



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Quantitative Cell Biology for Engineers and Scientists

CBE 5740

Credit Hours:

3.00 - 3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Introduction to the biophysical and biochemical principles underlying the behavior of cellular processes with an emphasis on surveying engineering models and quantitative measurements.

Prerequisites and Co-requisites:

Prereq: Permission of instructor.

Course Goals / Objectives:

- Student understanding of the hierarchy of characteristic time scales, length scales, and forces involved in cellular processes.
 - Identify quantitative models, analytical tools, and experimental techniques appropriate to describing cellular processes that occur on and/or across different characteristic time scales, length scales, and forces.
 - Have the knowledge to apply the principles of thermodynamics and reaction kinetics to analyze and model specific cellular processes.
 - Apply the principles of momentum and mass transport to analyze and model specific cellular processes.
 - Apply system biology approaches in combination with the science and engineering principles cited above to analyze and model complex biological processes.
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Course Topics:

- Characteristic time and length scales of cells and cellular processes.
 - Life cycle- cell death, differentiation, population dynamics
 - Cell-cell communication
 - Endocytosis and exocytosis
 - Cell structure- cytoskeleton, membrane structure, biomechanical properties of cells
 - Specialized cells: immune cells
 - Specialized cells: neurons
 - Specialized cell functions: biomechanics
 - Specialized cell functions: transporters, pumps, and ion channels
 - Cancer
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Designation:

Elective