Courses

Contract All Courses |

Biomedical Engineering

BME 100 - Introduction to Biomedical Engineering

(1 unit)

Corequisite: 1A, 1C, or related GE foundation course.
Introduction to major topics and concepts in Biomedical Engineering. Current and future trends and challenges in various subfields of Biomedical Engineering. Social, ethical and economical issues related to biomedical technology. Exploration of career and professional development opportunities.

Letter grade only (A-F). (Lecture 1 hour) Same Course as BME 100H. Not open for credit to students with credit in: BME 100H

BME 100H - Introduction to Biomedical Engineering

(1 unit)

Prerequisites: Engr Honors Program track I or II.
Introduction to major topics and concepts in Biomedical Engineering. Current and future trends and challenges in various subfields of Biomedical Engineering. Social, ethical and economical issues related to biomedical technology. Exploration of career and professional development opportunities.

Letter grade only (A-F). (Lecture 1 hour) Same course as BME 100
. Open to students in the Engineering Honors Program. Additional assignments/projects adding depth to the course materials required for Engineering Honors students. Not open for credit to students with credit in BME 100
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BME 200 - Regulatory Basics and Compliance in Biomedical Engineering

(1 unit)

Prerequisite: BME 100
.
Review of basic concepts of compliance in biomedical engineering, and overview of FDA regulatory

affairs, quality measures for medical device and drug development.

Letter grade only (A-F). Not repeatable for credit.

BME 201 - Programming for Biomedical Engineering

(3 units)

Prerequisite: MATH 122
with a grade of "C" or better.
Corequisite: BME 100.

Introduction to the constructs in the MATLAB programming language. Array and matrix operations, functions and function handles, control flow, plotting and image manipulation, cell arrays and structures, and various related toolboxes. Programming projects/examples will emphasize Biomedical Engineering applications.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 205 - Fundamentals of Medical Electronics

(2 units)

Corequisite: MATH 224.

Prerequisite/ Corequisite: BME 201

Fundamental concepts to analyze biomedical circuits: Active and passive circuit elements, Node and mesh analysis, Responses of first and second order circuits, Role of circuit ground, surge protection and electric hazard in the hospitals.

Letter grade only (A-F) (Lecture 1 hour and Laboratory 3 hours).

BME 211 - Biomechanics I

(3 units)

Prerequisites: PHYS 151
, MATH 224,
all with a grade of "C" or better.
Fundamental principles of mechanics applied to the study of biological systems. Introduction to cardiovascular and musculoskeletal biomechanics and problem-solving strategies to investigate diverse systems of the human body.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours)

BME 301 - Biomedical Signals and Systems

(3 units)

Prerequisites: MATH 370A
, BME 201
and BME 205
, all with a grade of "C" or better.
Corequisite: E E 380
.
Physiological Signals and their properties, Linear time invariant systems (LTI), Causality, Filtering, Time and Frequency Domain Analysis, Correlation Analysis, Laplace and Fourier Analysis.

Letter grade only (A-F) (Lecture 2 hours, Laboratory 3 hours)

BME 304 - Biomedical Signal Processing

(3 units)

Prerequisite: BME 301
, EE 380
all with a grade of "C" or better.
Introduction of basic Biomedical Signal Processing Techniques, Z-Transform, Frequency Domain Analysis, Digital Filters, Stability, Event Detection, Temporal and Spectral Feature Extraction.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 304H - Biomedical Signal Processing

(3 units)

Prerequisite(s): BME 301
(Biomedical Signal and Circuits), E E 380
(Probability, Statistics and Stochastic Modeling) all with a grade of "C" or better. Open only to students in the Engineering Track of the University Honors Program.
Introduction of basic Biomedical Signal Processing Techniques, Z-transform, Frequency Domain Analysis, Digital Filters, Stability, Event Detection, Temporal and Spectral Feature Extraction. (Lecture 2 hours, Laboratory 3 hours).

Same course as BME 304. Only open to students in the Engineering Honors Track of the University Honors Program. Additional assignments/projects adding depth to the course materials required for Engineering Honors Track students. Not open for credit to students with credit in BME 304.

Letter Grade Only (A-F). Not open to students with credit in BME 304. Not repeatable for credit.

BME 311 - Biomechanics II

(3 units)

Prerequisites: BME 201, BME 211
, and MATH 370A
, all with a grade of “C” or better.
Introduction to structure-function relationships and mechanical behavior of biological tissues. Introduction to statics, continuum mechanics, dynamics, kinematics of rigid bodies, analysis of human motion and hemodynamics.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 315 - Bioinformatics and Genomics

(3 units)

Prerequisites: BME 301
and (BIOL 200
or BIOL 212
) all with a grade of “C” or better.
Development and application of computational approaches to problems in Biology and Genomics, with focus on formulating interdisciplinary problems as computational problems and then solving these problems using algorithmic techniques. Computational techniques include those from statistics and computer science.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours)

BME 320 - Biomedical Data Acquisition and Analysis

(3 units)

Prerequisite: BIOL 207 or BIOL 342 or BIOL 345 with a grade of “C” or better, CHEM 111B
with a grade of “C” or better.
Corequisites: BME 304
Introduction to invasive and noninvasive methods of physiological data collection with an emphasis on real time acquisition and processing. Throughout the course, students learn about physiological and biomedical data collection process with an emphasis on temporal and spatial analysis of biomedical signals such as ECG, blood pressure and EEG.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 370 - Bio-Fluids and Transport

(3 units)

Prerequisites: BME 201, MATH 370A, PHYS 151
, (BIOL 207
or BIOL 342
or BIOL 345
), and ENGR 170

Review of basic fluid mechanics concepts, cardiovascular structure, pulmonary anatomy, physiology, respiration, hematology and blood rheology, characteristics of blood vessels, mechanics of heart valves, pulsatile flow, flow and pressure measurement and experiments, flow modeling.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 370H - Bio-fluids and Transport

(3 units)

Prerequisite(s): MATH 349
, PHYS 151
, BIOL 207
or BIOL 342
or BIOL 345
, ENGR 170
. Only open to students in the Engineering Honors Track of the University Honors Program.
Review of basic fluid mechanics concepts, cardiovascular structure, pulmonary anatomy, physiology, respiration, hematology and blood rheology, characteristics of blood vessels, mechanics of heart valves, pulsatile flow, flow and pressure measurement and experiments, flow modeling. (Lecture 2 hours, Laboratory 3 hours).

Same course as BME 370. Only open to students in the Engineering Honors Track of the University Honors Program. Additional assignments/projects adding depth to the course materials required for Engineering Honors Track students. Not open for credit to students with credit in BME 370.

Letter Grade Only (A-F). Not repeatable for credit.

BME 406 - Selected Topics in Biomedical Engineering

(3 units)

Prerequisite: Senior standing in the Biomedical Engineering Major.
Each offering is based upon an area of biomedical engineering in which recent advances have been made.

Letter grade only (A-F). (Lecture 2 hours, laboratory 3 hours) May be repeated to a maximum of 6 units with different topics in different semesters. Topics announced in the Schedule of Classes.

BME 410 - Biomedical Image Processing

(3 units)

Prerequisite: BME 304
with a grade of “C” or better.
Principles of imaging modalities in radiology: X-ray, Computed Tomography, Ultrasound imaging, and Magnetic Resonance Imaging. Principles of wave propagation, transmission, reflection, refraction, attenuation, absorption, scattering, acoustic impedance. Ultrasound transducers. Principles

of light. Specific application in Mammography and angiography.

Letter grade only (A-F). (Lecture 2 hours, laboratory 3 hours)

BME 425 - Biomaterials

(3 units)

Prerequisites: BME 311
, CHEM 111B
, (BIOL 200
or BIOL 212
), all with a grade of "C" or better.
Overview of natural and synthetic materials for biomedical applications, including metals, ceramics and polymers. Mechanical, electrical, chemical, and surface characterization of biomaterials. Design of hard and soft tissue implant materials. Biocompatibility of materials, wound repair, medical devices and government regulations.

Letter grade only (A-F). (Lecture 2 hours, laboratory 3 hours)

BME 440 - Healthcare Informatics

(3 units)

Prerequisite: BME 315
with a grade of "C" or better.
Principles of Healthcare Informatics. Digital Imaging and Communication in Medicine (DICOM) standard. Medical Imaging. Networking. Teleradiology and Telemedicine. Scaling clinical projects. Security, Confidentiality, Availability. Fault Tolerance and Robustness. Clinical Modeling and Performance Optimization. Clinical decision support. HL7, IHE standards.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 450 - Stem Cells and Tissue Engineering

(3 units)

Prerequisites: BME 311
, CHEM 111B
, (BIOL 200
or BIOL 212
) all with a grade of "C" or better.
Stem cell biology and recent engineering techniques to use stem cells for biomedical engineering purposes. Current concepts and strategies in tissue engineering.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 455 - Computational Biomedicine

(3 units)

Prerequisite: BME 304 and BME 320
with a grade of "C" or better
Introduction to computational methods and machine learning techniques to analyze biomedical data. Topics include parametric and non-parametric classification, supervised and unsupervised methods and dimensionality reduction.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours)

BME 460 - Biomedical Instrumentation

(3 units)

Prerequisite: BME 320
with a grade of "C" or better.
Circuit Analysis Methods. Diodes, Transistors, Operational Amplifiers, Differential Amplifiers, Active Filters – their design principles and applications in Biomedical Instrumentation and Measurement Systems.

Letter grade only (A-F). (Lecture 2 hours, Laboratory 3 hours).

BME 490A - Biomedical Engineering Capstone

(3 units)

Prerequisites: BME 311
, BME 304, BME 320
and BME 370
all with a grade of "C" or better.
Design of a biomedically-oriented hardware or software project(s) including related instrument/device or signal or image processing concepts. Associated constraints, standards, reliability, and verification issues. Individual and group projects.

Letter grade only (A-F). (Lecture 2 hours, laboratory 3 hours)

BME 490B - Biomedical Engineering Capstone

(3 units)

Prerequisite: BME 490A
with a grade of "C" or better.
Implementation of a biomedically-oriented hardware or software project(s) including related instrument/device or signal or image processing concepts. Associated constraints, standards, reliability, and verification issues. Individual and group projects.

Letter grade only (A-F). (Lecture 2 hours, laboratory 3 hours)

BME 497 - Directed Studies in Biomedical Engineering

(1-3 units)

Prerequisite(s): Senior Standing, and consent of instructor
Assigned study/research project/field experience related to recent advances in biomedical engineering with a final report on the topic.

Requires submission of an Independent Study Agreement form as a contract for the project and submission of a Directed Studies Permission form for each semester of enrollment.

Letter Grade Only (A-F) May be repeated to a maximum of 3 units.

BME 500 - Compliance and Quality of Medical Devices

(3 units)

Prerequisite: Graduate standing.
Compliance, quality requirements, and risk management in medical devices for the US market and worldwide. Introduction to Institutional Review Board procedures, clinical trials, FDA regulations, standards for testing and validation, and quality management for medical device development.

Letter grade only (A-F). (3 hours lecture) Not repeatable for credit.

BME 505 - Advanced Systems Physiology and Design

(3 units)

Prerequisite: Graduate standing.
Advanced topics in structure and function of human cells, tissues, organs, and organ systems in health and disease. Application of biomedical engineering approaches to investigate, model, and control these physiological systems. Identification of gaps and unmet biomedical needs related to these systems.

Letter grade only (A-F). (Lecture - Problem 3 hours) Not repeatable for credit.

BME 510 - Advanced Biomedical Imaging

(3 units)

Prerequisite: Graduate Standing.
Advanced topics in modern medical imaging modalities, physics of sound and light, and their interaction with living matter. Implementation of image generation techniques from ultrasound, X-ray, CT, MRI, and radioactive imaging. Segmentation, clustering, filtering, and thresholding

algorithms of diagnostic imaging.

Letter grade only (A-F). (Lecture - Problem 3 hours) Not repeatable for credit.

BME 515 - Advanced Bioinformatics and Genomics

(3 units)

Prerequisites: Open to Biomedical Engineering MS, Computer Engineering and Computer Science MS only.

Concepts, algorithms, and tools for solving advanced problems in bioinformatics including nucleotide and amino acid sequence alignment, DNA fragment assembly, phylogenetic reconstruction, and protein structure visualization and assessment.

Letter grade only (A-F). (Lecture 3 hours) Not repeatable for credit.

BME 550 - Advanced Tissue Engineering

(3 units)

Prerequisites: Open to Biomedical Engineering MS only.
Tissue engineering strategies for designing stem cell technologies. Analysis of tissue development and repair; the extracellular matrix; biochemical and biomechanical signals; cellular biomechanics; engineered scaffolds; drug and gene therapies, and engineered tissues. Regulatory, ethical, and economical issues in tissue engineering

Letter grade only (A-F). (Lecture 3 hours) Not repeatable for credit.

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