ME 304: Energy and Thermodynamics, Spring 2013

Instructor:
Professor James Bird
Department of Mechanical Engineering
730 Comm. Ave., Rm. 220
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Course web page: Blackboard

Course schedule:
Lectures: MW 8-10 AM (PHO 203)
Office hours: M 11:30AM - 12:30 PM (EMA 220); for extra hours, please email jbird@bu.edu
Discussions: Review material with GTF / discuss homework
Wed: 4-5pm SOC B59 / Thur: 1-2pm SOC B67 / Fri: 12-1pm SOC B65
Labs: 2 labs – locations to TBA
GTF: Yang Yu (yuyang20@bu.edu)

Textbook: Fundamentals of Engineering Thermodynamics by Moran et al., 7th Edition, Wiley

Prerequisites:
1) Differential and integral calculus, multivariate calculus
2) One-semester college physics (calculus based)

Course learning objectives:
This course will deliver a broad and in-depth presentation of modern thermodynamics with sufficient coverage of cycles as a prerequisite for focused study of energy conversion and propulsion.

Policy on collaboration:
Collaboration is encouraged on homework and labs, however students should turn in their own work in their own words. No collaboration is permitted on quizzes or exams.

Grading:

Assignments (10%):	Weekly assignments
Lab reports (20%):	Two laboratory exercises; must complete to pass the course
Quizzes (10%):	Three quizzes on topics covered in the last few weeks; closed book; allowed one-page (8.5''x11'') formula sheet (we will drop lowest grade, no make-ups).
Exams (55%):	Midterm I (15%); Midterm II (15%); Final (25%); closed book; formula sheet will be provided.
Participation (5%):	Will be evaluated on overall participation in class and discussion

Assignments:
Homework assignments will be announced in class, as well as on the course webpage. Homework is due in class a week after it is handed out (usually Monday; can be turned in for full credit up to 1pm). On each assignment one or two problems will be randomly selected and graded in full (10 points) and other problems will receive 1 point if evidence of sufficient effort

to complete. This grading system is designed to provide the course staff with more time to help you understand the material instead of using that time to check all of your work.

Lab exercises: There will be two lab exercises for this course. Sign-up sheets will be posted once the labs are scheduled. The experiments will be done in groups, but all reports must be individual. Typed reports are due on the Monday following the lab.

Quizzes and Exams: The quizzes will take place during a portion of the class and will feature exam-like questions. The goal of these quizzes is to help you access your understanding of the material well before the midterms. The exams will take place over the entire class period. Midterm I will cover the material in lectures 1-7 (below) and midterm II will cover the material in lectures 8-17. The Final Exam will be cumulative.

Lecture by topic: We will cover the following topics around these given dates.

Lecture	Date	Topic	Text	Due
1	1/16	What is thermodynamics?	Ch. 1	
2	1/23	Relating mechanical and thermal driving forces	Ch. 2	
3	1/28	Work, heat, and energy		PS #1
4	1/30	P-V-T surface and steam tables – **Quiz**	Ch. 3	
5	2/4	Enthalpy and specific heats		PS #2
6	2/6	Equations of state		
7	2/11	Review	Ch. 4	PS #3
	2/13	**Midterm exam I** (2/21 last day to drop w/o W)		
8	2/20	Mass and energy rate balances		
9	2/25	Open system applications		Lab #1
10	2/27	Second law of thermodynamics	Ch. 5	
11	3/4	Applying the second law		PS #4
12	3/6	Carnot cycle, thermal efficiency		
13	3/11	Introducing entropy – **Quiz**	Ch. 6	PS #5
14	3/13	Entropy balance		
15	3/18	Isentropic processes		PS #6
16	3/20	Exergy	Ch. 7	
17	3/25	Review		PS #7
	3/27	**Midterm exam II** (3/29 last day to drop class)		
18	4/1	Vapor power system	Ch. 8	
19	4/3	Improving vapor power system		
20	4/8	Gas power systems: internal combustion	Ch. 9	PS #8
21	4/10	Gas power systems: turbines		
22	4/17	Maxwell relations -- **Quiz**	Ch. 11	PS #9
23	4/18	Other thermodynamic relations		
24	4/22	Multicomponent systems	Ch. 12	PS #10
25	4/24	Special topics	Ch. 12+	Lab #2
26	4/29	Special topics / Review		PS #11
27	5/1	Review		
		Final exam		