



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Quantitative Principles of Cellular and Molecular Systems

BIOMEDE 2200

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Course Components:

Lecture

Course Description:

An introduction to quantitative principles in molecular and cellular biology in the context of potential biomedical engineering applications. Topics covered: molecular structure and function; receptor-ligand and antigen-antibody specificity; cell energetics; enzyme catalysis, genetic information, disease state; Cell-surface interaction.

Prerequisites and Co-requisites:

Prereq: Biology 1113. Concur: 2000.

Course Goals / Objectives:

- Students will have a fundamental understanding of cell biology and confidence to acquire new knowledge related to cellular and molecular biology.
 - Understand how to apply fundamental physical and chemical processes to enable the control/prediction of biological systems.
 - Develop an appreciation for cutting edge techniques to measure biological phenomenon.
 - Explain how a cell's interactions with its environment influences cell function, e.g. cell morphology, differentiation, division, or survival.
 - Devise strategies to control and measure cell function for different cell types.
 - Develop and apply mathematical models to describe biological processes at the molecular and cellular levels.
 - Identify and evaluate assumptions associated with mathematical models of biological systems.
 - Compare and contrast biological components with similar functions, e.g. membrane channels and carriers, cytoskeletal proteins, extracellular matrix constituents, etc.
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Course Topics:

- Welcome and Course Introduction
 - Membrane Structure and Function
 - Cell Communication
 - Modeling Receptor-Ligand Interactions
 - Extracellular Matrix
 - Muscle Cells Intro
 - Cellular Specialization
 - Gene Expression
 - Excitable Cells, Ion Channels, Hodgkin-Huxley Model
 - Metabolism
 - Epithelial Cells Intro
 - Multicellularity and Cell Connections
 - Morphogenesis, Apoptosis and Cell Growth
 - Cancer Cell Biology
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Designation:

Elective