Boston University

ENG ME 304 Energy and Thermodynamics Fall 2009

Instructor:
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Lectures: MW 8-10 AM (PHO 205)
Office Hours: MW 10-11 AM (location TBA) and by appointment (email to arrange)

Graduate Teaching Fellow:
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Discussions: Tu 1-2 PM (PSY B47), second section TBD
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:

10%	Homework	Ten assignments (details below)
5%	Lab reports	Two laboratory exercises; both must be completed to pass the course
25%	Quizzes	Twelve in-class quizzes based on assigned reading, best ten count
60%	Exams	Three exams, best two count, one 8.5x11" formula sheet allowed

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

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. Homework is due a week from the time it is assigned.

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. Reports are due on the Monday following the lab.

Tentative Lecture Schedule:

Lecture	Day	Date	Topic	Reading
1	W	9/2	Preliminaries	1.1 – 1.9
	M	9/7	**Labor Day – no class**	
2	W	9/9	Energy and Work	2.1 – 2.3
3	M	9/14	Heat; The First Law; Cycles	2.4 – 2.6
4	W	9/16	Evaluating Properties	3.1 – 3.6
5	M	9/21	Enthalpy and Specific Heats	3.9 – 3.11
6	W	9/23	The Ideal Gas Model	3.12 – 3.15
7	M	9/28	Review	
Exam	W	9/30	**MIDTERM EXAM I**	
8	M	10/5	Control Volume Analysis	4.1 – 4.5
9	W	10/7	Open System Applications	4.6 – 4.11
	M	10/12	**Columbus Day – no class**	
10	T	10/13	The Second Law	5.1 – 5.7
11	W	10/14	The Carnot Cycle	5.8 – 5.11
12	M	10/19	Entropy	6.1 – 6.5
13	W	10/21	Entropy Balances	6.6 – 6.10
14	M	10/26	Isentropic Processes; Isentropic Efficiencies	6.11 – 6.12
15	W	10/28	Exergy of a System	7.1 – 7.3
16	M	11/2	Vapor Power Systems: Rankine Cycle	8.1 – 8.2
17	W	11/4	Review	
Exam	M	11/9	**MIDTERM EXAM II**	
	W	11/11	**Veterans Day – no class**	
18	M	11/16	Vapor Power Systems: Improving Performance	8.3 – 8.6
19	W	11/18	Internal Combustion Engines: Otto and Diesel Cycles	9.1 – 9.4
20	M	11/23	Gas Turbines: Brayton Cycle	9.5 – 9.8
	W	11/25	**Thanksgiving Break – no class**	
21	M	11/30	Refrigeration and Heat Pump Systems	10.1 – 10.6
22	W	12/2	Combustion	13.1 – 13.2
23	M	12/7	Fuel Cells	13.3 – 13.4
24	W	12/9	Summary	
Exam	W	12/16	**FINAL EXAM**	