

COURSE SYLLABUS
BIO/ESC 240 Introduction to Bioengineering
Winter 2008

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 Biological Sciences Engineering
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Office Hours TBA

Course Synopsis

In this course, students will explore the application of engineering principles and analyses to the study of biological systems and seek to understand the potential benefits and constraints of engineered materials and devices in medical and environmental applications. The course will cover principles of solid mechanics, fluid mechanics and neural information processing and control. Topics include the mechanics of support and locomotion, circulatory transport, and sensory information processing. One lab per week. Course prerequisites: MTH 110 and one majors course in BIO, CHM or PHY; PHY 110 recommended.

Text and Readings

Hall, S. Basic Biomechanics, 5th ed. McGraw Hill. Supplemental readings from the primary literature and/or secondary sources will also be required and made available through the library's reserve desk.

Assignments, Exams and Grading:

Students will have weekly to biweekly problem sets that are designed to reinforce the computational and analytical aspects of the course. One mid-term and a final exam will also be administered. Final grades will be determined using the following weightings:

Problem Sets (approximately 5):	25%
Laboratory	25%
Mid-term Exam:	25%
Final Exam*:	25%

**The final exam will be administered on the scheduled date during final exam week. Make your plans accordingly.*

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Topic Outline

Unit	Week	Topic	Lab
Mechanics of Support and Movement	1	Kinematics and kinetic concepts for analyzing human motion	Scaling in the Vertebrate Jaw
	2	Free body diagrams and equilibrium equations	Practicum
	3	Biomechanics of bone	Practicum
	4	Biomechanics of human muscle	Mechanics of Wood, a Biological Composite
	5	Biomechanics of upper and lower extremities	Practicum
	5	Mid-Term Exam	
Fluid Dynamics in Biological Systems	6	Flow Around Organisms	Artificial Heart Valves
	7	Fluid Dynamics of the Cardiovascular System	Shear Stress on Endothelial Cells I.*
	8		Shear Stress on Endothelial Cells II.
Neural Processing and Integration	9	Emergent Properties and Neural Networks	Neural Networks and the Perceptron
	10	Feedback and Control Systems	Biologically Inspired Robots
	11	Final Exam	

*Note: Students will need to meet outside of class and lab times to complete this exercise.