

BME50A CELL AND MOLECULAR ENGINEERING

(Required for BME and BMEP; Elective for MSE)

- Catalog Data:** **BME50A Cell and Molecular Engineering (Credit Units: 4)**
Physiological function from a cellular, molecular, and biophysical perspective. Applications to bioengineering design. (Design units: 2)
- Textbook:** Alberts, B., et al., *Essential Cell Biology: An Introduction to the Molecular Biology of the Cell*, Second Edition, Garland Press.
Wilson, J., and Hunt, T., *Molecular Biology of the Cell*, 4th edition, ISBN 0-8153-3577-6.
- References:** Class notes posted on course website: <http://eee.uci.edu>.
- Coordinator:** James P. Brody
- Course Outcomes:** Students will:
Calculate the mass or length of single molecules of DNA or protein.
Solve first order linear differential equations and use the solution to model the exponential growth process.
Provide a mathematical, microscopic definition of temperature.
Provide a mathematical, microscopic definition of diffusion.
Use the free energy of a reaction to predict whether or not it will occur.
Describe the amino acid components of a protein.
Classify amino acids into negatively charged, positively charged, or neutral.
Predict protein secondary structure based upon amino acid sequence for alpha helix and beta sheet structures.
- Prerequisites by Topic:** Calculus
General chemistry
Physics (mechanics, Newton's law of motion)
- Lecture Topics:** Introduction to cells, microscopy, chemical components of cells
Energy, catalysis, and biosynthesis
Protein structure and function
DNA and chromosomes
DNA replication
Repair, and recombination
From DNA to proteins
Control of gene expression, how genes and genomes evolve
Manipulating genes and cells
- Class Schedule:** Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.
- Computer Usage:** Students will use basic computer skills to solve homework problems (MS Word and Excel).
- Laboratory Projects:**

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

Relationship to Program Outcomes: This course relates to Program Outcomes (a), (c), (d), (e), (f), (h), (i), (j), and (k) as stated at:
<http://undergraduate.eng.uci.edu/degreeprograms/biomedical/mission>

Design Content Description:

Approach: Students have some design experience on homework problems. Much more design content is in the companion course, BME50B (70%). Occasional lectures address the design process, including enumerating constraints, identifying the best alternatives, and the iteration of design. (30%)

Lectures: 100%

Laboratory Portion: 0%

Grading Criteria:

Homework: 30%

Midterm: 30%

Final: 40%

100%

Estimated ABET Category Content:

Mathematics and Basic Science: 0 Credit units or 0%

Engineering Science: 2 Credit units or 50%

Engineering Design: 2 Credit units or 50%

Prepared by: James P. Brody **Date:** July 2007

CEP Approved: Fall 2002