



BE208 January 3:0

Fundamentals of Bioengineering

Instructor

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Department: Centre for BioSystems Science and Engineering

Course Time: Mon., Wed., Fri., 9 - 10 AM

Lecture venue:

Detailed Course Page: <http://www.be.iisc.ac.in/CourseTemplate/BE%20-%2020208/index%20-%2020208.html>

Announcements

Brief description of the course

This course will introduce concepts in the interdisciplinary areas of bioengineering, biomedical engineering and biotechnology. The following topics will be covered - introduction to mathematics and biology; polymer science engineering; transport phenomena through polymeric matrices and its applications in drug delivery; biological and immune responses to polymeric implants; principles of tissue engineering; computational approaches to study biological phenomena; and bioprocess engineering that includes an introduction enzyme kinetics, metabolic pathways and bioreactors.

Prerequisites

Biology for Engineers (BE206) or equivalent course

Should have taken at least 2 undergraduate level mathematics courses

Syllabus

Polymer science

Biomaterials

Immune responses to implants

Drug delivery systems

Tissue Engineering

Computational Biology

Bioprocess Engineering

Course outcomes

Upon completion of the course, students will be able to:

1. Describe concepts in polymer science and engineering
2. Understand the mechanics of materials and analyze stress strain relationships
3. Discuss fundamental principles in biomaterials and explain the Vroman effect
4. Write diffusion equations and describe basic transport phenomena in solids and liquids
5. Explain concepts in bioprocess engineering including reactor design, product separation and purification techniques
6. Design polymeric scaffolds for growing cells
7. Describe concepts in stem cell biology and their use in tissue engineering utilize
8. Understand fundamental ideas in computational and systems biology
9. Assess and critique bioengineering literature

Grading policy

40% - paper presentation and discussion in class

30% - grant proposal (towards the middle of the semester)

30% - final examination

Assignments

Resources

There is no prescribed textbook for this course. Class notes (to be taken during the lecture) will be primary course material. Papers from contemporary literature will be provided for class discussions. In addition, a few reference books include:

Biomedical Engineering (2nd Edition), by W. Mark Saltzman

Introduction to Biomedical Engineering (3rd Edition), by Enderle and Bronzino