NEAR EAST UNIVERSITY

DEPARTMENT OF Bioengineering

Course Structure Diagram with Course Credits

2021-2022

1. Courses List with Near East University credits and ECTS

List of courses of taken each year are given below.

DEPARTMENT OF BIOENGINEERING

1st Semester

CODE	COURSE NAME	C/E	T	P	C	E		CODE	COURSE NAME
PHY101	General Physics I	C	3	2	4	5		PHY102	General Physics II
MTH101	Calculus I	C	4	0	4	5		MTH102	Calculus II
ENG101	English I	C	0	0	3	3		ENG102	English II
BIOE101	Introduction to Bioengineering	C	3	0	3	5		MTH113	Linear Algebra
CHM104	Chemistry For Biological Sciences	C	3	2	4	5		CHM122	Organic Chemistry
ECC107	Biology	C	3	0	3	3			
NTE	Non-Technical electives KTK/CHC 100	E	0	0	2	2			
Total					23	28		Total	

2nd Semester

3rd Semester

CODE	COURSE NAME	C/E	T	P	C	E		CODE	COURSE NAME
ECC217	Microbiology	C	3	0	3	6		BIOE202	Polymer TechnologiesPolimer Teknolojileri
BME102	Biochemistry	C	3	2	4	4		BME250	Biostatistics
ENG201	Communication Skills	C	3	0	3	3		BIOE200	Internship I
BIOE205	Principles and applications of Ecology	C	3	0	3	6		BIOE204	Thermodynamics
NTE	Nontechnical Electives	E	3	0	3	3		BIOE208	Genetics
YIT101	Turkish for Foreign Students I	C	0	0	2	2		YIT102	Turkish for Foreign Students II
AIT103	Principles of Atatürk and the History of Turkish Revolution I	C	0	0	2	2		AIT104	Principles of Atatürk and the History of Turkish Revolution II
Total					20	26		Total	

4th Semester

5th Semester

CODE	COURSE NAME	C/E	T	P	C	E		CODE	COURSE NAME
BME202	Biomaterials	C	3	0	3	5		BIOE302	Bioenergy Resources
BME301	Biomedical Sensors	C	3	2	4	6		BIOE304	Nanotechnology
ECC106	Introduction to Computers and Programming	C	3	2	4	6		BIOE306	System Design on Bioengineering
BME320	Biomechanics	C	3	0	3	5		BME300	Internship II
BIOE301	Mass and Heat transfer	C	3	0	3	6		BME340	Modeling of Biological Systems
								BME321	Artificial Organs
Total					17	28		Total	

6th Semester

7th Semester

CODE	COURSE NAME	C/E	T	P	C	E
BIOE400	Graduation Project I	C	3	0	3	10
BME401	Instrumental Analysis	C	3	0	4	5
TE	Technical Elective	E	3	0	3	5
TE	Technical Elective	E	3	0	3	5
TE	Technical Elective	E	3	0	3	5
Total					16	30

8th Semester

CODE	COURSE NAME
BIOE402	Graduation Project II
BME345	Bioinformatics
TE	Technical Elective
TE	Technical Elective
TE	Technical Elective
Total	

Total No. of Courses	47
Total No. Of Electives	8
Total No. Of Credits	139

Percentage of Electives

Total ECTS

Key:

C/E: Compulsory/Elective (Please indicate) P: Hours of Practice/Lab C: Credits

Technical Elective Courses

Course Code	Course Name	Credit	ECTS	Prerequisite	Class Hours	LAB	Pract
BME432	Fundamental Applications of Computed Tomography	3	5	-	3	0	0
BME443	Introduction to Tissue Engineering	3	5	-	3	0	0
BME333	Biomedical Computer Applications	3	5	-	3	0	0
BME405	Nuclear Medicine	3	5	-	3	0	0
BME409	Clinical Engineering						
BME304	Introduction to Nanotechnology	3	5	-	3	0	0
BME437	X-Ray Based Systems	3	5	-	3	0	0

Course Code	Course Name	Credit	ECTS	Prerequisite	Class Hours	LAB	Pract
BME453	Medical Ethics	3	5	-	3	0	0
BME458	Biomedical Equipment Design	3	5	-	3	0	0
BME482	Maintenance and Operation of Medical Devices	3	5	-	3	0	0
BME431	Cardiac Biomechanics and ECG Systems	3	5	-	3	0	0
BME407	Ultrasound Imaging	3	5	-	3	0	0
ECC413	Introduction to Artificial Intelligence	3	5	-	3	0	0
ECC419	Digital Image Processing	3	5	-	3	0	0
ECC426	Economics for Engineers	3	6	-	3	2	0
ECC427	Management for Engineers	3	6	-	3	2	0

PS: Problem Solving **C:** Complementary **R:** Reformative **T:** Tutorial **Restricted Non-Technical Elective Courses**

Course Code	Course Name	Credit	ECTS	Prerequisite	Class Hours	LAB	Pract
MAN101	Introduction to Management	3	5	-	3	0	0

Course Code	Course Name	Credit	ECTS	Prerequisite	Class Hours	LAB	Pract
ECON101	Introduction to Economics	3	5	-	3	0	0
FRE101	French I	3	5	-	3	0	0
FRE102	French II	3	5	-	3	0	0
GER101	German I	3	5	-	3	0	0
GER102	German II	3	5	-	3	2	0
ARB101	Arabic	3	5	-	3	2	0
GRE101	Greek	3	5	-	3	2	0
RUS101	Russian	3	5	-	3	2	0
DBT301	Debate Club	3	5	-	3	2	0
PHIL101	Introduction to Philosophy	3	5	-	3	2	0
HIST103	History of Civilization	3	5	-	3	2	0
POL101	Political Science I	3	5	-	3	2	0
SOC101	Sociology	3	5	-	3	2	0

PS: Problem Solving **C:** Complementary **R:** Reformative **T:** Tutorial

Course Descriptions

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 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 to use 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.

BIOE101 Introduction to Bioengineering (course type: required) (3 Credits)
Course objective: The students will survey the field of bioengineering and the global impact of technology innovation in solving problems in biology and medicine with an emphasis on the quantitative and engineering tools and concepts.
Course Content: This course provides a broad perspective of Bioengineering as applied to topics in contemporary Biology, Physiology, and Medicine, including Biotechnology and Biomaterials.

ECC107 Biology (course type: required) (3 Credits)
Course objective: The course presents the basic principles and concepts of biology. The course will emphasize how concepts are actually designed and tested and how the alternatives are rejected.
Course Content: Principles of biology from the cellular to the ecosystem level, including biochemistry, cell biology, molecular biology, genetics, and evolution. This course is designed for students planning to major in biology or a related discipline. Includes laboratory experiences.

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 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

CHM122 Organic Chemistry (course type: required) (4 Credits)
Course objectives: This course is designed as a one-semester course for materials science and nanotechnology engineering, bioengineering, food engineering and molecular biology and genetics students. CHM 122 is a central link between physical and biological sciences and

introduces a fundamental basis in nanotechnology, food processing, genetics and tissue engineering.
Course content: This course provides a broad perspective about carbon compounds, chemical bonds, molecular structure, intermolecular interactions, organic reactions and mechanisms, acids and bases, alkanes and cycloalkanes, conformational analysis, stereochemistry: chiral molecules, substitution and elimination reactions of alkyl halides, alkenes and alkynes (addition reactions), alcohols and ethers, aromatic compounds and reactions, aldehydes and ketones, carboxylic acids and amines.

YEAR 2

BIOE202 Polymer Technologies (course type: required) (3 Credits)
Course objective: After completing the course, the students should be able to learn the concepts of polymer physics and polymer technology, identify the hardness, temperature and frequency dependence and define the phenomena in terms of their molecular level properties.
Course Content: Definitions of polymers: Classification: Raw materials sources, structural, mechanical, thermal, electrical, optical and chemical properties of polymers, Weight average molecular weight and analysis techniques and process techniques. Methods to determine average molecular weight of the polymer. Polymer Fabrication technologies.

ECC217 Microbiology (course type: required) (3 Credits)
Course objective: Apply the fundamentals of the chemistry of life to microbial metabolism and physiology.
Course Content: Microbiology is the study of microorganisms, which are microscopic, unicellular, and cell-cluster organisms. This includes eukaryotes such as fungi and protists and prokaryotes. Viruses and prions, though not strictly classed as living organisms, are also studied.

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 relationship between molecular architecture and the functional properties of biomolecules, and the thermodynamic, unceasing, and self regulating nature of living processes.
Prerequisite: BME104

BIOE205 Principles and Applications of Ecology (course type: required) (3 Credits)
Course objective: Students are led to appreciate the importance of ecology in solving environmental problems.
Course Content: This course examines the relationship between organisms and their biotic and abiotic environments at three levels of biological hierarchy: individual organism, population, and community. Population characteristics, models of population dynamics, and the effect of ecological interactions on population regulation are discussed in detail. The structure and function of natural and man-made communities and the impact disturbances have on community structure are also examined.

BIOE204 Thermodynamics (course type: required) (3 Credits)
Course objective: The goal of the course is to provide the students with the fundamentals of thermodynamics and heat transfer.
Course Content: Thermodynamics is the branch of physics that deals with heat and

temperature, and their relation to energy, work, radiation, and properties of matter. The First Law of Thermodynamics, Heat and Work are mainly discussed.

BIOE208 Genetics (course type: required) (3 Credits)
Course objective: This course discusses the genetic principles and applies them to the study of biological function at the level of molecules, cells and multicellular organisms in humans.
Course Content: Structure and function of genes, chromosomes and genomes, biodiversity resulting from recombination, mutation and selection, population genetics, use of genetic methods to analyze protein function, gene regulation and hereditary disease.
ENG201 Academic English Writing Technique II (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

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

BIOE200 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

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.

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.

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.

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.

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.

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

BIOE302 Bioenergy Resources (course type: required) (3 Credits)
Course objectives: This course offers great insight into biorenewable biomass resources related to technologies and feedstocks.
Course Content: Dealing specifically with biofuels and bioenergy produced from renewable resources, it also provides production technologies and applications.

BIOE304 Nanotechnology (course type: required) (3 Credits)
Course objectives: Nano structures and technology of materials are discuss in details. Solid state physics and chemical role on nanotechnology; Instruments used in the characterization and synthesis of nanomaterials are to be discussed.
Course Content: Nanotechnology is an interdisciplinary course, contains biochemistry, electrical electronics engineering, and biomaterials.

BIOE306 System Design on Bioengineering (course type: required) (3 Credits)
Course objectives: This course provides an introduction to the strategies behind the development of tissue substitutions and basic bioengineering design criteria.
Course Content: Engineering principles and life sciences focus on the development of biological substitutions that restore, maintain or improve tissue function.

BIOE300 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.

BIOE400 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 bioengineering, 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.

BIOE402 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 bioengineering, 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.