BME-Biomedical Engineering Courses

Courses

BME 011. Undergraduate Coop/Internship in BME. 0 Hours.
Engineering workplace experience in preparation for the student's intended career.

BME 210. Engineering in Biology. 3 Hours.
Application of engineering to the study of biology on the cellular and molecular level. Engineering solutions in genomics, proteomics, and nanotechnology to investigate cellular and molecular process.

Prerequisites: BY 123 [Min Grade: C] and PH 222 [Min Grade: C](Can be taken Concurrently)

BME 221. Clinical Innovation I. 3 Hours.
The goals of this class are to develop an understanding of the concept of clinical innovation and develop skills in written and oral communication of innovation in the context of a business proposal/presentation.

BME 289. Undergraduate Research in Biomedical Engineering I. 1 Hour.
Undergraduate research experiences in biomedical engineering. Must have sophomore standing.

Prerequisites: EGR 200 [Min Grade: C] or EGR 111 [Min Grade: C] or HC 111 [Min Grade: C] or HC 120 [Min Grade: C] and (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and PH 221 [Min Grade: C](Can be taken Concurrently)

BME 310. Biomaterials. 3 Hours.
Introduction to wide range of materials used for biomedical applications. Physical, chemical and mechanical properties of biomaterials.

Prerequisites: MSE 280 [Min Grade: C] and BME 210 [Min Grade: C]

BME 311. Biomaterials for Non-Majors. 3 Hours.
Wide range of materials used for biomedical applications. Physical, chemical and mechanical properties of biomaterials.

Prerequisites: MSE 280 [Min Grade: C]

BME 312. Biocomputing. 3 Hours.
Introduction to computational techniques used in biomedical engineering.

Prerequisites: EGR 150 [Min Grade: C] and EGR 265 [Min Grade: C] or (MA 227 [Min Grade: C] and MA 252 [Min Grade: C]) and MA 260 [Min Grade: C](Can be taken Concurrently)

BME 313. Bioinstrumentation. 3 Hours.
An introduction to instrumentation used to make biological and physiological measurements. Techniques include acquisition and analysis of bioelectric signals and instrument control.

Prerequisites: EE 312 [Min Grade: C] and (MA 227 [Min Grade: C] and MA 252 [Min Grade: C]) or EGR 265 [Min Grade: C]

BME 333. Biomechanics of Solids. 3 Hours.
Application of mechanics of solids principles to biomedical engineering problems; stress-strain of bone, viscoelasticity and constitutive equations of tissues, mechanics of the cell, introduction to molecular mechanics.

Prerequisites: EGR 265 [Min Grade: C] or (MA 227 [Min Grade: C] and MA 252 [Min Grade: C]) and ME 215 [Min Grade: C](Can be taken Concurrently)

BME 350. Biological Transport Phenomena. 3 Hours.
Basic mechanisms and mathematical analysis of transport processes with biological and biomedical applications. Analysis of flow, transport and reaction processes for biological fluids and biological molecules with applications towards development of artificial organs, drug delivery systems and tissue engineering products.

Prerequisites: EGR 265 [Min Grade: C] or (MA 227 [Min Grade: C] and MA 252 [Min Grade: C]) and BME 210 [Min Grade: C] and BY 409 [Min Grade: C](Can be taken Concurrently) and ME 215 [Min Grade: C](Can be taken Concurrently)

BME 389. Undergraduate Research in Biomedical Engineering II. 1 Hour.
Undergraduate research experiences in biomedical engineering. Must have junior standing.

Prerequisites: BME 210 [Min Grade: C]

BME 401. Undergraduate Biomedical Engineering Seminar. 1 Hour.
Undergraduate seminar.

BME 420. Implant-Tissue Interactions. 3 Hours.
An overview of implant biocompatibility including tissue histology, histopathology of implant response and the regulatory process for medical devices. Emphasis placed on ethical issues related to design, development, and implementation of biomedical implants. Ethics and Civic Responsibility are significant components of this course.

Prerequisites: BME 310 [Min Grade: C] or BME 311 [Min Grade: C]

BME 423. Living Systems Analysis and Biostatistics. 3 Hours.
Basic concepts and techniques of measurement processing and analysis of data from living systems. Statistics, analysis of variance and regression analysis. Emphasis is placed on data analysis and presentation of group projects.

Prerequisites: BME 312 [Min Grade: C]

BME 424. Current Topics in Stem Cell Engineering. 3 Hours.
This course is designed for students interested in the field of stem cells, regenerative medicine, and tissue engineering using stem cells and stem cell derived cells. The course will introduce the role of stem cells in tissue growth and development, the theory behind the design and in vitro construction of tissue and organ replacements, and the applications of biomedical engineering principles to the treatment of tissue-specific diseases. Students will have hands on experience on culturing and analyzing stem cells, stem cell differentiation, analysis of functional and physiological properties of differentiated cells, and fabricating basic engineered-tissues.

Prerequisites: BY 123 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 212 [Min Grade: C] or BY 115 [Min Grade: C])

BME 435. Tissue Engineering. 3 Hours.
Principles underlying strategies for regenerative medicine such as stem-cell based therapy, scaffold design, proteins or genes delivery, roles of extracellular matrix, cell-materials interactions, angiogenesis, tissue transplantation, mechanical stimulus and nanotechnology.

Prerequisites: BME 310 [Min Grade: C] or BME 311 [Min Grade: C]

BME 443. Medical Image Processing. 3 Hours.
Fundamental topics of medical image processing to practical applications using conventional computer software.

Prerequisites: BME 312 [Min Grade: C](Can be taken Concurrently) and PH 222 [Min Grade: C]
BME 444. Machine Learning for Biomedical Engineering Applications. 3 Hours.
This course provides the introduction to the practical aspects of machine learning such that the students can apply some basic machine learning techniques in simple biomedical engineering problems. The course also provides the principle of machine learning ‘thinking process’ for the next machine learning – AI courses and more in-depth machine learning studies. By ‘thinking process’, at the beginning, it is better to view machine learning like human learning. Students who have experience with Data Mining may further understand the fundamental differences between Machine Learning and Data Mining, although these two fields share many concepts and techniques. Also, the student will learn fundamental theories in machine learning to be able to develop new machine learning techniques and research machine learning in biomedical engineering.
Prerequisites: EGR 150 [Min Grade: C]

BME 450. Computational Neuroscience. 3 Hours.
This course examines the computational principles used by the nervous system. Topics include: biophysics of axon and synapse, sensory coding (with an emphasis on vision and audition), planning and decision-making, and synthesis of motor responses. There will be an emphasis on systems approach throughout. Homework includes simulations.
Prerequisites: BME 312 [Min Grade: C]

BME 461. Bioelectric Phenomena. 3 Hours.
Quantitative methods in electrophysiology with focus on using simulations to examine responses in electrically excitable cell types.
Prerequisites: BME 312 [Min Grade: C]

BME 462. Cardiac Electrophysiology. 3 Hours.
Experimental and computational method on cardiac electrophysiology, ionic current, action potentials, electrical propagation, the electrocardiogram, electromechanical coupling, cardiac arrhythmias, effects of electric fields in cardiac tissue, defibrillation and ablation.
Prerequisites: BME 312 [Min Grade: C]

BME 471. Continuum Mechanics of Solids. 3 Hours.
Matrix and tensor mathematics, fundamentals of stress, momentum principles, Cauchy and Piola-Kirchoff stress tensors, static equilibrium, invariance, measures of strain, Lagrangian and Eulerian formulations, Green and Almansi strain, deformation gradient tensor, infinitesimal strain, constitutive equations, finite strain elasticity, strain energy methods, 2-D Elasticity, Airy Method, viscoelasticity, mechanical behavior of polymers.
Prerequisites: EGR 265 [Min Grade: C] or (MA 227 [Min Grade: C] and MA 252 [Min Grade: C]) and (BME 333 [Min Grade: C] or CE 220 [Min Grade: C])

BME 472. Industrial Bioprocessing and Biomanufacturing. 3 Hours.
This course will introduce students to the growing industries related to biomedical, biopharmaceutical and biotechnology. It is targeted to offer the students marketable skills to work in a vital area of economic growth and also convey some of the challenges and opportunities awaiting.
Prerequisites: BME 310 [Min Grade: C] or BY 330 [Min Grade: C] or CH 460 [Min Grade: C] or can be taken concurrently

BME 489. Undergraduate Research in Biomedical Engineering III. 1-2 Hour.
Undergraduate research experiences in biomedical engineering. Must have senior standing.
Prerequisites: BME 210 [Min Grade: C]

BME 490. Special Topics in Biomedical Engineering. 1-3 Hour.
Special Topic in Biomedical Engineering.