

ENG ME 304 B1 – Energy and Thermodynamics

Fall 2016

Instructor

Prof. **Chuanhua Duan** (Course coordinator)

Lecture Section B1: MW 8-10 am, PHO 203

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Office hours: Tue 1-3 pm and Wed 4-5 pm

Graduate Teaching Fellow

Aliya Mukazhanova (maliya@bu.edu) and Reyhaneh Toufanian (reyhaneh@bu.edu)

Discussion Section: B2 Tue 6-7 pm, PSY B33 and B3 Thu 11-12 am HAR 304

A2 Tue 1-2 pm, PSY B51 and A3 Wed 2-3 pm BSY B53

Office hours: **TBD**

Course Objectives

To 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.

Course Prerequisites

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

Course Website

learn.bu.edu

Textbook

Fundamentals of Engineering Thermodynamics by Moran, Shapiro, Boettner, and Bailey, 8th Edition, Wiley

Class/Laboratory Schedule

Four hours of lecture and one hour of discussion per week. There are 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 reports are individual. This class has homework every week. Homework assignments and deadlines will be announced in class, as well as on the course webpage. Homework submitted late will not receive credit.

Exams

There will be three exams, including two midterms and one final exam. The exact dates are listed in the syllabus. All exams are **closed book, but allowed two-page (8.5" x 11") formula sheet**. Calculators are allowed to use during exams but other electronic devices (cell phones, PDAs, laptops, etc.) are prohibited. The only valid reasons for missing an exam are: death in the immediate family, serious illness (documented by a physician), or a conflict with a scheduled Boston University event. If you feel that you have a valid

¹ Subject to change. Check the course website for the latest version.

reason for missing an exam, you must petition to Prof. Duan for permission to take the make-up exam. This petition must be received **BEFORE** the regularly scheduled exam. Petitions are not always granted! If the petition is granted, a mutually convenient time for the make-up exam will be arranged. Make-up exams will be more difficult than the regularly scheduled exams.

Collaboration Policy

Students are allowed (in fact, encouraged) to work together on the homeworks and on the lab worksheets. Working together means truly working together, exchanging ideas, NOT copying. Copying another's work is cheating, as is allowing someone else to copy your work. All exams must be done by each student individually. Anyone caught cheating may be subject to disciplinary action by the Committee on Student Conduct of the College of Engineering. Also, anyone found guilty of cheating will receive a 0 for that particular grade. When in doubt, ask before you collaborate!

Grading Policy¹

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|-------------|-----|
| Three exams | 70% |
| Labs | 20% |
| Homework | 10% |

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Lecture and Exam Schedule¹

| Lecture | Date | Topics | Reading | Other |
|---------|--------------|--|-----------|---|
| 1 | 09/07 | What is thermodynamics? | 1.1-1.9 | |
| 2 | 09/12 | Relating mechanical and thermal driving forces | 2.1-2.7 | |
| 3 | 09/14 | Work, heat and energy balance | | |
| 4 | 09/19 | P-V-T surface and steam tables | 3.1-3.11 | |
| 5 | 09/21 | Enthalpy and specific heats | | TAs or Prof. Nagem will cover my lecture |
| 6 | 09/26 | Equations of state | | |
| 7 | 09/28 | Review & Mass and Energy Balances | 4.1-4.12 | |
| | 10/03 | Mass and Energy Balances II | | |
| 8 | 10/05 | Midterm exam I | | |
| 9 | 10/11 | Open system applications I | | Lab 1 starts |
| 10 | 10/12 | Open system applications I | | |
| 11 | 10/17 | Second law of thermodynamics | 5.1-5.10 | |
| 12 | 10/19 | Carnot cycle, thermal efficiency | | |
| 13 | 10/24 | Introducing entropy | 6.1-6.13 | |
| 14 | 10/26 | Entropy balance | | |
| 15 | 10/31 | Isentropic processes | | |
| 16 | 11/02 | Heat transfer and work in internally reversible, steady-state Flow | | |
| 17 | 11/07 | Refrigerator system | 10.1-10.3 | Lab 2 starts |
| | 11/09 | Improving refrigerator system | | |
| 18 | 11/14 | Vapor power system & review | 8.1-8.3 | TAs or Prof. Nagem will cover my lecture |
| 19 | 11/16 | Midterm exam II | | TAs will hold the exam |
| 20 | 11/21 | Improving vapor power system | 8.1-8.3 | |
| | 11/23 | Thanksgiving Recess | | |
| 21 | 11/28 | Gas Power systems: internal combustion | 9.1-9.8 | |
| 22 | 11/30 | Gas Power systems: turbines | 9.1-9.8 | |
| 23 | 12/05 | Multicomponent systems I | 12.1-12.5 | |
| 24 | 12/07 | Multicomponent systems II | 12.1-12.5 | |
| 25 | 12/12 | Review | | |
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