Boston University

ENG ME 304 A2 Energy and Thermodynamics Fall 2010

Instructor:
William J. Palm
Department of Mechanical Engineering wjpalm@bu.edu
110 Cummington St cell (617) 319-0105
Boston, MA 02215 http://blackboard.bu.edu

Lectures: MW 8-10 AM (PHO 205)
Office Hours: TBA after first week of classes (EMB 130)

Graduate Teaching Fellow:
Amitesh Saha Email TBA

Discussions: Tu 1-2 PM (PSY B45), Th 11 AM - 12 PM (MCS B29)
Labs: Detailed schedule TBA (ENG B01)

Catalog Description:
Macroscopic treatment of the fundamental concepts of thermodynamic systems. Zeroth, first, and second laws; properties of simple compressible substances; entropy; energy availability; ideal gas mixtures and psychometrics; and thermodynamic cycles. Application to engines, refrigeration systems, and energy conversion. Includes lab. 4 credits. (Formerly ENG EK 304)

Goals:
To provide a broad introduction to classical thermodynamics with sufficient coverage of cycles as a prerequisite for focused study of energy conversion and propulsion.

Pre-requisites by Topic:
1) Differential and integral calculus, multivariate calculus (e.g. B.U. CAS MA 225)
2) 1st semester college physics, calculus based (e.g. B.U. CAS PY 211)

Required Textbook:
M.J. Moran and H.N. Shapiro, *Fundamentals of Engineering Thermodynamics*, 6th Edition, New York: Wiley, 2007. (ISBN: 978-0-471-78735-8)

Grading:

60%	Exams	Three exams: two mid-terms and final, closed book and notes, all count
15%	Quizzes	Ten in-class quizzes based on assigned reading, best eight count
15%	Homework	Nine assignments (details below)
10%	Lab reports	Two laboratory exercises; both must be completed to pass the course

Academic Conduct Code:
We will follow the College of Engineeringôs Undergraduate Conduct Code:
http://www.bu.edu/eng/handbook/documents/ugrad-handbook-ch09-academic-conduct.pdf

Assignments:
Homework assignments will be announced in lecture and posted on the course website. Collaboration with other students is allowed, but each student must write up his or her own solution and cite his or her collaborators. Use of the textbookôs solutions manual, even as a reference, is expressly forbidden. Late homework will receive a 50% penalty.

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 the reports are individual.

Tentative Lecture Schedule:

Lecture	Day	Date	Topic	Reading
	M	9/6	**Labor Day – no class**	
1	W	9/8	Introductory Concepts and Definitions	1.1 ï 1.9
2	M	9/13	Energy and Work	2.1 ï 2.3
3	W	9/15	Heat; The First Law; Cycles	2.4 ï 2.6
4	M	9/20	Evaluating Properties	3.1 ï 3.6
5	W	9/22	Evaluating Properties (cont.)	3.8 ï 3.10
6	M	9/27	Incompressible Substance and Ideal Gas Models	3.12 ï 3.15
7	W	9/29	Control Volume Analysis	4.1 ï 4.5
8	M	10/4	Review	
Exam	W	10/6	**MIDTERM EXAM I**	
	M	10/11	**Columbus Day – no class**	
9	T	10/12	Open System Applications	4.6 ï 4.11
10	W	10/13	Open System Applications (cont.)	
11	M	10/18	The Second Law	5.1 ï 5.7
12	W	10/20	The Carnot Cycle	5.8 ï 5.11
13	M	10/25	Entropy	6.1 ï 6.5
14	W	10/27	Entropy Balances	6.6 ï 6.10
15	M	11/1	Isentropic Processes; Isentropic Efficiencies	6.11 ï 6.12
16	W	11/3	Vapor Power Systems: Rankine Cycle	8.1 ï 8.2
17	M	11/8	Review	
Exam	W	11/10	**MIDTERM EXAM II**	
18	M	11/15	Vapor Power Systems: Improving Performance	8.3 ï 8.6
19	W	11/17	Gas Turbines: Brayton Cycle	9.5 ï 9.8
20	M	11/22	Internal Combustion Engines: Otto and Diesel Cycles	9.1 ï 9.4
	W	11/24	**Thanksgiving Break – no class**	
21	M	11/29	Refrigeration and Heat Pump Systems	10.1 ï 10.6
22	W	12/1	Combustion	13.1 ï 13.2
23	M	12/6	Combustion (cont.)	13.3 ï 13.4
24	W	12/8	Summary	
Exam	F	12/17	**FINAL EXAM**	