BME 2240: Biotransport
Spring 2012
TR 9:30-10:45, Thn E303; F 9:00-9:50, MR5 1041
http://collab.itc.virginia.edu/portal

Instructor: Brian P. Helmke, Associate Professor of Biomedical Engineering
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TA: Paul Jensen

BME TF: Bela Dhamankar

Objectives: To introduce principles and mathematics governing biological and biomedical transport processes; to apply classical engineering solutions and governing equations from simple transport problems to more complex biomedical transport processes; and to integrate knowledge of cell and organ physiology with mathematical expression of transport principles.

Prerequisites: APMA 2120, 2130. Corequisites: BME 2220, BME 2104 or instructor permission.

Textbook: R.L. Fournier, Basic Transport Phenomena in Biomedical Engineering, 3rd ed., Boca Raton, FL: Taylor & Francis, 2012, ISBN 978-1-4398-2670-6

Format: Lecture materials will be supplemented with readings from the textbook. Supplemental materials and slides containing figures for discussion in class will be posted on the class webpage on UVa Collab.

Friday Discussions will include supplemental lecture material, mathematical derivations, extra example problems, and homework help.

Homework problem sets may be individual or group projects as specified in each assignment. Homework will not be accepted late without prior arrangement with Dr. Helmke.

Two midterm tests will consist of short explanation or analysis questions. The final exam will be comprehensive. You must work alone; you may not use your notes or any other source of information except as specified in the test instructions. Review sessions will be offered before each test.

All work is to be your own work (see the Honor Statement below). If you consult published material, then you must cite those sources appropriately.

Honor Statement: I trust every student in this course to fully comply with all of the provisions of the UVa Honor System. In addition to pledging that you have neither received nor given aid on an assignment, your signature also affirms that you have not knowingly represented as your own any opinions or ideas that are attributable to another author in published or unpublished notes, study outlines, abstracts, articles, textbooks, or web pages. In other words, I expect that all assignments and reports are your original work and that references are cited appropriately. All alleged honor violations brought to my attention will be forwarded to the Honor Committee. If, in my judgment, it is beyond a reasonable doubt that a student has committed an Honor violation with regard to a given exam or assignment, the student will receive zero credit for that assignment, irrespective of any subsequent action taken by the Honor Committee.

Date	Topic	Assignment
Th 1/19	Definitions and Concepts	
Tu 1/24	Conservation Laws; Material Balances	
Th 1/26	Thermodynamics	
Tu 1/31	Thermodynamics	**HW 1 due**
Th 2/2	Thermodynamics	
Tu 2/7	Forces in Fluids	
Th 2/9	Momentum Balances	
Tu 2/14	**Exam 1**	
Th 2/16	Rheology	
Tu 2/21	Newtonian Velocity Field	**HW 2 due**
Th 2/23	Dimensional Analysis	
Tu 2/28	Energy Balances	
Th 3/1	Energy Balances	**HW 3 due**
Tu 3/6	**No Class—Spring Break**	
Th 3/8	**No Class—Spring Break**	
Tu 3/13	Solute Transport; Fick's 1st Law	
Th 3/15	Steady-State Diffusion	
Tu 3/20	Dimensional Analysis; Diffusion and Convection	
Th 3/22	Diffusion and Convection	**HW 4 due**
Tu 3/27	Diffusion and Convection	
Th 3/29	Heterogeneous/Porous Media	
Tu 4/3	**Exam 2**	
Th 4/5	Heterogeneous/Porous Media	
Tu 4/10	Heterogeneous/Porous Media	
Th 4/12	Heterogeneous/Porous Media	**HW 5 due**
Tu 4/17	Oxygen Transport in Tissues	
Th 4/19	Oxygen Transport in Tissues	
Tu 4/24	Extracorporeal Devices	**HW 6 due**
Th 4/26	Immobilized Enzyme Reactors	
Tu 5/1	Affinity Column	

Final Exam: Monday, May 7, 2:00 pm–5:00 pm, Thn E303

Grade: Homework 60%; Midterms 20%; Final exam 20%.
Approximate grading scale (**I use the full scale**): A+ >97; A >93; A– >90; B+ >87; B >83; B– >80; C+ >77; C >73; C– >70; D+ >67; D >63; D– >60; F <60