ENCH630: TRANSPORT PHENOMENA, Spring 2006
BIOE604: CELLULAR AND PHYSIOLOGICAL TRANSPORT PHENOMENA

Instructor:

Dr. Panos Dimitrakopoulos
Office: Room 1227B, Chemical & Nuclear Engineering Bldg
Phone: (301) 405-8166, Email: dimitrak@eng.umd.edu
Office hours: Mondays and Wednesdays: 2:00-2:45 pm (or by appointment: dimitrak@eng.umd.edu)
Course web: Blackboard & http://www.eng.umd.edu/~dimitrak/Courses
Class: Mondays and Wednesdays: 4:00-5:15pm (CHE 2136)

Teaching Assistant:

Walter R. Dodson
Office: Room 2210 , Chemical & Nuclear Engineering Bldg
Phone: (301) 405-7499, Email: wdodson@umd.edu
Office hours: Tuesdays and Thursdays: 2:00-3:00 pm

Course Description:

Momentum, heat and mass transfer theory is taught at both the macroscopic and microscopic levels utilizing integral and differential conservation equations; similarities between the three types of transport; dimensionless analysis and time scales; Finite Fourier Transform and similarity methodologies; and numerical analysis. The course includes steady- and unsteady-state creeping and laminar flows; viscous and inviscid flows; transport at interfaces; lubrication theory; boundary layer theory; forced and natural convection; with specific application to complex and biological chemical engineering processes.

The course is divided into 3 parts: (a) similarities between the three types of transport and relevant mathematical methodologies (Appendix from Deen, Chapters 1-5), (b) fluid mechanics (Chapters 5-8), and (c) heat and mass transfer (Chapters 9-12). In addition, the course gives emphasis on small-scale biological systems such as flow in circulation and tissues (Chapter 5 from Truskey *et al.*), transport in porous media (Chapter 8), transvascular transport (Chapter 9), and cell adhesion (Chapters 11, 12).

Recommended Textbooks:

Analysis of Transport Phenomena, by William M. Deen, Oxford University Press (1998).
Transport Phenomena in Biological Systems, by Truskey, Yuan and Katz, Pearson Prentice Hall (2004).

On reserve in the Engineering Library. Note that the library has also an array of books with similar titles; all of them may be used for further study.

Grading Policy:

Homework and Class Participation	15 %	(Teams of two members)
Project	15 %	
Mid-term exam	30 %	
Final exam	40 %	

Examinations:
All exams are "closed-books"/"closed-notes" (notes on 3 sheets of paper allowed).
The "mid-term" exam will be one class period in length.
Date for "mid-term" exam (subject to change): Wednesday March 29, 2004.
Final Exam: the date is set by the University (Tuesday, May 16, 2006, at 1:30pm).

Homework Assignments:
Homework problems will be assigned on a regular basis.
The homework must be submitted at the beginning of the class the date it is due.
The problems and the solutions will be posted on the course web page.

Project:
The goal of the project is to familiarize the students with the current scientific and engineering utilization of transport phenomena. Teams of two students will choose (in agreement with the course instructor) a research topic involving application of transport phenomena to nanotechnology, bioengineering, biomedicine, polymer science, etc. Based on recent publications, the students shall write a proposal (up to 12 double-space pages excluding references) describing the proposed research. The proposal should include abstract, introduction, review of relevant publications, proposed research, conclusions and references. The paper is due one week before the end of the semester, i.e. on Wednesday May 3, 2006.

Academic Honesty:
Plagiarism and academic dishonesty will not be tolerated, and suspected incidence will be referred to the Student Honor Council of the Judiciary Programs. For more information see:
http://www.testudo.umd.edu/soc/dishonesty.html & http://www.studenthonorcouncil.umd.edu

The following passage is suggested by the Student Honor Council.

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studenthonorcouncil.umd.edu/whatis.html.