BME130 BIOMEDICAL SIGNALS AND SYSTEMS
(Required for BME and BMEP)

Catalog Data: **BME130 Biomedical Signals and Systems (Credit Units: 4)** Analysis of analog and digital biomedical signals. Fourier Series expansions; difference and differential equations; convolutions. System models: discrete-time and continuous-time linear time-invariant systems; Laplace and Fourier transforms. Analysis of signals and systems using computer programs. Prerequisites: Mathematics 2J and 3D; Mathematics 7 recommended. (Design units: 1)

Textbook: *Signals and Systems Analysis in Biomedical Engineering,* Northrop, R. B., CRC Press. 2003,..(Recommended)

References: http://www.mathworks.com/products/demos/

Coordinator: Zoran Nenadic

Relationship to Program Outcomes: This course relates to the Program Outcomes for **BME:** a, b, and k as stated at: http://undergraduate.eng.uci.edu/degreeprograms/biomedical/mission

Course Outcomes / Performance Criteria: Students will:
Understand the nature of common biomedical signals. (BME b)
Apply the essential techniques for analyzing analog and digital signals. (BME a, b)
Analyze linear time invariant systems. (BME a, k)
Develop computing skills by using MATLAB for signal analysis and system modeling. (BME a, k)

Prerequisites By Topic: Understanding of infinite sequences and series, complex numbers, systems of algebraic equations, determinants, and basic linear algebra (vectors, matrices, determinants).

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: Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.

Computer Usage: Students will use MATLAB to analyze biomedical signals and model systems.

Laboratory Projects:

Professional Component: Contributes toward Biomedical Engineering Topics and Major Design experience.

Design Content Description

Approach: Students will use acquired skills to design systems for signal processing and analysis. (50%)

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

Laboratory Portion: 0%

Grading Criteria:

Homework	30%
Midterm #1	20%
Midterm #2:	20%
Final exam:	30%
	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: Zoran Nenadic **Date:** July 2008

CEP Approved: Fall 2004