

BME 479: Biotransport

Class Location & Time

1014 DOW; Monday & Wednesday 9:30am-11:30pm

Instructor

Prof. Cheri X. Deng (cx deng@umich.edu); Office Hours (2111 Gerstacker): F 10:30 – noon.

IAs

Leon Wang (mingming@umich.edu); Alexa Arvidson (alexara@umich.edu)

Course Summary

This course covers the fundamentals of mass transport related to biomedical or living systems. A variety of biological transport phenomena, with length scale ranging from intracellular to organ level, will be examined. Main topics include mass transport by diffusion, along with effects of convection, chemical reactions, and other mechanisms. Distributed (spatially and temporally dependent) and compartmental models will be discussed with emphases on fundamental principles, quantitative approaches, as well as applications of these principles and techniques.

Pre-requisites

Calculus, ordinary and partial differential equations, and fluid mechanics.

Course Objectives

Understanding the basic biotransport principles and mastering of the basic quantitative approaches in analyzing biotransport problems and questions with a focus on mass transport. You are to be proficient in the following three important aspects to be successful in this course:

- 1) *To mathematically define and describe general biotransport problems including derivation of the governing equation and defining the appropriate boundary/initial conditions;*
- 2) *To solve a variety of basic biotransport problems;*
- 3) *To apply mass transport models and approaches to biomedical problems;*
- 4) *To interpret the solutions/results obtained from the general biotransport problems;*

Required Textbook, Course Materials, and Course/Instruction Format

G.A. Truskey, F. Yuan, D. F. Katz: "Transport phenomena in biological systems." 2nd Edition.

Selected research manuscripts (journal articles) will be used in the course.

Lectures, pre-lecture reading, group and in-class work, will be employed to facilitate active learning.

Assessment/Grading

- Regular homework assignments (**15%**) will be graded. No late homework will be accepted.
- Three sectional exams, accounting for **20%** of final grade.
- **Two group projects, total 20%, each accounting for 10%**
- Participation (in-class work, asking/answering questions etc.) accounts for **5%**.

Tentative Exam Schedule (may change slightly depending on progress)

Exam 1:	February 01	(20%)
Exam 2:	February 24	(20%)
Exam 3:	April 18	(20%)

Tentative class/lecture schedule (may change depending on progress)

<i>Period I</i>	<i>Introduction, Chapter 1 and 6</i>
Jan 06	Introduction; Chapter 1
Jan 11	Chapter 1
Jan 13	Chapter 6
Jan 20	Chapter 6
Jan 25	Chapter 6
Jan 27	Chapter 6; Review
Feb 01	Exam 1
<i>Period II</i>	<i>Chapters 7-9</i>
Feb 03	Chapter 7
Feb 08	Chapter 7
Feb 10	Chapter 8
Feb 15	Chapter 8
Feb 17	Chapter 9
Feb 22	Chapter 9; Review
Feb 24	Exam 2
<i>Period III</i>	<i>Chapters 10, 13, 14, 15, 16</i>
Mar 07	Chapter 10
Mar 09	Chapter 10
Mar 14	Chapter 16
Mar 16	Chapter 15
Mar 21	Chapter 15
Mar 23	Review/Project time
Mar 28	Chapter 13
Mar 30	Chapter 13
Apr 04	Chapter 14
Apr 06	Chapter 14
Apr 11	Project time
Apr 13	Review
Apr 18	Exam 3