

BIOMEDICAL ENGINEERING

BME 5401 Biomedical Engineering and Physiology I 3 Credits

Grading Scheme: Letter Grade

Physiology of cells, bones, and the circulatory system from a biomaterials, biomechanics, cellular, and tissue engineering perspective. Intellectual property and technology transfer included.

BME 5500 Biomedical Instrumentation 3 Credits

Grading Scheme: Letter Grade

Engineering and medical aspects of measuring and processing signals from living systems. Discusses biomedical transducers for measuring movement, biopotentials, pressure, flow, concentrations, and temperature; and treatment devices like ventilators and infusion pumps. Whenever possible, devices actually used in clinical practice are used in class.

Prerequisite: basic knowledge of physics and calculus, consent of instructor.

BME 5703 Statistical Methods for Biomedical Engineering 3 Credits

Grading Scheme: Letter Grade

Computational methods needed for biomedical engineering research. Students will be acquainted with a variety of techniques for analyzing and modeling experimental data arising in molecular, cellular, physiological, and pathological systems encountered in typical laboratory and clinical settings.

Prerequisite: Knowledge of calculus, linear algebra and basic statistics.

BME 5937 Special Topics 1-4 Credits, Max 6 Credits

Grading Scheme: Letter Grade

Special Topics

BME 6010 Clinical Immersion 1 Credit, Max 6 Credits

Grading Scheme: Letter Grade

Biomedical engineers develop practical solutions to various problems encountered in healthcare and clinical practice. Students learn and identify such problems through direct immersion in the clinical environment. Students will shadow a clinician (one-on-one) for 1-3 hours per week where they will identify a clinical problem and propose a solution.

Prerequisite: BME 6018 Clinical Correlations.

BME 6018 Clinical Correlations in BME 3 Credits

Grading Scheme: Letter Grade

Biomedical engineers develop practical solutions to various problems encountered in healthcare and clinical practice. Students are exposed to clinical problems, learn how to identify unmet needs and will devise engineering solutions to address clinical needs. Topics related to clinical translation of biomedical innovations and medical device commercialization will be covered.

Prerequisite: BME 5401.

BME 6164 Magnetic Biomaterials 3 Credits

Grading Scheme: Letter Grade

Consists of classroom lectures on fundamental concepts in magnetism and magnetic micro- and nano-materials and their applications in biomedicine. As part of the course, students will present a critical review of recent literature in the field and lead a group discussion on a specific recent paper.

Prerequisite: Undergraduate physics and chemistry

BME 6330 Cell and Tissue Engineering 3 Credits

Grading Scheme: Letter Grade

Applying engineering principles, combined with molecular cell biology, to developing a fundamental understanding of property-function relationships in cells and tissues. Exploiting this understanding to manipulate cell and tissue properties rationally to alter, restore, maintain, or improve cell and tissue functions; and to design bioartificial tissue substitutes.

BME 6353 Patient Dosimetry in Medical Imaging and Radiotherapy 3 Credits

Grading Scheme: Letter Grade

Students will review the methods and techniques for assessing organ doses in medical imaging and radiotherapy techniques through the use of computational dosimetry. The L-Series of lectures will discuss various imaging modalities, preceded by a review of how radiation exposure might induce cancer in humans. The latter portion of the course will cover radiotherapy. The P-Series of practicum sessions will give hands-on experience with computational phantoms

BME 6360 Neural Engineering 3 Credits

Grading Scheme: Letter Grade

Applying engineering to neuroscience including such diverse areas as neural tissue engineering, models of neural function, and neural interface technology. Focuses mainly in the context of neural interfaces and prosthetics, from basic neural physiology and models of neural mechanisms to advanced neural interfaces currently in development or produced commercially.

Prerequisite: consent of instructor.

BME 6522 Biomedical Multivariate Signal Processing 3 Credits

Grading Scheme: Letter Grade

Statistical analysis of biomedical signals, emphasizing multivariate time series. Introduces analysis concepts and methods in the time domain and the spectral domain. Uses actual recordings from biomedical applications to demonstrate the methods.

Prerequisite: multivariate calculus and a basic knowledge of probability and statistics.

BME 6535 Radiological Physics, Measurements and Dosimetry 3 Credits

Grading Scheme: Letter Grade

Interacting and measuring techniques for x-rays, gamma rays, neutrons and charged particles with matter; radioactive decay processes ion chamber measurements, scintillation detectors, and dosimetry techniques. Applications of cavity theory and dosimetry measurement in medical physics.

Prerequisite: Upper level college physics

BME 6705 Mathematical Modeling of Biological and Physiological Systems 3 Credits

Grading Scheme: Letter Grade

Mathematical modeling of biological and physiological phenomena. Starting from basic theory of linear systems, introduces qualitative analysis of nonlinear ordinary differential equations and maps. Examples from biomedical applications show concepts and methods.

Prerequisite: calculus, linear algebra, and passing knowledge of differential equations.

BME 6905 Individual Work in Biomedical Engineering 1-4 Credits, Max 8 Credits

Grading Scheme: Letter Grade

Individual Work in Biomedical Engineering

BME 6907 BME Project 1-9 Credits, Max 12 Credits

Grading Scheme: S/U

BME Project

Prerequisite: BME MS non-thesis status.

BME 6910 Supervised Research 1-5 Credits, Max 5 Credits

Grading Scheme: S/U

Supervised Research

BME 6936 Biomedical Engineering Seminar 1 Credit, Max 4 Credits

Grading Scheme: S/U

Biomedical Engineering Seminar

BME 6938 Special Topics in Biomedical Engineering 1-4 Credits, Max 18 Credits

Grading Scheme: Letter Grade

Special Topics in Biomedical Engineering

BME 6940 Supervised Teaching 1-5 Credits, Max 5 Credits

Grading Scheme: S/U

Supervised Teaching

BME 6971 Research for Master's Thesis 1-15 Credits

Grading Scheme: S/U

Research for Master's Thesis

BME 7979 Advanced Research 1-12 Credits

Grading Scheme: S/U

Research for doctoral students before admission to candidacy. Designed for students with master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

BME 7980 Research for Doctoral Dissertation 1-15 Credits

Grading Scheme: S/U

Research for Doctoral Dissertation

EGN 5949 Practicum/Internship/Cooperative Work Experience 1-6 Credits, Max 6 Credits

Grading Scheme: S/U

Practical cooperative engineering work under approved industrial and faculty supervision.

Prerequisite: graduate student.

EGN 6913 Engineering Graduate Research 0-3 Credits, Max 12 Credits

Grading Scheme: S/U

Course will provide the student with supervised research in a laboratory setting.