BMEH110B HONORS BIOMECHANICS II
(Elective)

Catalog Data: **BMEH110B Honors Biomechanics II (Credit Units: 4)** Covers the same material as BME110A-B but in greater depth. Prerequisite: BME H110A BMEH110A-B and BME110A-B may not both be taken for credit. (Design Units: 1)

Textbook: Fung, Y. C., Biomechanics*: Mechanical Properties of Living Tissues.,* 2nd edition, Springer Verlag: New York, 1993.

References:

Coordinator: James P. Brody

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

Performance Criteria/Course Outcome: Students will:
Describe the structure of various biological systems including bone, connective tissue, muscle, vessels, etc. (BME a, k)
Describe the function of various biological systems. (BME a)
Describe the constitutive relation of biological tissues. (BME b)
Demonstrate knowledge of continuum mechanics to formulate and solve various biological problems (Homework and design projects). (BME c, k)
Study existing and design novel biomechanical devices. (BME e)
Demonstrate oral communication skills in presenting team projects. (BME g)

Prerequisites By Topic: Understanding of continuum mechanics of both living and nonliving bodies, properties of common fluids and solids, and derivation of field equations and boundary conditions.

Lecture Topics:
Biomechanics: the continuum mechanics model, experiment and design.
Review of matrices, vectors and tensors, tensor analysis and kinematics: motion and strain.
Stress and equilibrium.
Constitutive equations for biological solids and fluids, the properties of blood and plasma, viscosity and its measurement.
The flow of blood in a tube. Navier-Stokes equations.
Rheology of the whole blood, the effects of red blood cells, clotting.
Blood flow in microcirculation, red blood cells in very narrow tubes, bioviscoelastic fluids.
Elasticity, Hookean and non-Hookean elastic solids.
Red blood cell deformability and testing, elasticity of the red blood cell membrane.
The mechanics of bone and skeleton, mechanical properties of cartilage, testing methods.

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: Students will use learned skills to analyze and design mechanical systems to model biological systems. (70%) Specific discussions on biomechanical system designs. (30%)

Lectures: 100%

Laboratory Portion: 0%

Grading Criteria:

Homework assignments:	30%
Midterm exams:	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: James P. Brody **Date:** July 2007

CEP Approved: Fall 2005