

BME 479: Biotransport

Class Location & Time

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

Instructor

Prof. Cheri X. Deng (cx deng@umich.edu); Office Hours (2111 Gerstacker): F 11:00 – noon.

Course Summary

This course covers the fundamentals of mass transport related to biomedical or living systems. After establishing the basic principles of transport, a variety of biological transport phenomena, with length scale ranging from intracellular to organ level, will be examined. Specifically, topics include mass transport by diffusion, along with effects of convection, chemical reactions, and other mechanisms will be covered. Emphases are given with regard to 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 biotransport principles and mastering of the basic quantitative approaches in analyzing biotransport problems. Three critical goals of this course are:

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

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.

Assessment/Grading

- Regular homework assignments (total worth of **10%**). No late homework will be accepted.
- Pop quizzes, total worth **10%**.
- Four sectional exams, with first three exam each accounting for **20%**, and the 4th exam accounting for **10%**.
- One special project, accounting for **10%**. The special project will focus on a set of research articles, including a group classroom presentation (5%) and a term paper (5%). Note that Exam 4 (10%) will be based on these research articles and some basic principles of biotransport.

Exam Schedule:

Exam 1:	January 30	(20%)
Exam 2:	February 22	(20%)
Exam 3:	March 27	(20%)
Exam 4:	April 17	(10%)

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

<i>Period I</i>	<i>Introduction, Chapter 1 and 6</i>
Jan 04	Introduction; Chapter 1
Jan 09	Chapter 1
Jan 11	Chapter 6
Jan 18	Chapter 6
Jan 23	Chapter 6
Jan 25	Chapter 6
Jan 30	Exam 1
<i>Period II</i>	<i>Chapters 7-9</i>
Feb 01	Chapter 7
Feb 06	Chapter 7,8
Feb 08	Chapter 8
Feb 14	Chapter 8,9
Feb 15	Chapter 9
Feb 20	Chapter 9, chapter 10
Feb 22	Exam 2
<i>Period III</i>	<i>Chapters 10, 13, and maybe partial Chapter 15</i>
Mar 06	Discussion and test correction
Mar 08	Chapter 10
Mar 13	Chapter 10
Mar 15	Chapter 10
Mar 20	Chapter 13
Mar 22	Chapter 13 (maybe chapter 15)
Mar 27	Review
Mar 29	Exam 3
<i>Period IV</i>	<i>Special project</i>
Apr 03	Project time
Apr 05	Project time
Apr 10	Project time
Apr 12	Project time
Apr 17	Exam 4