

## **BIME 3000 Fundamentals of Biomedical Engineering**

This course is required for all Engineering majors pursuing the Biomedical Engineering concentration.

### Course Coordinator:

Purvis Bedenbaugh

### Catalog Description

Application of fundamental engineering skills to solve problems in medicine and biology. Introduces students to a wide range of state-of-the-art applications in biomedical engineering and promotes understanding of interdisciplinary nature of the field. Topics covered include medical instrumentation and design, biomechanics, biomaterials, mass transport, application of computers in medicine, artificial implants, medical imaging, and medical ethics.

### Course Structure:

Three 50-minute lectures (four credits)

### Prerequisites

Consent of instructor

### Required Texts:

*Introduction to Biomedical Engineering, Second Edition*, John Enderle, Susan M. Blanchard and Joseph Bronzino, Elsevier, 2005.

### Course Objectives:

Upon completion of this course, students should be able to:

- Record signals from the Human Body Using the Biopac System
- Describe the Many Fields of BME
- Discuss Moral and Ethical Issues in BME
- Describe a System, Work with Vectors and Scalars, and Calculate the Dot and Cross Product
- Compute Static Forces in Human Body and Work with Free Body Diagrams
- Calculate Torques and Moments
- Analyze Continuous and Discrete Time Signals, and Use Delta, Unit Step and Ramp Functions, and Describe the Signals Created by the Human Body
- Use MatLab to Make biomedical engineering Calculations and Plot Results
- Compute Steady State Potentials Across a Cell Membrane Using Biophysics and Electric Circuits
- Apply Biosensors can Record Signals in the Human Body
- Describe Various Imaging Techniques and applications

### Course Topics:

- Intro to BME, Morals and Ethical Issues
- Systems, Vectors and Scalars
- Dot Product and Cross Product, Forces, Signals
- Biomechanics, Biosignal Processing
- Forces, Signals (Continued)
- Biomechanics and Biosignal Processing
- Matlab applications

- Multiphase equilibrium, chemical kinetics
- Mass balances and compartmental modeling
- Bioinstrumentation Applications
- Bioelectric Phenomena
- Biosensors
- Radiation Imaging

Relevant Program Outcomes:

Graduates of the Engineering Program will demonstrate:

c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

h) demonstrate the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

i) demonstrate a recognition of the need for, and an ability to engage in life-long learning.

j) a knowledge of contemporary issues

L3) apply advanced math, science and engineering at the interface of engineering and biology

Professional Component Content:

Math/Science: 0;

Engineering: 3 credits;

General Education: 0

Assessment Requirements:

Student Work Samples

- Paper related to standards in the biomedical industry (outcomes i, j, and h)
- Targeted exam questions demonstrating use of math, science and engineering to solve biomedical engineering problems. (outcome L3)

Student Course Survey (outcome c and others)

Last Review:

October 15, 2008 by Paul Kauffmann