

BIOMEDICAL ENGINEERING (BMED)

BMED 1000. Introduction to Biomedical Engineering. 1 Credit Hour.

An introduction to the field of biomedical engineering, with an emphasis on career preparation.

BMED 1300. Problems in Biomedical Engineering I. 3 Credit Hours.

Biomedical engineering problems from industrial and clinical applications are addressed and solved in small groups using problem-based learning methodologies.

BMED 1750. Introduction to Bioengineering. 3 Credit Hours.

An introduction to the field of bioengineering, including the application of engineering principles and methods to problems in biology and medicine, the integration of engineering with biology, and the emerging industrial opportunities. Crosslisted with AE, CHE, ECE, ME, and MSE 1750.

BMED 1801. Special Topics. 1 Credit Hour.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1802. Special Topics. 2 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1803. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1804. Special Topics. 4 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1805. Special Topics. 5 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1811. Special Topics. 1 Credit Hour.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1812. Special Topics. 2 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1813. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1814. Special Topics. 4 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1815. Special Topics. 5 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 1XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 2110. Conservation Principles in Biomedical Engineering. 3 Credit Hours.

A study of material and energy balances applied to problems in biomedical engineering.

BMED 2250. Problems in Biomedical Engineering. 3 Credit Hours.

Biomedical engineering problems from industrial and clinical applications are addressed and solved in small groups using problem-based learning methodologies. Credit will not be awarded for both BMED 2250 and BMED 1300.

BMED 2300. Problems in Biomedical Engineering II. 3 Credit Hours.

Biomedical engineering problems from industrial and clinical applications are addressed and solved in small groups using problem-based learning methods.

BMED 2310. Intro to Biomedical Engineering Design. 3 Credit Hours.

In small teams students will apply problem-based learning and human centered design to reverse engineer, analyze, and redesign medical devices. Credit will not be awarded for both BMED 2310 and BMED 2300.

BMED 2400. Introduction to Bioengineering Statistics. 3 Credit Hours.

Introduction to statistical modeling and data analysis in bioscientific and bioengineering applications. Topics include estimation, testing, regression, and experimental design.

BMED 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

BMED 2699. Undergraduate Research. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

BMED 2801. Special Topics. 1 Credit Hour.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2802. Special Topics. 2 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2803. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2804. Special Topics. 4 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2805. Special Topics. 5 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2811. Special Topics. 1 Credit Hour.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2812. Special Topics. 2 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2813. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2814. Special Topics. 4 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2815. Special Topics. 5 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 2XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 3100. Systems Physiology. 3 Credit Hours.

An introduction to human physiology emphasizing biomedical engineering approaches to the understanding of basic organ function, disease states, and medical intervention.

BMED 3101. Introduction to Biomedical Data Science and Engineering. 3 Credit Hours.

Practical/hands-on experience in performing biomedical-related data processing/computation/analysis with a variety of computer tools, platforms, and applications.

BMED 3110. Quantitative Engineering Physiology Laboratory I. 2 Credit Hours.

A hands-on lab providing an active learning team environment to reinforce selected engineering principles of physiology, emphasizing a quantitative model-oriented approach to physiological systems.

BMED 3201. Introduction to Machine Learning for Biomedical Engineers. 3 Credit Hours.

This course is designed to provide biomedical engineering undergraduates with a solid foundation in the principles and applications of machine learning.

BMED 3211. Introduction to Bioinformatics. 3 Credit Hours.

Students will be introduced to the field of bioinformatics, an interdisciplinary field that combines computer science, statistics, machine learning and mathematics to analyze biological data.

BMED 3231. Introduction to Neuroengineering. 3 Credit Hours.

An introduction to the intersection between neuroscience and neurotechnology, including identification of key aspects of the nervous system as the basis for measurement and intervention.

BMED 3300. Biotransport. 4 Credit Hours.

Fundamental principles of fluid, heat, and mass transfer with particular emphasis on physiological and biomedical systems.

BMED 3310. Biotransport. 3 Credit Hours.

Fundamental principles of fluid, heat, and mass transfer with particular emphasis on physiological and biomedical systems. Credit will not be awarded for both BMED 3310 and BMED 3300.

BMED 3400. Introduction to Biomechanics. 4 Credit Hours.

An introduction to the basic concepts and methods in biomechanics, including statistics and the mechanics of biomaterials. The biomedical applications of mechanics will be illustrated.

BMED 3410. Introduction to Biomechanics. 3 Credit Hours.

Introduces concepts and approaches for biomedical deformation and dynamics problems using the application of simple models from statics, mechanics of materials, kinematics, and dynamics.

BMED 3500. Biomedical Sensors and Instrumentation. 3 Credit Hours.

A study of basic concepts and design of electronic sensors and instrumentation used in biomedical measurements. Standard clinical measurement techniques will also be examined.

BMED 3510. Biomedical Systems and Modeling. 4 Credit Hours.

Basic concepts, modeling tools and analysis techniques for the study of biochemical, bioelectrical and biomedical systems.

BMED 3520. Biomedical Systems and Modeling. 3 Credit Hours.

Introduction of computational systems biology, including the modeling process, various types of models, standard analysis and simulation of systems, and applications in real-world biological systems. Credit will not be awarded for both BMED 3520 and BMED 3510.

BMED 3600. Physiology of Cellular and Molecular Systems. 3 Credit Hours.

In depth cell and molecular physiology focused on cellular responses to stimuli, including cell organization/ reorganization, membrane transport/ kinetics, cell signaling/ molecular biology, mechanobiology and energy requirements.

BMED 3610. Quantitative Engineering Physiology Laboratory II. 2 Credit Hours.

This lab provides an active learning team environment, incorporating common cell/molecular biology techniques, to reinforce selected engineering principles in an in vitro cell culture setting.

BMED 3801. Special Topics. 1 Credit Hour.

BMED 3802. Special Topics. 2 Credit Hours.

Special Topics in Biomedical Engineering.

BMED 3811. Special Topics. 1 Credit Hour.

BMED 3853. Special Topics. 3 Credit Hours.

Special topics in BMED.

BMED 3XXX. Bioengineering Elective. 1-21 Credit Hours.

BMED 4000. The Art of Telling Your Story. 1 Credit Hour.

Students will create a professional portfolio and develop the ability to pitch themselves to an audience to prepare themselves to begin their professional careers.

BMED 4400. Neuroengineering Fundamentals. 4 Credit Hours.

Lab and lecture on current topics in Neuroengineering, including electrophysiology, clinical and diagnostic neuroengineering, neural prosthetics, sensory-motor integration, neuromorphic VLSI, neurodynamics and neurorobotics.

BMED 4477. Biological Networks and Genomics. 3 Credit Hours.

Introduction to modeling of biological networks involved in gene regulation, cell signaling and metabolism. Mathematical modeling of cellular processes, such as gene expression, using genomic data.

BMED 4478. Biomed-AI and Health Informatics. 3 Credit Hours.

The course will introduce commonly used informatics pipelines driven by current biomedicine and health care challenges and opportunities.

BMED 4500. Cell and Tissue Engineering Laboratory. 3 Credit Hours.

The principles of cell and tissue engineering will be presented as a laboratory course to give students a hands-on experience. Cell engineering topics include receptor/ligand interactions, cell cycle/ metabolism, cell adhesion, cellular mechanics, cell signal transduction, and cell transfection. Tissue engineering topics include applications, biomaterials/scaffolds and cells for reparative medicine, bioreactors and bioprocessing, functional assessment, in vivo issues.

BMED 4600. Senior Design Project I. 2 Credit Hours.

Team-oriented major design project in biomedical engineering, incorporating engineering standards and realistic design constraints. Credit not allowed for BMED 4600 and BMED 4603 (or BMED 4601).

BMED 4601. Senior Design Project II. 3 Credit Hours.

Team-oriented major design project in biomedical engineering, incorporating engineering standards and realistic design constraints. Credit not allowed for both BMED 4601 and BMED 4603 (or BMED 4600).

BMED 4602. Capstone Design. 3 Credit Hours.

Team-oriented design project in biomedical engineering, incorporating engineering standards and realistic design constraints. Includes introduction to relevant regulatory, intellectual property, and business management topics.

BMED 4603. Advanced Design. 3 Credit Hours.

Continuation of a team-oriented design experience initiated in BMED 4602 Capstone Design. Includes more advanced relevant regulatory, intellectual property, and business management topics. Credit not allowed for both BMED 4603 and BMED 4600 (or BMED 4601).

BMED 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

BMED 4699. Undergraduate Research. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

BMED 4723. Interdisciplinary Capstone Design. 3 Credit Hours.

Interdisciplinary Capstone Design, Industry projects or CREATE-X section.

BMED 4739. Medical Robotics. 3 Credit Hours.

An interdisciplinary course focusing on fundamental understanding of robot kinematics and dynamics as well as the design, development, and evaluation of a medical robotic system.

BMED 4740. Biologically Inspired Design. 3 Credit Hours.

We examine evolutionary adaptation as a source for engineering design inspiration, utilizing principles of scaling, adaptability, and robust multifunctionality that characterize biological systems.

BMED 4750. Diagnostic Imaging Physics. 3 Credit Hours.

Physics and image formation methods for conventional X-ray, digital X-ray CT, nuclear medicine, and magnetic resonance and ultrasound imaging. Crosslisted with MP 4750 and NRE 4750.

BMED 4751. Introduction to Biomaterials. 3 Credit Hours.

Introduction to different classes of biomaterials (polymers, metals, ceramics) and physiological responses to biomaterial implantation. Topics include material properties, host response, and biomaterial characterization techniques. Crosslisted with MSE 4751.

BMED 4752. Introductory Neuroscience. 3 Credit Hours.

Goals are to understand the components of the nervous system and their functional interactions, and appreciate the complexity of higher order brain functions and pathways. Crosslisted with BIOL 4752.

BMED 4757. Biofluid Mechanics. 3 Credit Hours.

Introduction to the study of blood flow in the cardiovascular system. Emphasis on modeling and the potential of flow studies for clinical research application. Crosslisted with AE, CHE and ME 4757.

BMED 4758. Biosolid Mechanics. 3 Credit Hours.

The mechanics of living tissue, e.g., arteries, skin, heart muscle, ligament, tendon, cartilage, and bone. Constitutive equations and some simple mechanical models. Mechanics of cells. Applications. Crosslisted with AE, CHE, and ME 4758.

BMED 4765. Drug Design, Development and Delivery. 3 Credit Hours.

Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods for delivery into the body. Includes student presentations. Crosslisted with CHEM and CHBE 4765.

BMED 4775. Translational Microsystems. 3 Credit Hours.

Learn how to design biomedical microsystems ready for clinical and biomedical translation. Course blends theory with examples of successful biomedical research, clinical translation, and case studies.

BMED 4781. Biomedical Instrumentation. 3 Credit Hours.

A study of medical instrumentation from a systems viewpoint. Pertinent physiological and electro-physiological concepts will be covered. Credit not allowed for both BMED 4781 and (CHE 4781 or ME 4781 or CHBE 4781 or ECE 4781).

BMED 4782. Biosystems Analysis. 3 Credit Hours.

Analytical methods for modeling biological systems, including white-noise protocols for characterizing nonlinear systems. Crosslisted with CHE, ECE, and ME 4782.

BMED 4783. Introduction to Medical Image Processing. 3 Credit Hours.

A study of mathematical methods used in medical image acquisition and processing. Concepts, algorithms, and methods associated with acquisition, processing, and display of two- and three-dimensional medical images are studied. Crosslisted with ECE 4783.

BMED 4784. Engineering Electrophysiology. 3 Credit Hours.

Basic concepts of electrophysiology from an engineering perspective. Functionality of relevant organs and systems; instrumentation tools which monitor electrophysiology function. Crosslisted with ECE 4784.

BMED 4785. Optical Microscopy. 3 Credit Hours.

The course will cover the fundamental principles of optical imaging and detail the inner workings of key microscopy technologies.

BMED 4786. Medical Imaging Systems: Physics, Engineering, and Applications. 3 Credit Hours.

Introduce major biomedical and clinical imaging modalities including X-ray radiography, computed tomography (CT), nuclear medicine (SPECT and PET), magnetic resonance imaging (MRI), and ultrasound.

BMED 4801. Special Topics. 1 Credit Hour.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4802. Special Topics. 2 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4803. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4804. Special Topics. 4 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4805. Special Topics. 5 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4811. Special Topics. 1 Credit Hour.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4812. Special Topics. 2 Credit Hours.

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BMED 4814. Special Topics. 4 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4815. Special Topics. 5 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4823. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4833. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4843. Special Topics. 3 Credit Hours.

Courses in special topics of current interest not included in the regular course offerings.

BMED 4853. Special Topics. 3 Credit Hours.

BMED 4863. Special Topics. 3 Credit Hours.

BMED 4873. Special Topics. 3 Credit Hours.

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Special Topics in BMED.

BMED 4900. Special Problems. 1-21 Credit Hours.

Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4901. Special Problems. 1-21 Credit Hours.

Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4902. Special Problems. 1-21 Credit Hours.

Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4903. Special Problems. 1-21 Credit Hours.

Individualized studies in certain specialized areas of interest in biomedical engineering.

BMED 4XXX. Bioengineering Elective. 1-21 Credit Hours.