BMEH10 HONORS ENGINEERING WITHIN THE CELL

Catalog Data: **BMEH10 Honors Engineering within the Cell (Credit Units: 4) S.** An engineer's view of cellular processes. Introduction to the cell; structure and function of DNA, RNA, and protein; thermodynamics; energy and catalysis, conversion of chemical energy to mechanical motion; feedback and control of gene expression; networks and cell-to-cell signaling. Prerequisite: admission to the Campuswide Honors Program. (Design Units: 0)

Textbook: Alberts, B., et al. *Essential Cell Biology: An Introduction to the Molecular Biology of the Cell.*, 2nd edition, Garland Press, 2003.

References: None.

Coordinator: James P. Brody.

Course Outcomes: Students will be able to:
Describe DNA, RNA, and protein and their general function within the cell.
Identify cellular organelles and describe their function.
Classify amino acids into negatively charged, positively charged, or neutral.
Predict amino acid sequence based upon DNA sequence.
Predict protein secondary structure based upon amino acid sequence for alpha helix and beta sheet structures.
Describe in general terms the transcription and translation process within a cell.
Predict how the alteration of DNA sequence will affect protein structure.
Predict whether a biochemical reaction will occur spontaneously based upon its free energy.

Prerequisites By Topic: None.

Lecture Topics: Exponential growth, size of molecules.
Probability density functions and temperature.
Gaussian distribution and diffusion equation.
Random walks, free energy, and thermodynamics.
Kinetics, free energy.
Protein structure, peptide bonds, classes of amino acids.
Predicting protein structure, alpha helix, beta sheet.
DNA structure, mutations, repair.
Ethics and contemporary issues in biomedical engineering.
Central dogma, control theory.
DNA packaging, Gene regulation.

Class Schedule: Each class meets 3 hours per week for 10 weeks and students are assigned to a 1 hour of discussion session per week.

Computer Usage: Students will use Microsoft Excel or equivalent to develop numerical methods to solve class problems.

Laboratory Projects: None.

Professional Component: Contributes toward the Biomedical Engineering Topics.

Relationship to Program Outcomes: This course relates to Program Outcomes 1, 2, and 4 as stated at: http://www.eng.uci.edu/dept/objective_biomedical.

Design Content Description

Approach:

Lectures:

Laboratory Portion:

Grading Criteria:

Homework assignments:	25%
Midterm exams:	35%
Final exam:	40%
	100%

Estimated ABET Category Content:

Mathematics and Basic Science: 0 credit units or 0%
Engineering Science: 4 credit units or 100%
Engineering Design: 0 credit units or 0%

Prepared by: James P. Brody **Date:** July 2005

CEP Approved: Fall 2005

Effective Date: Fall 2005