# ENCH630: TRANSPORT PHENOMENA, Spring 2015

## Instructor:

Dr. Panos Dimitrakopoulos
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Office hours: Mondays and Wednesdays: 1:00-2:00pm
Course web: ELMS Enterprise Learning Management System
Class: Mondays and Wednesdays: 3:30pm - 4:45pm (EGR 2116)

## Teaching Assistant:

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Office hours: Mondays 6:00-7:00pm

## 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; and the similarity methodology. 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 1-4, 6), (b) fluid mechanics (Chapters 6-9), and (c) heat and mass transfer (Chapters 10-12). In addition, the course gives emphasis on small-scale complex and biological systems such as transport in porous media and microfluidics, hemodynamics and cell adhesion. Additional material includes lectures on physiological and mesoscale fluid dynamics.

## Recommended Textbooks:

*Analysis of Transport Phenomena*, by William M. Deen, Oxford University Press (2012).
*Advanced Transport Phenomena: Fluid Mechanics and Convective Transport Processes*, by L. Gary Leal, Cambridge University Press (2007).

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:

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| Homework | 15 % |
| Two mid-term exams of equal weight | $2 \times 25 = 50$ % |
| Final exam | 35 % |

## Examinations:

All exams are “closed-books”/“closed-notes” (notes on 1 sheet of paper allowed).
Date for “mid-term” exams : Monday March 2 and April 13, 2015.
Final Exam: the date is set by the University.

## 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.
Team homework: 2 students - only one solution per team.

## Suggested Prerequisites:

The students who may want to take this class should have experience with:
(a) Undergraduate Transport Phenomena (at least for one semester);
(b) Applied Mathematics for Engineers (including Vector Calculus and Ordinary Differential Equations) from relevant undergraduate or graduate courses.

## 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.shc.umd.edu

The following information 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.shc.umd.edu.*