

## BME130 BIOMEDICAL SIGNALS AND SYSTEMS

- Catalog Data:** **BME130 Biomedical Signals and Systems (Credit Units: 4) F.** Analog and digitized biomedical signals analyses: characteristics; Fourier Series expansions; difference and differential equations; convolutions. System models: discrete-time and continuous-time linear time-invariant systems; Laplace and Fourier transforms. Use of computer programs for signal and systems analyses. Prerequisites: Mathematics 2J; Mathematics 7 recommended. (Design units: 1)
- Textbook:** Northrop, R. B., *Signals and Systems Analysis in Biomedical Engineering*, CRC Press, 2003. (Recommended)
- References:** <http://www.mathworks.com/products/demos/>.
- Coordinator:** William C. Tang.
- Course Outcomes:** Students will be able to:  
Understand the nature of common biomedical signals.  
Apply the essential techniques for analyzing analog and digital signals.  
Analyze linear time invariant systems.  
Develop compute skills in using MATLAB for signal analyses and system modeling.
- Prerequisites By Topic:** Understanding of infinite sequences and series, complex numbers, systems of algebraic equations, determinants, and basic matrix operations.
- Lecture Topics:** General Characteristics of biomedical signals and physiological systems.  
Linear time invariant systems, continuous description; ordinary differential equations; impulse response; step response; continuous convolution.  
Linear time invariant systems, discrete description; difference equations; impulse response; discrete convolution.  
Laplace transform properties; inverse Laplace transform; poles and zeros; applications.  
Continuous Fourier Transform Fourier series expansion; construction & properties; applications.  
Discrete Fourier Transform
- Class Schedule:** Each class meets 3 hours per week for 10 weeks and students are assigned to a 1 hour discussion session per week.
- Computer Usage:** Students will use MATLAB to analyze signals and solve system problems.
- Laboratory Projects:** None.
- Professional Component:** Contributes toward Biomedical Engineering Topics and Major Design experience.

**Relationship to Program Outcomes:** This course relates to program outcomes 1, 2, 3, and 4 as stated at: [http://www.eng.uci.edu/dept/objective biomedical](http://www.eng.uci.edu/dept/objective_biomedical).

**Design Content Description**

*Approach:* Students will use learned skills to design systems for signal processing. (50%)

*Lectures:* Specific discussions in signal processing system designs. (50%)

*Laboratory Portion:*

**Grading Criteria:**

Homework assignments: 30%

Midterm exam: 30%

Final exam: 40%

100%

**Estimated ABET Category Content:**

Mathematics and Basic Science: 0 credit units or 0%

Engineering Science: 3 credit units or 75%

Engineering Design: 1 credit units or 25%

**Prepared by:** William C. Tang **Date:** July 2005

**CEP Approved:** Fall 2004