BME110C BIOMECHANICS III

Catalog Data: **BME110C Biomechanics III (Credit Units: 4)** Introduction to continuum mechanics of both living and non-living systems. Laws of motion and free-body diagrams. Stresses deformation compatibility conditions and constitutive equations. Properties of common fluids and solids. Field equations and boundary conditions. Applications to bioengineering design. Prerequisites: Physics 7D, 7LD, 7E,a nd BME 100B. BME 110A-B-C must be taken in the same academic year. (Design units:1)

Textbook: *A First Course in Continuum Mechanics for Physical and Biologiucal Engineers and Scientists,* Fung, Y.C. Prentice Hall, 1994, 3rd edition.

References: Class Notes

Coordinator: Elliot Botvinick

Relationship to Program Outcomes: This course related to Program Outcomes
BME: a, b, g, and i as stated at:
http://undergraduate.eng.uci.edu/degreeprograms/biomedical/mission

Course Outcomes / Performance Criteria: Students will:
Describe the structure of various biological systems including bone, connective tissue, muscle, vessels, etc. (BME a)
Describe the function of various biological systems. (BME a, b)
Describe the constitutive relation of biological tissue. (BME a, b)
Demonstrate knowledge of the continuum mehanics to formulate and solve various biological problems. (Homework and design projects) (BME b, g, j)

Prerequisites By Topic: Classical physics and lab: electricity and magnetism
Classical Physics: Fluids, oscillations, waves, optics
Calculus
Differential equations.

Lecture Topics: Newton's Laws of Motion, Index Notation, Resultant Forces, Moments, Free Body Diagrams, Orthogonal Transformations, Definition of Stress, Cauchy Relation, Equation of Equilibrium, Applications of Principal Stresses, Stress Deviator, Stress Boundary Conditions, Infinitesimal strains, Rotations, Spin Tensor, Compatibility, Theory of Deformation, Strain, Strain Rate, Geometric Interpretation, Material Properties, Solids, Fluids, Newtonian Incompressible Fluids, Material Derivatives, Conservation of Mass of a Continuum, Equation of Motion for a Fluid, Navier-Stokes Equations, Non-Dimensionalization, Reynolds Number, Applications: Flow Between Parallel Channels, Flow in a Tube (Poiseuille's Equation)

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

Computer Usage:

Laboratory Projects:

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

Design Content Description

Approach: Design is taught through design projects and homework problems. The students are required to use the basic principles to design devices, theoretical approaches and experiments.

Lectures: Homework 80% Design Project 20%

Laboratory Portion: 0 %

Grading Criteria:

Homework:	20%
Midterm(1)	20%
Midterm(2):	20%
Final:	40%

Estimated ABET Category Content:

Mathematics and Basic Science: ____credit units or ____%

Engineering Science: __3__credit units or __75__%

Engineering Design: __1__credit units or __25__%

Prepared by: Elliot Botvinick **Date:** July 2008

CEP Approved: Winter 2008