

***ECE 309***  
**THERMODYNAMICS & HEAT TRANSFER**  
**Spring 2015**

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**Textbook:** 1) *Introduction to Thermodynamics and Heat Transfer, 2nd Edition*  
Yunus A. Çengel, McGraw-Hill, 2008. (highly recommended)  
2) *Property Tables Booklet (required)*

**Supplementary Books:** 1) *Introduction to Thermal Systems Engineering*, Moran, Shapiro, Munson and DeWitt, John Wiley and Sons Inc., New York, NY, 2003.  
2) *Fundamentals of Thermodynamics, 7th Edition*, Sonntag, Borgnakke and Van Wylen, John Wiley and Sons Inc., New York, NY, 2009  
3) *Fundamentals of Heat and Mass Transfer, 7th Edition*, Incropera, DeWitt, Bergman and Lavine, John Wiley and Sons Inc., New York, NY, 2011

**Outline:** Chapter 2 - Introduction and Basic Concepts  
Chapter 4 - Properties of Pure Substances  
Chapter 3, 5, 6 - 1st Law of Thermodynamics  
Chapter 7, 8 - 2nd Law of Thermodynamics & Entropy

midterm

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Chapter 10, 11 - Conduction Heat Transfer  
Chapter 12, 13, 14 - Convection Heat Transfer  
Chapter 15 - Radiation Heat Transfer

final

**Web page:** <http://www.mhtlab.uwaterloo.ca/courses/ece309/index.html>

**Tutorials:** T.A.'s will work through selected problems and answer questions about lecture material or assignments. They will also give individual help.

**Assessment:** Project 15%  
Midterm 40%  
Final 45%

The midterm and the final are closed book examinations of the course material. However, you are permitted to use the *Property Tables Booklet* for Çengel plus a crib sheet consisting of one side of one 8 1/2 × 11 sheet of paper for the midterm exam and two sides of one 8 1/2 × 11 sheet of paper for the final exam.

**Exams:** Midterm: June 19, 2015; 2:30 - 4:20 pm  
The midterm will be a 110 minute open book exam written during the 7th week of the term, based on material covered in Chapters 2-8.

Final: The final exam will be a 150 minute open book exam based on material covered in Chapters 10 - 15

**Note:** Because the midterm exam covers only the first half of the course and the final exam covers the second half of the course the weighting scheme for the midterm and final exams are fixed and no alternative schemes are possible. It is important to give your full attention to the entire course if you want to achieve maximum success.

## ***ECE 309* Project**

### **“Thermodynamics & Heat Transfer Analysis of a Compressed Air Car”**

One project, combining both thermodynamics and heat transfer, will be assigned during the eighth week of the term. The project must be completed and then handed in during the twelfth week of the term, subject to the following conditions:

- The project must be completed individually.
- Anyone suspected of copying or cheating will be assigned a grade of zero.
- All projects must be handed in immediately following the lecture period on the Due Date.
- No extensions will be granted.
- Failure to hand the project in on time will result in a grade of zero for that project.

### **Schedule**

Assigned Date: June 22, 2015

Due Date: July 23, 2015

Grade: 15%

## *ECE 309* Course Schedule

Week	Days	Topics	Text Sections
1	May 04 - 08	Basic concepts of thermodynamics - thermodynamic systems and properties	2-1 → 2-8
2	May 11 - 15	Properties of pure substances - equations of state	4-1 → 4-7
3	May 19 - 22	First law of thermodynamics - control mass (closed systems)	3-1 → 3-6 5-1 → 5-5
4	May 25 - 29	First law of thermodynamics - control volume (open systems)	6-1 → 6-5
5	June 01 - 05	Second law of thermodynamics	7-1 → 7-3, 7-6 → 7-10
6	June 08 - 12	Entropy - control mass and control volume	8-1 → 8-13
<b>midterm exam</b> _____			<b>June 19</b>
8	June 22 - 26	Conduction heat transfer - steady state	10-1 → 10-6
9	June 29 - July 03	Conduction heat transfer - transient	11-1 → 11-2
10	July 06 - 10	Convection heat transfer - external forced convection - internal forced convection	12-1 → 12-8 13-1 → 13-6
11	July 13 - 17	Convection heat transfer - natural convection	14-1 → 14-4
12	July 20 - 24	Radiation heat transfer - properties	15-1 → 15-4
13	July 27 - 28	Radiation heat transfer - exchanged between surfaces	15-5 → 15-7
<b>final exam</b> _____			<b>August XX</b>

## ***ECE309*** Recommended Problems

<b>Weeks</b>		<b>Section</b>	<b>Problems</b>
1	May 04 - 08	Chapter 2	2-53, 2-67, 2-85
2	May 11 - 15	Chapter 4 & 5	4-42, 4-54, 4-58, 4-79, 4-95 5-57
3-4	May 19 - 29	Chapters 3, 5, & 6	3-40, 3-105 5-25, 5-29, 5-35, 5-42, 5-72, 5-105, 5-109 6-37, 6-52, 6-61, 6-80, 6-85, 6-156
5-6	June 01 - 12	Chapters 7 & 8	7-88, 8-29, 8-44, 8-60, 8-69, 8-99, 8-148 8-166, 8-168, 8-183, 8-189
8-9	June 22 - July 3	Chapters 10 & 11	10-20, 10-48, 10-59, 10-70, 10-92 10-117, 10-123, 10-157, 10-162 11-14, 11-20, 11-36, 11-41, 11-53
10-11	July 6 - 17	Chapters 12, 13, & 14	12-46, 12-53, 12-68, 12-74, 12-85, 12-91 13-39, 13-45, 13-57 14-19, 14-42, 14-45, 14-48
12-13	July 20 - 28	Chapter 15	15-27, 15-33, 15-50, 15-57, 15-77, 15-79 15-86, 15-107, 15-108