ME354 THERMODYNAMICS 2
Winter 2012

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Web Page: **http://www.mhtlab.uwaterloo.ca/courses/me354/index.html**

bookmark this page: you will be expected to use this page regularly for things such as: important dates, course notes, assignments, etc.

Textbook: *Fundamentals of Thermodynamics, 7th Edition*, Claus Borgnakke and Richard E. Sonntag, John Wiley and Sons Inc., New York, NY, 2009 (same as ME 250)

Set Properties Tables for Fundamentals of Thermodynamics, 7th Edition A Custom Print Product from Wiley Canada Custom Services, John Wiley & Sons Canada Ltd.

Supplementary Books: 1) *Fundamentals of Engineering Thermodynamics, 7th Edition*, Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey, John Wiley and Sons Inc., New York, NY, 2011.

2) Thermodynamics an Engineering Approach, 7th Edition, Yunus A. Cengel and Michael A. Boles, McGraw-Hill, 2011.

Outline:

Chapter 3, 8	-	Review of the Fundamentals
Chapter 4 - 9	-	1st and 2nd Laws
Chapter 10	-	Availability
Chapter 11	-	Rankine Cycle
	-	Refrigeration Cycle
Chapter 12	-	IC Engines
	-	Brayton Cycle
	-	Jet Propulsion
Chapter 13	-	Non-Reacting Gas Mixtures
Chapter 15	-	Reacting Gas Mixtures

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

Assignments: Problems will be assigned on a regular basis, but it is a policy of Mechanical Engineering that weekly assignments in all courses are not marked. Students are expected to develop the independence and initiative to study on their own. Solutions are available for all assigned problems on the ME354 web page at (http://www.mhtlab.uwaterloo.ca/courses/me354/assign_2012.html). It is important that you keep up with the material by doing the problems **REGULARLY, ON YOUR OWN, BEFORE LOOKING AT THE SOLUTIONS.** To do well in exams, you must develop problem solving skills week by week throughout the term.

These skills cannot be developed by cramming lecture notes and looking at solution sets for a few hours before exam time. There is simply too much material to learn in this way. Lectures will also mean more to you if you are keeping up as new material is presented.

Assessment:

Lab (refrigeration)	10%
Midterm	40%
Final	50%

The midterm and the final are closed book examinations of the course material. However, you are permitted to use the *Property Tables Booklet* for Borgnakke and Sonntag plus a crib sheet consisting of <u>one side</u> of one 8 1/2× 11 sheet of paper for the midterm and <u>two sides</u> of one 8 1/2× 11 sheet of paper for the final exam. If you do not have a copy of the *Property Tables Booklet* for Borgnakke and Sonntag, I will allow a photocopy of the property tables to be used but only if it is not marked up with any additional text or figures.

The preparation of a well structured crib sheet will help during the testing of ME354 but it will also help in the preparation for exams as you assign priority to what is and is not important.

If a failing grade is obtained in <u>both</u> the midterm exam and the final exam the lab mark will **NOT** be included in the calculation of the overall grade for ME354.

ME354 Refrigeration Lab

Lab Schedule

During the week of February 6 - February 10, each member of the class will perform the refrigeration lab as detailed in the lab handout. The lab will be conducted in the Thermal Engineering Lab in E3-2108. Students will work in groups of 3 for data collection and the preparation of the lab write up. Note: Only one write up should be handed in for each group of three students. **Groups of 4 or more students are not permitted.**

Please note, during the second week of the term a lab schedule will be posted in your class room. 45 minute time slots are allotted for each group. It is your responsibility to select a time that is convenient with your schedule.

Lab write-ups will be handed in during or before the ME 354 class on Friday, March 2, 2012. **Failure to submit your lab on time will result in a penalty of 25% per day.**

Cheating or copying of labs will not be tolerated!

ME354 Course Schedule

Week	Days	Topics	Text Sections
1	Jan. 3 - 6	Modelling of Thermodynamic Systems Properties and Equations	3.2 → 3.4, 3.7 8.4 → 8.6, 8.8
2	Jan. 9 - 13	1st & 2nd Laws of Thermodynamics - control mass and control volume	4-1 → 4-3, 4.8, 5.1, 5.8, 5.9 6.1, 6.2, 7.2, 7.3 8.9 → 8.12, 9.1, 9.2
3	Jan. 16 - 20	Availability - control mass and control volume Exergy Balance Equation	10.1 → 10.4
4	Jan. 23 - 27	Rankine Cycle - reheat, regeneration	11.1 → 11.7
5	Jan. 30 - Feb. 3	Refrigeration Cycle - vapour compression refrigeration - absorption refrigeration	11.8 → 11.13
6	Feb. 6 - 10	Internal Combustion Engines - Otto, Diesel and Dual Cycles - Atkinson, Miller and Stirling Cycles	12.1, 12.7 → 12.12
7	Feb. 13 - 17	Midterm week - no lectures	
8	Feb. 20 - 24	Study week - no lectures	
9	Feb. 27 - Mar. 2	Brayton Cycle - reheat, intercooling, regeneration	12.2 → 12.4
10	Mar. 5 - 9	Gas Turbines for Jet Propulsion	12.5
11	Mar. 12 - 16	Non-reacting Gas Mixtures - ideal gas mixtures	13-1 → 13-4
12	Mar. 19 - 23	Non-reacting Gas Mixtures - psychrometrics	13.5
13	Mar. 26 - 30	Reacting Gas Mixtures	15.1 → 15.8
14	Apr. 2	Review	

ME354 Recommended Problems

Weeks		Section	Problems
1 & 2	Jan. 3 - 13	Chapters 5,6,8,9	5.61, 5.134, 6.138, 8.171, 8.178, 9.159, 9.160
3	Jan. 16 - 20	Chapters 10	10.59, 10.65, 10.66, 10.67, 10.69, 10.75, 10.81, 10.88
4 & 5	Jan. 23 - Feb. 3	Chapters 11	11.29, 11.36, 11.43, 11.47, 11.52, 11.55, 11.58, 11.74, 11.85, 11.86, 11.89, 11.95
8 & 9	Feb. 6 - Mar. 2	Chapter 12	12.16, 12.17, 12.18, 12.29, 12.36, 12.43, 12.44, 12.47, 12.67, 12.74, 12.81 12.82, 12.86, 12.89, 12.94, 12.116, 12.117
10 & 11	Mar. 5 - 16	Chapter 13	13.17, 13.19, 13.22, 13.30, 13.39, 13.53, 13.69, 13.78, 13.81, 13.84, 13.108, 13.109
12 & 13	Mar. 19 - Apr. 2	Chapter 15	15.26, 15.31, 15.69, 15.71, 15.79, 15.80, 15.83, 15.92, 15.94