BIOMEDICAL ENGINEERING (BME)

Biomedical Engineering (BME) Courses

BME 6011. Research Seminar. (1-0) 1 Credit Hour.
Prerequisites: Graduate student standing; consent of the instructor and the Graduate Advisor of Record. The seminar coordinator may require students to present their research. May be repeated for credit. The grade report for the course is either "CR" (satisfactory performance) or "NC" (unsatisfactory performance). (Formerly BME 5011 and BME 6991. Same as BIME 6090 at UT Health San Antonio.) Differential Tuition: $55.

BME 6021. Supervised Teaching. (0-0) 1 Credit Hour.
Prerequisites: Doctoral student standing; consent of the instructor and the Graduate Advisor of Record. Supervised teaching of undergraduate or graduate students will be required for at least one semester. Students may be required to lecture at undergraduate courses or graduate courses in the field of their expertise. Students will work with the instructor of the course or with their research supervisor on the number of classes to be taught. (Same as BIME 6071 at UT Health San Antonio.) Differential Tuition: $55.

BME 6033. BME Engineering Analysis. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in engineering or consent of the instructor. This course is designed to introduce students to advanced mathematical and numerical methods necessary to solve problems frequently encountered in biomedical engineering. Topics covered include vector differential and integral calculus, linear algebraic equations, and ordinary and partial differential equations. (Same as EGR 6013 and ME 6013. Same as BME 6093 offered in Fall 2007. Credit can be earned for only one of the following: BME 6033, BME 6093 taken Fall 2007, EGR 6013, or ME 6013.) Differential Tuition: $165.

BME 6043. Critical Thinking and Writing for BME. (3-0) 3 Credit Hours.
Prerequisites: Doctoral students who are either taking their qualifying examinations or have been admitted to candidacy; consent of the instructor and of the Graduate Advisor of Record. This course introduces students to grant applications and manuscript writing, and provides the opportunity to learn through writing and critiquing research proposals, manuscripts, abstracts, and scientific presentations. Differential Tuition: $165. Course fees: LRE1 $25; STSE $30.

BME 6051. Independent Study in Biomedical Engineering. (0-0) 1 Credit Hour.
Prerequisites: Graduate standing; consent of the instructor and of the Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of regular course offerings. May be repeated for credit on a different topic of study, but no more than 6 credit hours, regardless of discipline, will apply toward the degree. Differential Tuition: $55.

BME 6052. Independent Study in Biomedical Engineering. (0-0) 2 Credit Hours.
Prerequisites: Graduate standing; consent of the instructor and of the Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of regular course offerings. May be repeated for credit on a different topic of study, but no more than 6 credit hours, regardless of discipline, will apply toward the degree. Differential Tuition: $110.

BME 6053. Independent Study in Biomedical Engineering. (0-0) 3 Credit Hours.
Prerequisites: Graduate standing; consent of the instructor and of the Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of regular course offerings. May be repeated for credit on a different topic of study, but no more than 6 credit hours, regardless of discipline, will apply toward the degree. Differential Tuition: $165.

BME 6063. Introduction to Scientific Computing and Visualization. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing; consent of the instructor. This is an introductory course covering the basic concepts and tools of scientific computing and visualization. It will cover basic UNIX operations (shell scripts and editors), UNIX tools (grep, awk, sed), basic visualization concepts and software tools (ParaView and VisIt). It will also cover parallel programming using Fortran/C/C++ with Message Passing Interface (MPI) and public domain libraries. (Credit can be earned for only one of the following: BME 6063, ME 4953 or ME 5013.) Differential Tuition: $165.

BME 6073. Professional Science Master's Practicum. (0-0) 3 Credit Hours.
Prerequisites: Graduate standing and consent of the Program Director. An internship in a Biomedical Engineering company. Students must have completed all required core courses and electives, and be in the writing phase of their thesis. May not be repeated for credit. Differential Tuition: $165.

BME 6093. Topics in Biomedical Engineering. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing; consent of the instructor and of the Graduate Advisor of Record. May be repeated for credit on a different topic of study. Differential Tuition: $165.

BME 6103. Biology for Bioengineers. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing; consent of the instructor and of the Graduate Advisor of Record. This course provides a broad background in biological concepts with specific attention given to biological processes important to bioengineering. Topics may include biochemistry, genetics, molecular biology, cell biology, and physiology. (Same as BIME 6004 at UT Health San Antonio. Credit cannot be earned for both BME 6103 and BIME 6004.) Differential Tuition: $165.

BME 6123. Medical Device Design. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing; consent of the instructor and of the Graduate Advisor of Record. This course will educate students about current biomedical technologies and product development. Topics covered will include ideation, concept development, design methodologies, business plan basics, regulatory concepts for medical devices and intellectual property management. Differential Tuition: $165.

BME 6131. Biomedical Project. (0-0) 1 Credit Hour.
Prerequisites: Graduate standing; consent of the instructor and of the Graduate Advisor of Record and concurrent enrollment in BME 6143. This project course will be offered to nonthesis students as an alternative to the comprehensive examination and will involve the design and development of a biomedical device or instrument. This course requires the final presentation of a prototype at the end of the semester and cannot be repeated for credit. The grade report for the course is either "CR" (satisfactory performance in Biomedical Project) or "NC" (unsatisfactory performance in Biomedical Project). (Credit cannot be earned for both BME 6131 and BME 6961.) Differential Tuition: $55.

BME 6133. Biomedical Project II. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing, consent of the instructor and of the Graduate Advisor of Record and concurrent enrollment in BME 6143. This project course will be offered to non-thesis students as an alternative to the comprehensive examination and will involve the design and development of a biomedical device or instrument. This course requires the final presentation of a prototype at the end of the semester and cannot be repeated for credit. The grade report for the course is either "CR" (satisfactory performance in Biomedical Project) or "NC" (unsatisfactory performance in Biomedical Project). Differential Tuition: $165.

BME 6143. Biomedical Device Development. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing, consent of the instructor and of the Graduate Advisor of Record, and BME 6123. This course involves the development of project proposals, testing of the design project and presentation of conceptual designs and a final prototype. Industrial collaboration and/or faculty sponsorship of these projects is encouraged. Differential Tuition: $165.

BME 6153. Medical Device Project Management. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. This course addresses concepts and techniques for the management of business and technology projects. Includes topics such as the project life cycle, project planning, project scheduling, project cost estimating, project risk analysis, project control techniques, earned value management, project organizations and functions, project manager responsibilities, and team building. Differential Tuition: $165.

BME 6163. Medical Technology Regulatory. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing, consent of the instructor and of the Graduate Advisor of Record, and BME 6123. This course provides an overview of product quality and safety responsibilities during device development, the regulatory framework, both nationally as well as internationally, and product monitoring standards. An understanding of the approval submission process and the nature of benchmarking and testing products as well as product classifications will be covered. Differential Tuition: $165.

BME 6173. Biomedical Commercialization and Entrepreneurship. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing, consent of the instructor and of the Graduate Advisor of Record, and BME 6123. A review of the steps and processes involved in starting a biomedical technology-based commercial endeavor. The focus is built around the steps of identifying a problem area, identifying potential technological solutions to the identified need, and developing a proposed business entity to commercialize the technology solution. Differential Tuition: $165.

BME 6203. Physiology for Engineers. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor or completion of BIME 6004 (UT Health San Antonio). Designed to provide students with the essential graduate-level background for applications and practices of biomedical engineering. Integration of the nervous, skeletal, muscle, cardiovascular, and other systems from the sub-cellular to the whole-organism level will be emphasized. Differential Tuition: $165. Course fees: LRE $25; STSE $30.

BME 6213. Cellular Engineering. (3-0) 3 Credit Hours.
Prerequisites: Consent of the instructor and completion of BIME 6004 (UT Health San Antonio) or BME 6203. This course will focus on the use of engineering skills and principles in the analysis and design of cellular function including protein engineering, enzyme kinetics, drug design, receptor-ligand interactions, cell signaling, metabolism, growth, adhesion and migration. Differential Tuition: $165.

BME 6233. Cardiovascular Bioengineering. (3-0) 3 Credit Hours.
Prerequisites: BME 2103, BME 6203, and BME 6033 or consent of the instructor. This course introduces the bioengineering principles applied to the understanding and modeling of the cardiovascular system. Topics covered include anatomy of the human cardiovascular system; comparative anatomy; allometric scaling principles; cardiovascular molecular and cell biology; overview of continuum mechanics; form and function of blood, blood vessels, and the heart from an engineering perspective; normal, diseased and engineered replacement tissues and medical devices. Differential Tuition: $165.

BME 6303. Introduction to Python with Applications to Biomedical Industries. (3-0) 3 Credit Hours.
Students will be exposed to coding for applications using Python in the biomedical industries. The course aims to provide students with the ability to apply Python to analyze biological data and solve contemporary problems in the biosciences, bioengineering and biomedicine. Differential Tuition: $165.

BME 6313. Computational Bioengineering and Biomedicine. (3-0) 3 Credit Hours.
Prerequisite: BME 6033 or consent of the instructor. The objective of this course is to provide both engineering and medical students an introductory knowledge and skills of mathematical modeling and computer simulation, particularly in bioengineering. The course will consist of three parts: theoretical background, computational methods, and practical applications. (Same as ME 6873. Credit cannot be earned for both BME 6313 and ME 6873.) Differential Tuition: $165.

BME 6403. Biomedical Terminologies for Entrepreneurs. (3-0) 3 Credit Hours.
Prerequisite: Completion of or concurrent enrollment in BME 6123. Designed to provide students with an introduction to concepts and terminologies that span across the fields of biomedical engineering, technologies, medical devices and healthcare. Differential Tuition: $165.

BME 6413. Working Knowledge in the Biomedical Industries. (3-0) 3 Credit Hours.
Prerequisite: Completion of or concurrent enrollment in BME 6403. Designed to provide students with an introduction to biomedical industries and medical product categories. Examples will be provided for specific companies in regards to the technologies, intellectual property protection and business models that provide the foundation for their success. Differential Tuition: $165.

BME 6593. Biomaterials for Drug Delivery/Pharmacology. (3-0) 3 Credit Hours.
Provides a conceptual understanding of therapeutic agents used to regulate physiological function of cells comprising organ systems with relevance to biomaterials. Interpretation of drug mechanisms at a molecular, cellular and tissue level. Traditional reviews of pharmacodynamics and pharmacokinetics will be addressed with particular application to biomaterial interaction and drug-delivery systems. Differential Tuition $165.

BME 6703. Biomedical Imaging. (3-0) 3 Credit Hours.
Prerequisite: Consent of the BME Program Director. This course will examine, from a systems perspective, the techniques used in a variety of medical imaging modalities, which include X-ray imaging, computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine (PET), ultrasound imaging, optical imaging and photoacoustic imaging. The fundamental principles and engineering underlying each imaging modality will be discussed and a performance analysis of each system will be examined. With approval from the BME Program Director, credit for this course can be counted towards satisfying the imaging core course for Ph.D. students. (Credit can be earned for only one of the following: BME 6703 or RADI 5015 at UT Health San Antonio.) Differential Tuition: $165.

BME 6723. Bioinstrumentations. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. This course will cover fundamental principles of bioinstrumentation used in clinical and research measurements. Topics include: principles of transducer operation, amplifiers and signal processing, recording and display. Overview of specific examples in optical sensors, biological sensors, MRI, ultrasound, pacemakers and defibrillators. Differential Tuition: $165. Course fees: LRE1 $25; STSE $30.

BME 6733. Microfabrication and Application. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. This course describes the science of miniaturization which is essential for nanotechnology development. Microfabrication techniques for micro-electro-mechanical systems (MEMS), bioMEMS, microfluidics, and nanomaterials and their applications in biomedical research will be covered. Differential Tuition: $165. Course fees: STSE $30; LRE1 $25.

BME 6743. Biophotonics. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. This course describes the fundamental principles of biophotonics and their wide range of applications in biomedical research. Topics will include fundamentals of light interactions with molecules, cells, and tissues, optical biosensing (fiber-optic biosensors, evanescent wave biosensors, surface plasmon resonance biosensors), optical imaging (transmission microscopy, fluorescence microscopy, confocal scanning microscopy, multiphoton microscopy, fluorescence lifetime imaging microscopy), flow cytometry, photodynamic therapy, laser tweezers and laser scissors, and nanotechnology for biophotonics. Differential Tuition: $165.

BME 6753. Biosensors: Fundamentals and Applications. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. This course will cover biosensing basics and in-depth view of device design and performance analysis. Topics include optical, electrochemical, acoustic, piezoelectric, and nano-biosensors. Emphasized applications in biomedical, environmental, and homeland security areas are discussed. Differential Tuition: $165.

BME 6793. Topics in Image and Signal Processing. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. May be repeated for credit on a different topic of study. Differential Tuition: $165. Course fees: LRE1 $25; STSE $30.

BME 6803. Experimental Biomechanics. (3-0) 3 Credit Hours.
Prerequisites: BME 6033 and graduate standing. Fundamental applications of engineering mechanics in studying and modeling fluid flow, tissues, organs, and the whole human body will be discussed. This course includes a laboratory. (Formerly BME 6833. Same as ME 6833. Credit can be earned for only one of the following: BME 6803, BME 6833, ME 5833, or ME 6833. Formerly titled “Biomechanics I.”) Differential Tuition: $165.

BME 6823. Advanced Biomechanics. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. This course covers biomechanics of biological tissue deformation and their constitutive equations. Topics may include elasticity, viscoelasticity, deformation, stress analysis, strain measurement, stress and strain in organs. Tissues covered may include heart, blood vessels, cartilage, and bone. (Formerly titled “Biomechanics II.”) Differential Tuition: $165. Course fees: LRE1 $25; STSE $30.

BME 6843. Tissue Mechanics. (3-0) 3 Credit Hours.
Prerequisite: BME 6803 or ME 3663 or consent of the instructor. Topics may include biomechanics characterization, modeling, and properties of regenerating tissues ranging from bone, cartilage, tendons, ligaments, skin, adipose tissue, nerves, bladder, eye, and pulmonary and cardiovascular tissues. Differential Tuition: $165.

BME 6893. Topics in Biomechanics. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. May be repeated for credit on a different topic of study. (Same as ME 6893. Credit cannot be earned for both BME 6893 and ME 6893 when the topic is the same.) Differential Tuition: $165.

BME 6903. Biomaterials. (3-0) 3 Credit Hours.
Prerequisite: Consent of the instructor. Fundamentals of biomaterials science and engineering principles and concepts in repairing, replacing, and protecting human tissues and organs will be discussed. (Formerly BME 5903 and BME 6813. Same as ME 6813. Credit can be earned for only one of the following: BME 5903, BME 6903, BME 6813, ME 5813 or ME 6813.) Differential Tuition: $165.

BME 6913. Biomaterials II. (3-0) 3 Credit Hours.
Prerequisites: BME 6903 and consent of the instructor. Application of biomaterials in medicine and dentistry will be emphasized. Differential Tuition: $165. Course fees: LRE1 $25; STSE $30.

BME 6923. Tissue Engineering. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. This course is an introduction to the principles and current practice of tissue engineering endeavors. Strategies for choosing and using mammalian cells and scaffold biomaterials as well as select chemical and biophysical stimuli in order to obtain neotissue formation are reviewed in detail. Case studies are discussed to illustrate successful tissue engineering solutions of clinical problems pertinent to tissue regeneration. (Formerly BME 5923 and BME 6853. Credit can be earned for only one of the following: BME 5923, BME 6853, or BME 6923.) Differential Tuition: $165. Course fees: LRE1 $25; STSE $30.

BME 6933. Tissue-Biomaterials Interactions. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. This course is an introduction to biocompatibility with special emphasis on the interaction of proteins, cells and tissues with biomaterials. Blood-material interactions are reviewed in detail. Case studies of implants are discussed to illustrate biomaterial selection as a key aspect to successful design of implant materials and prosthetic devices. Differential Tuition: $165.

BME 6943. Biomaterials and Cell Signaling. (2-3) 3 Credit Hours.
Prerequisite: Graduate standing. Develop current understanding of topics in cell receptors and signaling mechanisms with application for biomaterial design. Focus will emphasize receptor-ligand communication, methods of identification and quantification, and pathways involved for cell to material stress response. Differential Tuition: $165. Course fees: LRE1 $25; STSE $30.

BME 6953. Biomaterials for Drug Delivery/Pharmacology. (3-0) 3 Credit Hours.
Prerequisite: Completion of or concurrent enrollment in BME 6403. Provides a conceptual understanding of therapeutic agents used to regulate physiological function of cells comprising organ systems with relevance to biomaterials. Interpretation of drug mechanisms at a molecular, cellular and tissue level. Traditional reviews of pharmacodynamics and pharmacokinetics will be addressed with particular application to biomaterial interaction and drug-delivery systems. Differential Tuition: $165.

BME 6961. Comprehensive Examination. (0-0) 1 Credit Hour.
Prerequisite: Approval of the Biomedical Engineering Committee on Graduate Studies to take the Comprehensive Examination. Independent study course for the purpose of taking the Comprehensive Examination for M.S. students in the nonthesis option. May be repeated once if approved by the Biomedical Engineering Committee on Graduate Studies and if the student received an "unsatisfactory performance" on his/her previous attempt on the Comprehensive Examination. Enrollment is required each term in which the Comprehensive Examination is taken if no other courses are being taken that term. The grade report for the course is either "CR" (satisfactory performance on the Comprehensive Examination) or "NC" (unsatisfactory performance on the Comprehensive Examination). (Credit cannot be earned for both BME 6961 and BME 6131.) Differential Tuition: $55.

BME 6963. Fundamentals to Polymer Science with Select Biomedical Applications. (3-0) 3 Credit Hours.
Prerequisites: Graduate standing and BME 6903; or consent of the instructor. This course introduces the fundamentals of polymer chemistry, characterization of the chemical and material properties, and determination of the biocompatibility of polymer formulations. Current applications of polymeric biomaterials in diagnostic and therapeutic devices, implants, tissue engineering and regenerative medicine are highlighted and discussed in detail. Differential Tuition: $165.

BME 6981. Master's Thesis Research. (0-0) 1 Credit Hour.
Prerequisites: Master's student standing, and consent of the instructor and of the Graduate Advisor of Record. May be repeated for a maximum of 9 credit hours. (Same as BIME 6098 at UT Health San Antonio.) Differential Tuition: $55.

BME 6982. Master's Thesis Research. (0-0) 2 Credit Hours.
Prerequisites: Master's student standing, and consent of the instructor and of the Graduate Advisor of Record. May be repeated for a maximum of 9 credit hours. (Same as BIME 6098 at UT Health San Antonio.) Differential Tuition: $110.

BME 6983. Master's Thesis Research. (0-0) 3 Credit Hours.
Prerequisites: Master's student standing, and consent of the instructor and of the Graduate Advisor of Record. May be repeated for a maximum of 9 credit hours. (Same as BIME 6098 at UT Health San Antonio.) Differential Tuition: $165.

BME 6986. Master's Thesis Research. (0-0) 6 Credit Hours.
Prerequisites: Master's student standing, and consent of the instructor and of the Graduate Advisor of Record. May be repeated for a maximum of 9 credit hours. (Same as BIME 6098 at UT Health San Antonio.) Differential Tuition: $330.

BME 7951. Doctoral Research. (0-0) 1 Credit Hour.
Prerequisites: Doctoral student standing, and consent of the instructor and of the Graduate Advisor of Record. This course consists of independent, original research under the direction of a faculty advisor. May be repeated for a maximum of 18 credit hours. (Same as BIME 6097 at UT Health San Antonio.) Differential Tuition: $55.

BME 7952. Doctoral Research. (0-0) 2 Credit Hours.
Prerequisites: Doctoral student standing, and consent of the instructor and of the Graduate Advisor of Record. This course consists of independent, original research under the direction of a faculty advisor. May be repeated for a maximum of 18 credit hours. (Same as BIME 6097 at UT Health San Antonio.) Differential Tuition: $110.

BME 7953. Doctoral Research. (0-0) 3 Credit Hours.
Prerequisites: Doctoral student standing, and consent of the instructor and of the Graduate Advisor of Record. This course consists of independent, original research under the direction of a faculty advisor. May be repeated for a maximum of 18 credit hours. (Same as BIME 6097 at UT Health San Antonio.) Differential Tuition: $165.

BME 7956. Doctoral Research. (0-0) 6 Credit Hours.
Prerequisites: Doctoral student standing, and consent of the instructor and of the Graduate Advisor of Record. This course consists of independent, original research under the direction of a faculty advisor. May be repeated for a maximum of 18 credit hours. (Same as BIME 6097 at UT Health San Antonio.) Differential Tuition: $330.

BME 7991. Doctoral Dissertation. (0-0) 1 Credit Hour.
Prerequisites: Admission to Doctoral candidacy, and consent of the Graduate Advisor of Record and Dissertation Advisor. May be repeated for a maximum of 18 credit hours. (Same at BIME 7099 at UT Health San Antonio.) Differential Tuition: $55.

BME 7992. Doctoral Dissertation. (0-0) 2 Credit Hours.
Prerequisites: Admission to Doctoral candidacy, and consent of the Graduate Advisor of Record and Dissertation Advisor. May be repeated for a maximum of 18 credit hours. (Same at BIME 7099 at UT Health San Antonio.) Differential Tuition: $110.

BME 7993. Doctoral Dissertation. (0-0) 3 Credit Hours.
Prerequisites: Admission to Doctoral candidacy, and consent of the Graduate Advisor of Record and Dissertation Advisor. May be repeated for a maximum of 18 credit hours. (Same at BIME 7099 at UT Health San Antonio.) Differential Tuition: $165.

BME 7996. Doctoral Dissertation. (0-0) 6 Credit Hours.
Prerequisites: Admission to Doctoral candidacy, and consent of the Graduate Advisor of Record and Dissertation Advisor. May be repeated for a maximum of 18 credit hours. (Same at BIME 7099 at UT Health San Antonio.) Differential Tuition: $330.