

## ME150L: Heat and Mass Transfer Fall 2011 – Syllabus

**Instructor:** Prof. Chuan-Hua Chen (chuanhua.chen@duke.edu)  
**Lecture:** TuTh 11:40AM - 12:55PM (Hudson 208)  
**Office Hours:** M 4-5pm, Th 1-2pm (Hudson 178)

### Textbook

Bergman, Lavine, Incropera and DeWitt, *Fundamentals of Heat and Mass Transfer*, 7<sup>th</sup> Ed., Wiley, 2011.

### References

Bejan, *Heat Transfer*, Wiley, 1993.

Rigorous treatment of fundamentals with unique coverage of scaling analysis.

Cengel, *Heat and Mass Transfer*, 3<sup>rd</sup> Ed., McGraw-Hill, 2007.

Lucid presentation of physical interpretations and practical applications.

Lienhard and Lienhard, *A Heat Transfer Textbook*, 3<sup>rd</sup> Ed., Phlogiston Press, 2003.

Available online at <http://web.mit.edu/lienhard/www/ahtt.html>.

### Overview

Heat transfer problems complicate nearly every engineering endeavor, even when it is not the main subject of interest. This course teaches the basic principles and practical calculation methods of heat transfer. The majority of the lectures will deal with the three modes in which heat is transferred, conduction, convection and radiation. Mass transfer which is analogous to heat transfer will also be treated briefly. When you are finished with this course, you should be able to solve heat transfer problems through order-of-magnitude estimates and/or in-depth analysis, whichever is more appropriate.

### Grading

Your final grade will be based upon your performance in homework, labs and exams:

- Homework 10%
- Laboratory 10%
- Midterm-1 20%
- Midterm-2 20%
- Final Exam 40%

Homework is due in class, roughly every other Tuesday. *No late homework will be accepted.* Instead, the lowest score of your homework will not be counted toward your grade. You will receive full grade for each homework problem as long as you turn in the homework on time and make a reasonable effort to solve that particular problem.

You will work in a group for laboratories and associated reports, and will be graded by group for both. Attendance of all labs is mandatory. Lab reports are due in class on the Thursday following each lab. *No late lab reports will be accepted.* The entire group is responsible for the timely submission of the lab report.

## Schedule

<u>Week</u>	<u>Topics</u>	<u>Reading</u>
8-29	Introduction to Heat Transfer	Ch. 1
9-5	Heat Diffusion Equation	Ch. 2, 3.1; 3.2 (browse)
9-12	1-D Conduction <i>Thermal Measurements</i>	3.3-3.6; 3.7-3.9 (browse) Handout
9-19	Transient Conduction <i>Lab 1: Fin Conduction</i>	5.1-5.9
9-26	Multidimensional Conduction <i>Lab 2: Transient Conduction</i>	4.1-4.3
10-3	Introduction to Heat Convection <b>Midterm-1: Conduction (Wednesday, October 5, 11:40am, Teer 203)</b>	Ch. 6
10-10	Heat Convection ( <u>Fall Break</u> )	Ch. 6
10-17	External Convection	7.1-7.5; 7.6-7.8 (browse)
10-24	Internal Convection <i>Lab 3: Forced Convection</i>	8.1-8.6; 8.7-8.8 (browse)
10-31	Free Convection Phase Change	9.1-9.5; 9.6-9.9 (browse) 10.1-10.3; 10.4 (browse) 10.6-10.8, 10.11 (browse)
11-7	Heat Exchanger <i>Lab 4: Heat Exchanger</i>	11.1-11.4; 11.5-11.6 (browse)
11-14	Introduction to Thermal Radiation <b>Midterm-2: Convection (Wednesday, November 16, 11:40am, Teer 203)</b>	Ch. 12
11-21	Thermal Radiation ( <u>Thanksgiving</u> )	Ch. 12
11-28	Radiation Exchange <i>Lab 5: Radiation</i>	13.1-13.5
12-5	Mass Transfer	Handout
12-12	<b>Final Exam: Comprehensive (Tuesday, December 13, noon)</b>	