Course Objectives:

This course aims to introduce you to key concepts in microbiology and biochemistry that underpin their application in biochemical engineering, including coverage of microbial and biochemical applications with comparison to non-biological physical-chemical processes. To help you understand biological processes you should learn about the basic structure and function of microbial cells, and key aspects of biochemistry, including macromolecules, enzyme and key metabolic pathways and processes.

Catalog Description:

**Bioengineering: 3 semester hours:** Design and analysis of biochemical systems with applications in biomedical engineering and metabolic processes, enzyme catalyzed reactions and product separation, biomass production, and wastewater treatment. Emphasis is placed upon the application of biochemical systems structure, reaction kinetics, transport processes, and control in the design and use of biochemical reactors and separation units.

Textbooks and References:

Textbooks are not mandatory; however, they are highly recommended.


Course Outline:

1. Microbiology concepts. Basic biochemical concepts (3 classes).

3. Metabolic stoichiometry and energetics. Basic molecular genetics and control systems (3 classes).

4. Kinetics of substrate utilization, product formation, and biomass production in cell cultures (3 classes).

5. Transport phenomena in bioprocess systems (3 classes).

6. Design and analysis of biological reactors (3 classes).

7. Analysis of multiple interacting microbial populations and applications in natural systems. (3 classes).

In addition to the above course outline, the students will be required to critically review the latest literature on related topics and prepare reports.

Prepared by: Dr. Jorge Gabitto

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• Ch. 1. A little microbiology
• Ch. 2. Chemicals of life
• Ch. 3. The kinetics of enzyme-catalyzed reactions
• Ch. 4. Applied enzyme catalysis
• Ch. 5. Metabolic stoichiometry and energetics
• Ch. 6. Molecular genetics and control systems
• Ch. 7. Kinetics of substrate utilization, product formation, and biomass production in cell cultures
• Ch. 8. Transport phenomena in bioprocess systems
• Ch. 9. Design and analysis of biological reactors
• Ch. 10. Instrumentation and control
• Ch. 11. Product recovery operations
• Ch. 12. Bioprocess economics
• Ch. 13. Analysis of multiple interacting microbial populations
• Ch. 14. Mixed microbial populations in applications and natural systems.