

BMED 3610 Quantitative Engineering Physiology Laboratory II

Credit: 1-3-2

Prerequisite(s): BMED 2300 and BMED 3300 and BMED 3110 and BMED 3600
(w/concurrency)

Catalog Description

This lab provides an active learning team environment, incorporating common cell/molecular biology techniques, to reinforce selected engineering principles in an in vitro cell culture setting.

Textbooks:

Self-directed reading of original literature

Objectives

To introduce common cell/molecular biology techniques in a self-learning team environment. Selected engineering principles are reinforced in an in vitro cell culture setting. The objectives of the lab include:

- *Experimental design and data analysis:* Design and build test systems incorporating living cell culture systems and measure, statistically analyze, and interpret experimental data from living systems
- *Variability in biological systems:* Recognize biological variability and its implication on controls, instrumentation, and procedures.
- *Communication:* Deliver oral and written communication.
- *Teamwork:* Work constructively in a team environment and understand team roles and responsibilities. Maintain an effective work plan to meet milestone timelines.

Outcomes

At the end of the course, the students will:

1. conduct experiments as well as to measure, analyze and interpret experimental data from cells and cellular structures (Program Outcome 4)
2. understand homeostasis in cell systems and be able to apply this information to bioreactor design problems (Program Outcomes 1 and 2)
3. acquire first hand knowledge of biologic variability at a cellular level and its impact on engineering systems design (Program Outcomes (1 and 2)
4. develop the ability to address the challenges associated with the interaction between cells and non-living materials and systems (Program Outcome 4)
5. complete an individual experimental design project that will culminate in a poster presentation (Program Outcomes 2, 4 and 5)

Topical Outline

Weeks 1-3: Microscopy

Objectives: To introduce *in vitro* cell culture, microscopy, and image analysis

Weeks 4-6: Genetic Engineering

Objectives: Develop and understand the utility of genetically engineered constructs in mammalian cell culture

Weeks 7-11: Bioreactor Design

Objectives: Understand develop control systems to illustrate principles of cell metabolism and homeostasis through examination of one of cell-material interaction, thermal regulation, or mechanical stimulation.

Weeks 11-16: Independent project

Objectives: Complete an open-ended individual project.