BIOMEDICAL ENGINEERING (BME)

BME 3100C - Introduction to Biomaterials (3 Credits)
Examination of the structure, fundamental properties and functional behavior of materials such as metals, polymers, ceramics and composites used in medical devices and in biological systems, emphasizing mechanical, corrosion, and surface properties.
Prerequisite(s): EGM 3420C and (CHM 1046C or (CHM 1046 and CHM 1046L)) and (STA 2023 or STA 2037)

BME 3101C - Bio Performance of Materials (3 Credits)
Examination of the interactions between the human body and implanted biomaterials focusing on the processes occurring at the tissue-biomaterial interface, including biocompatibility fundamentals with material used in medicine. Special emphasis will be placed in the interaction of biomaterials with cells and tissues including blood.
Prerequisite(s): BME 4332C

BME 3261C - Biofluid Mechanics (3 Credits)
Fundamentals of fluid mechanics and their application to systems in biology and physiology. Topics covered include: properties and statics of fluids; conservation of mass, momentum and energy in fluid flow; flow in closed conduits; dimensional analysis; and flow measurements.
Prerequisite(s): BME 3100C and MAC 2313

BME 3403C - Human Physiology Engineers I (3 Credits)
First course in a quantitative two semester sequence on human physiology for engineers. Includes overview of cells and tissues; energy and cellular metabolism; membrane dynamics; communication, integration, and homeostasis; the endocrine system, neurons and the nervous system; sensory physiology; muscles and control of body movement. Integrates modeling and simulation of physiological systems as well as computer-based experimentation.
Prerequisite(s): EGN 1041C and (BSC 1010C or (BSC 1010 and BSC 1010L)) and (CHM 1046C or (CHM 1046 and CHM 1046L)) and MAP 2302 and (PHY 2048C or (PHY 2048 and PHY 2048L))

BME 3404C - Human Physiology Engineers II (3 Credits)
Second course in a quantitative two semester sequence on human physiology for engineers. Includes the cardiovascular system; blood, blood flow, and control of blood pressure; mechanics of breathing; gas exchange and transport; the kidneys; fluids and electrolyte balance; digestion; energy balance and metabolism; endocrine control of growth and metabolism; the immune system; exercise physiology. Integrates modeling and simulation of physiological systems as well as computer-based experimentation.
Prerequisite(s): BME 3403C and (PHY 2049C or (PHY 2049 and PHY 2049L))

BME 3506C - Circuits for Bioengineers (3 Credits)
Principles of Circuit design, simulation, and analysis; DC and AC circuit theory; principles of electronic devices and amplifiers for bioengineering applications.
Prerequisite(s): (PHY 2049C or (PHY 2049 and PHY 2049L)) and MAP 2302

BME 3507C - Signals Syst Bioengineers (3 Credits)
Introduction to analysis of signals arising from both living and non-living systems. Basic processing of signals with emphasis on analog models and processes. Linear systems and an introduction to closed-loop control. Includes Laplace and Fourier transforms and use of computers for signal and system analysis and control within bioengineering applications.
Prerequisite(s): MAC 2312 and (PHY 2049C or (PHY 2049 and PHY 2049L)) and EGN 1041C and BME 3403C

BME 4211C - Biomechanics (3 Credits)
This course begins with an overview of mechanics applied to bioengineering, including statics and dynamics of human movement. Students will draw upon skills learned in engineering mechanics and biomaterials. Applications of biomechanics will be discussed in gait analysis, orthopedics, and sports assessment. Instrumentation important to biomechanics will be covered to provide a general understanding of applications in research and industry.
Prerequisite(s): EGM 3420C and BME 3403C

BME 4332C - Cellular & Tissue Engineering (3 Credits)
This course focuses on molecular, cellular and tissue engineering, emphasizing concepts, techniques, and clinical applications. Understanding the molecular basis of cellular function and interactions, in combination with fundamental engineering principles, students gain insights into hard and soft tissue structure and function, with the purpose of developing bioartificial tissues or enhancing native materials at the cellular or tissue level.
Prerequisite(s): BME 3100C and BME 3403C

BME 4503C - Biomedical Instrumentation (3 Credits)
Design and applications of biomedical instruments and devices. Includes biopotential electrodes and amplifiers, cardiovascular and respiratory measurements, clinical laboratory instruments, therapeutic and diagnostic devices, medical imaging systems, and electrical safety.
Prerequisite(s): BME 3506C and BME 3507C and BME 3404C

BME 4504C - Bioelectricity (3 Credits)
Fundamental concepts in bioelectricity. Includes both theory and application of knowledge in engineering and electrophysiology to design and use of medical and laboratory devices and diagnostic systems.
Prerequisite(s): BME 3403C and BME 3506C

BME 4513C - Bioengineering Data Acqn&Ctrl (3 Credits)
Theory and applications of data acquisition and control for biomedical instruments, devices, and experimentation. Includes analog and digital interfacing, data conversion, use of timers and other electronic devices as well as pertinent software tools.
Prerequisite(s): BME 3506C and EGN 3060C

BME 4632C - Biotransport Phenomena (3 Credits)
The quantitative description of momentum, heat and mass (convection and diffusion) transport in living systems. Application of engineering methods to model and quantify transport aspects of biological and medical systems.
Prerequisite(s): BME 3261C

BME 4722 - Health Care Engineering (3 Credits)
In this class, students use the Engineering Design Method and Operations Management Concepts to solve problems pertinent to health care industries, E.G. Hospitals, clinics, and research labs, as well as problems related to design development in industry. Specific topics include methods of problem solving, data gathering, statistical methods of data analysis, and developing solutions.
Prerequisite(s): STA 2023 or STA 2037

BME 4800C - Bioengineering Product Design (3 Credits)
Introduction to the engineering design process as applied to bioengineered products. Focus on technical, regulatory, legal, ethical, economic, and social aspects of medical device, biologic and combination product designs, development and commercialization. Includes existing product benchmarking and provides and introduction to modern engineering software tools for biomedical product design.
Prerequisite(s): BME 3100C and EGN 3433C

BME 4884 - Bioengineering Senior Design I (2 Credits)
First course in a two semester capstone design sequence for bioengineers. Includes capstone project problem definition, competitive benchmarking, design metrics and specifications, realistic constraints including ethical, regulatory, intellectual property and standards. Also generation of potential project solution strategies and concept selection.
Prerequisite(s): EGN 3060C and BME 4332C and BME 3507C and BME 4722 and BME 4800C

BME 4885 - Bioengineering Sr Design II (3 Credits)
Second course in a two semester capstone design sequence for bioengineers. Includes capstone project design and assembly drawings, engineering analysis, prototyping, testing, and documentation. Also realistic constraints including health and safety, human factors, economics, sustainability, and manufacturing.
Prerequisite(s): BME 4884 and BME 3404C
Attribute(s): SUSC - Sustainability Component

BME 4930 - Special Topics Bioengineering (1-3 Credits)
This course covers topics in bioengineering with an emphasis on recent developments. Topics and credit may vary.