To understand sampling theory; To teach the basic of filtering, the basic of feedback concepts. To provide a modeling of the systems in time domain, z domain and frequency domain using software programs
Course Content: The following main topics are covered: Classifications of signals, basic operations on signals, elementary signals, properties of systems, impulse response, convolution, step response, systems described by differential and difference equations, frequency response, Fourier series and transform, Fourier analysis of discrete-time signals and systems, properties of Fourier representations, Fourier representations for mixed signal classes, sampling, reconstruction, z-Transform.

ECC301 Microprocessors (course type: required) (4 Credits)
Course objectives: Teaching the microprocessor as a programmable digital system element. To illustrate some basic concepts of microprocessors through the use of assembly language programming. To give the principles of hardware design; To provide an understanding of a microprocessor based system as a combination of hardware and software subsystems and their interactions.
Course Content: Introduction to microprocessors. Architecture of microprocessors and instruction sets. Interrupts. Memories. Parallel and serial input/output programming. Microprocessor based system design. Microprocessor applications.

Prerequisite: ECC001

BME340 Modeling of Biological Systems (course type: required) (3 Credits)
Course objectives: Formulate mathematical models that extend class examples to address biological questions. Examine linear algebra, differential equations and probabilistic techniques for solving them and analyze mathematical models presented. Interpret the mathematical results in the context of biological problems.
Course Content: This course introduces the current approaches for mathematical modelling and analysis of biological systems using both computer simulation and mathematical techniques. The course reviews the basics of modelling methodology, stochastic and deterministic models, numerical and analytical methods, and model validation. Examples throughout the course are drawn from population dynamics, biochemical networks, ecological models, neuronal modelling, and physiological systems.

Prerequisite: BME250

BME350 Radiology Physics (course type: required) (3 Credits)
Course objectives: Students will be able to understand the mechanisms describing radioactive decay and the production of ionizing radiation; the interactions of ionizing radiation with matter; describe the imaging and treatment equipment used for the clinical care of cancer patients; discuss the use of devices and protocols for the accurate measurement of ionizing radiation and calibration of clinical equipment.
Course Content: This course covers the essential physics of radiological imaging modalities. The main topics; radiation and the atom, interaction of radiation with matter, X-ray production, X-ray tubes, nuclear magnetic resonance, magnetization properties, characteristics of ultrasound, interactions of ultrasound with matter, radioactivity and nuclear transformation, radionuclide production and radiopharmaceuticals, radiation detection, radiation protection, dosimeter and radiation biology.

Prerequisite: PHY101

BME303 Biomedical Imaging (course type: required) (4 Credits)
Course objectives: The aim of this course is to provide an overview of the physical processes of biological imaging tissues. To provide students with mathematical, computational tools for analyzing and interpreting various biomedical images and technical aspects of biomedical imaging equipment.
Course Content: This course covers medical imaging modalities, including x-ray devices, fluoroscopes, mammography, computed Tomography (CT), magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), ultrasound, positron emission tomography (PET), single photon emission computed tomography (SPECT).

BME312 Biomedical Instrumentation II (course type: required) (4 Credits)
Course objectives: The purpose of the course is to provide biomedical instrumentation backround on technical aspects. Biomedical measurement systems are introduced in detail. Students are provided with overviews of the major physical techniques that engineers have used to explore in biomedical engineering levels. Biomedical instrumentation II focuses on how electrical equipment can measure physiological patient data and improve medical care. This course introduces the principles of various components used in different biomedical devices and sensors.
Course Content: Advanced biopotential signals, electrocardiograms and electrical shock, hospital equipment transducers and element based repair, maintenance, biopotential amplifiers, electrocardiography and unit based repair, electrocencephalograh and filtering, defibrillator, pacemaker, blood pressure measurement, clinical laboratory equipment.

Prerequisite: BME311

BME321 Artificial Organs (course type: required) (3 Credits)
Course objectives: The purpose of this course is to thought technologies that will maintain, improve or even restore the function of diseased organs. The growing need for these technologies is substantial. Improved health care has resulted in an increased life span for the general population and, when coupled with a growing shortage of donor organs, makes it clear that organ assistance and substitution devices will play a larger role in managing patients with end-stage disease by providing a bridge to recovery or transplantation.
Course Content: This course covers the design principles of artificial organs, the design and function of artificial heart, artificial heart valves and cardiovascular system components, orthopedic and dentistry treatment and rehabilitation devices, hemofiltration, extracorporeal circulatory systems and tissue engineering.

BME300 Internship II
An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks. It develops a greater understanding about career options while more clearly defining personal career goals; experiencing the activities and functions of business professionals; refining oral and written communication skills and identifying areas for future knowledge and skill development.

YEAR 4

BME401 Instrumental Analysis (course type: required) (4 Credits)
Course objectives: The objective of this course is to provide a fundamental understanding of various analysis tools and instruments in biomedical applications.
Course Content: This course is designed to give students practical experience using modern analytical instrumentation and to provide students with the background theory and principles of operation.

BME452 Biomedical Signal Processing (course type: required) (3 Credits)
Course objectives: The aim of this course is to understand the practical problems in the objective analysis of biomedical signals, to understand the basic theoretical background for the use of digital signal processing techniques for biomedical applications, to understand the practical benefits of various digital signal processing approaches and to determine the best solution for specific problems.
Course Content: Fundamentals of digital signal processing signal conditioning, frequency analyses, digital filtering methods, feature extraction, classification and application on EEG-ECG signals are introduced in detail. Students are provided with overviews of major techniques that engineers have used to explore in biomedical engineering level.

BME400 Graduation Project I **(course type: required) (3 Credits)**
Course objectives: Preparatory studies of the literature and data collection for the graduation project in a particular area of concentration and under the supervision of one of the faculty members.
Course Content: The course covers directed readings in the literature of biomedical engineering, introduction to research methods, seminar discussions dealing with special engineering topics of current interest. Planning, design, construction and management of an engineering project are carried out and finally completed by writing a technical report. The

main aim of this course is to prepare students for the practical tasks of the work place after graduation. This includes building his/her ability to perform a complete project.

BME402 Graduation Project II (course type: required) (3 Credits)
Course objectives: Preparatory studies of the literature and data collection for the graduation project in a particular area of concentration and under the supervision of one of the faculty members.
Course Content: The course covers directed readings in the literature of biomedical engineering, introduction to research methods, seminar discussions dealing with special engineering topics of current interest. Planning, design, construction and management of an engineering project are carried out and finally completed by writing a technical report.The main aim of this course is to prepare students for the practical tasks of the work place after graduation. This includes building his/her ability to perform a complete project.

BME435 Bioinformatics (course type: required) (3 Credits)
Course objectives: This course is a graduate level bioinformatics course, which emphasizes as a basis for understanding bioinformatics and their applications. The course focuses on a general introduction to the uses of biological databases in generating biological knowledge to better understand living systems, for the purposes of aiding healing of diseases.
Course Content: Topics include Genomic Era, the anatomy of genome, probabilistic models of genome sequences, biological databases, sequence alignment, gene and promoter prediction, molecular phylogenetics, post-genomic epidemic, structural bioinformatics and proteomics. This course covers the fundamental concepts molecular biology, database management systems, and probabilistic models.

ECC426 Economics for Engineers (course type: elective) (3 Credits)
Course Objective: Discuss principles and economic analysis of decision making. Discuss cost concepts, make-versus-purchase studies; Analyze principles of money-time relationships. Work on cash flow analysis. Analyze application of money-time relations. Analyze supply and demand relations. Analyze price and demand relations.Analyze breakeven point analysis and effects of inflation on money-time relationships
Course Content: Principles and economic analysis of engineering decision making. Cost concept. Economic environment. Price and demand relations. Competition. Make-versus-purchase studies. Principles and applications of money-time relations. Depreciation. Many and banking. Price changes and inflation. Business and company finance.

ECC427 Management for Engineers (course type: elective) (3 Credits)
Course Objective: Discuss principles of management, Discuss functions of managers, Discuss organization and environment, Discuss marketing, production and personnel management, Discuss marketing control, Discuss accounting and financial reports, Discuss budgeting and overall control.
Course Content: Principles of management. Functions of managers. Organisation and environment. Marketing management. Production management. Personnel management. Managerial control. Accounting and financial reports. Budgeting and overall control.

ECC 413 Introduction to Artificial Intelligence (course type: elective) (3 Credits)
Course Objective: The main aim of this course is to equip you with the tools to overcome the new Artificial Intelligence problems that you may encounter in life.
Course Content: Problem solving methods, heuristic search, game-playing, knowledge acquisition, knowledge representation, logical inference, planning, reasoning under

uncertainty, decision theory, expert systems and application, Prolog/LISP programming, learning, perception, and natural language understanding.

ECC 419 Digital Image Processing (course type: elective) (3 Credits)
Course Objective: This course introduces digital image processing. It focuses on the theory and algorithms underlying a range of tasks including acquisition and formation, enhancement, segmentation, and representation.
Course Content: Overview of digital image processing including visual perception, image formation, spatial transformations, image enhancement, color image representation and processing, edge detection, image segmentation, and morphological image processing.

BME432 Fundamental Applications Of Computed Tomography (course type: elective) (3 Credits)
Course Objective: This course will improve your knowledge of the clinical, technological and instrumental basis of Computed Tomography (CT).
Course Content: You will be introduced to topics including history of computed tomography and continued developments CT scanning techniques, cross-sectional anatomy and pathology**,** data acquisition, basic principles of CT, data acquisition, image quality, image reconstruction and computed tomography angiography in coronary artery disease.

BME431 Cardiac Biomechanics and ECG Systems (course type: elective) (3 Credits)
Course Objective: The main aim of the course is to teach how to model blood flow and mechanical forces in the cardiovascular system. It clarifies the ability between the cardiology and biomedical engineering; using and developing the technology about diagnostic and treatment devices for cardiovascular diseases. It also brings a detailed explanation for anatomy, physiology and electrophysiology of the heart.
Course Content: The course will examine how mechanical forces on cardiovascular tissue (blood vessels, heart) and cardiovascular cells (endothelial cells, platelets, red and white blood cells) and the effects of these forces will be discussed. The course provides a thorough understanding on cardiac mechanics and Electrocardiogram (ECG) systems.