

ME 200 Thermodynamics

2035 Campus Instructional Facility MWF 12-12:50

Text: *Fundamental of Engineering Thermodynamics*, Moron & Shapiro, 9th Ed.

Instructor: Nick Glumac (MEL 2111 x4-8333) glumac@illinois.edu

Office Hours: Monday 2-3 PM and Thursday 2-3 PM, or by appointment. TA: Paul, Arghyadeep paul26@illinois.edu Class Website: <http://glumac.mechse.illinois.edu/me200/>

Goals:

This course is intended to provide the fundamental concepts and methods of classical thermodynamic analysis as a prerequisite for all other applied thermodynamic courses to follow.

Conduct of the Course:

The course consists of three lectures of 50 minutes each per week and extensive homework assignments. The instructor is available during office hours to answer questions and provide individual attention.

Course Outline (Tentative)

Week 1: Introduction, properties, units, general problem solving skills, barometric pressure, interpolation. Book Sections Covered: Chapter 1.

Week 2: Properties and states, equilibrium, using the steam tables, specific heats, P-v-T property relations, the ideal gas law, thermodynamic property data. Book Sections Covered: Chapter 3

Week 3: Energy and work, potential and kinetic energy, energy transfer, P-V work, imperfect differentials. Book Sections Covered: Chapter 2.1 – 2.4.

Week 4: The first law of thermodynamics, applications to closed systems, analysis of cycles. Book Sections Covered: Chapter 4, Sections 2.5-2.7.

Week 5: The first law for open systems at steady state. Book Sections Covered: Chapter 4, Sections 4.1 – 4.11

Week 6: First law for transient problems, introduce second law, reversible and irreversible processes, entropy and disorder. Book Sections Covered: Chapter 4, Section 4.12; Chapter 5, Sections 5.1-5.3.

Week 7: The second law of thermodynamics, possible and impossible processes. Book Sections Covered: Chapters 5&6

Week 8: Consequences of the second law, availability, maximum work. Book Sections Covered: Chapters 6 & 7.

Week 9: General analysis of cycles, component efficiencies, cycle efficiency, sources of loss. Book sections covered: Section 2.6, Chapter 9

Week 10: Gas cycles; Brayton, Otto, Diesel, gas turbine. Book sections covered: Chapter 9

Week 11: Refrigeration gas cycles, begin vapor cycles, introduce Rankine cycle. Book sections covered: Chapter 8.

Week 12: Superheat and reheat, vapor refrigeration cycles. Book Sections Covered: Chapters 8 & 10.

Week 13: Modern Environmental Issues involving Thermodynamics. Reading material on class website.

Week 14: Ideal Gas Mixtures, Psychrometrics. Book Sections Covered: Chapters 12 & 13.

Grading: Quizzes 60%, Final Exam 40%

Homework:

Given the current availability of internet tools, evaluating students based on their ability to complete homework assignments is no longer viable. Therefore, there will be no graded homework in this class. Suggested homework problems for each week will be provided, along with solutions. These problems represent most of the skills required to demonstrate proficiency in thermodynamic analysis, and they will be similar to quiz and exam problems.

Quizzes:

Seven quizzes will be given during the term. These quizzes will begin promptly at the beginning of the class period and involve problems for which you will be assigned approximately 15-25 minutes. Only 5 of 7 quizzes will count towards the final grade. The two quizzes that are not graded should be considered as allowances for inevitable illnesses, interviews, special events conflicts, etc that will occur during the term. **No makeup or early quizzes will be given.** Quizzes will be on Fridays, roughly every other week. The material that will be tested on the quizzes covers up through the homework problems that were posted the previous week. The planned quiz dates are: Sept-13, Sept-27, Oct-11, Oct-25, Nov-8, Nov-22, Dec-6.

Quizzes will be closed book, closed notes. A set of formula sheets and tables will be provided that you can use for quizzes and the final exam. A non-programmable calculator is allowed. For approved models, see the list of NCEES allowed calculators for the FE exam (<https://www.prepfe.com/fe-exams/resources/calculators>). If your calculator is not on the list, come see me, and I'll approve it if appropriate.

First Homework Assignment:

From Chapter 1, problems, 4,8,9,19,22,30,36,38,41