Boston University

ENG ME 304 Energy and Thermodynamics Spring 2010

Instructor:
William J. Palm, PE
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Lectures: MW 8-10 AM (PHO 203)
Office Hours: M 10-11:30 AM and F 1-2:30 PM (15 Saint Mary's St, Room 130)

Graduate Teaching Fellow:
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Discussions: M 12-1 PM (COM 111), W 4-5 PM (SOC B67), F 12-1 PM (SOC B67)
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
20%	Quizzes	Ten in-class quizzes based on assigned reading, best eight count
10%	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 Engineering's Undergraduate Conduct Code:
http://www.bu.edu/eng/handbook/documents/ugrad-handbook-ch09-academic-conduct.pdf

Homework:
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 textbook's 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
1	W	1/13	Introductory Concepts and Definitions	1.1 – 1.9
	M	1/18	**Martin Luther King, Jr. Day – no class**	
2	W	1/20	Energy and Work	2.1 – 2.3
3	M	1/25	Heat; The First Law; Cycles	2.4 – 2.6
4	W	1/27	Evaluating Properties	3.1 – 3.6
5	M	2/1	Evaluating Properties (cont.)	3.8 – 3.10
6	W	2/3	Incompressible Substance and Ideal Gas Models	3.12 – 3.15
7	M	2/8	Control Volume Analysis	4.1 – 4.5
8	W	2/10	Open System Applications (cont.)	4.6 – 4.11
	M	2/15	**President's Day – no class**	
9	T	2/16	Review	
Exam	W	2/17	**MIDTERM EXAM I**	
10	M	2/22	Open System Applications (cont.)	
11	W	2/24	The Second Law	5.1 – 5.7
12	M	3/1	The Carnot Cycle	5.8 – 5.11
13	W	3/3	Entropy	6.1 – 6.5
	M	3/8	**Spring Break – no class**	
	W	3/10	**Spring Break – no class**	
14	M	3/15	Entropy Balances	6.6 – 6.10
15	W	3/17	Isentropic Processes; Isentropic Efficiencies	6.11 – 6.12
	M	3/22	TBD	
16	W	3/24	Review	
Exam	M	3/29	**MIDTERM EXAM II**	
17	W	3/31	Vapor Power Systems: Rankine Cycle	8.1 – 8.2
18	M	4/5	Vapor Power Systems: Improving Performance	8.3 – 8.6
19	W	4/7	Gas Turbines: Brayton Cycle	9.5 – 9.8
20	M	4/12	Internal Combustion Engines: Otto and Diesel Cycles	9.1 – 9.4
21	W	4/14	Refrigeration and Heat Pump Systems	10.1 – 10.3; 10.6 – 10.7
	M	4/19	**Patriot's Day – no class**	
22	W	4/21	Combustion	13.1 – 13.2
23	Th	4/22	Combustion (cont.)	13.3
24	M	4/26	Fuel Cells	13.4
25	W	4/28	Summary	
Exam	T	5/4	**FINAL EXAM**	