

Bioengineering Mass Transport & Systems Laboratory

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Author Information

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Course Details

Description

This course is designed to reinforce and provide in-depth, hands-on exploration of the topics covered in BIOEN 335 (Mass Transport and Kinetics in Biological Systems) and BIOEN 336 (Bioengineering Systems and Control). Lab projects will involve the analysis and control of linear and nonlinear systems, involving both ODE and PDE solution approaches. Labs will involve practical lab applications in bioengineering such as mass transport, electrical systems, enzyme kinetics and control systems. In addition to wet-lab and instrumentation-based experiments, emphasis will also be placed on computational analysis of the systems and acquired data.

Prerequisites

- Probability and statistics
- Differential equations and linear algebra
- Fluid mechanics
- Computational numerical methods

Original Course Documents

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Course Contents

[Syllabus](#)

[Lab Notebook Guidelines](#)

Lab 1

- [Lab 1 Report Guidelines](#)
- [Electrical Analog Lab Handout](#)
- [Lab Handout for Constructing Circuit](#)

Reading

- Batten: Chapters 1, 4, 6 addressing inverting amplifiers, addition and subtraction, and integration and differentiation using circuits

Lab 2

- [1-D Diffusion Lab Handout](#)
- [Lab 2 Report Guidelines](#)

Reading

- Crank: Chapter regarding the solution to the diffusion problem.
- Cu et al. article

Lab 3

- [Soluble Enzyme Lab Handout](#)
- [Lab 3 Report Guidelines](#)

Textbooks

- Design and Application of Linear Computational Circuits, George L. Batten, Jr., 1987
- The Mathematics of Diffusion, J. Crank, Second Edition.
- Mathematical modeling of molecular diffusion through mucus, Yen Cu and W. Mark Saltzman, Department of Biomedical Engineering, Yale University, New Haven, CT 06511, Adv Drug Deliv Rev. 2009 February 27; 61(2): 101-114. doi: 10.1016/j.addr.2008.09.006.



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