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ME 40: Thermodynamics
Fall 2024
Format: In person
3 Units

Course Description: This course introduces the scientific principles that deal with energy conversion among different forms, such as heat, work, internal, electrical, and chemical energy. The physical science of heat and temperature, and their relations to energy and work, are analyzed on the basis of the fundamental thermodynamic laws. These principles are applied to various practical systems, including heat engines, refrigeration cycles, and air conditioning systems.

Our first lecture will be on September 4, 2024.
There will be NO lectures on August 28th, 2024 and August 30th, 2024.

Objectives:

I. *Knowledge:* Write the first and second laws of thermodynamics.
II. *Comprehension*: Describe the first and second laws in the student's own language.
III. *Application*: Solve simple single-answer problems using the first law.
IV. *Analysis*: Solve problems requiring both the first and second laws.
V. *Synthesis*: Develop schemes to improve the efficiency or performance of thermodynamic systems, e.g., compressors, turbines, heat pumps, etc.
VI. *Evaluation*: Determine and describe second law fallacies in proposed power cycles.
VII. *Evaluation*: Judge when classical thermodynamics is not the appropriate analysis tool.
VIII. *Evaluation*: Find and correct errors in the student's own solutions and in those of others.
IX. *Analysis and Evaluation*: Search appropriate databases and the literature to find required thermodynamic data, and if the data are not available the student can select appropriate procedures and predict the values of the data.
X. *Knowledge*: Briefly outline the history of the field of thermodynamics.

Instructor: Prof. Thomas Schutzius; email: tschutzius@berkeley.edu
Office Hours and Location: Friday 12:00-1:00 pm, 6107 Etcheverry Hall

Teaching Support Staff
Head GSI
Andrew Kokubun, kokubunandrew@berkeley.edu
Office Hours: [day] [time] [1st floor Hesse Hall]

	Reader Thomas Yu, thomaszy@berkeley.edu
	Emails to course staff: Begin subject line with "ME40: …" Messages on Canvas are not regularly monitored. Email is best for communication.
Required Text:	Çengel and Boles, *Thermodynamics: An Engineering Approach*, **10th Edition** Other recent editions may be acceptable (e.g., 7th, 8th, or 9th), but it is your responsibility to determine the correct homework problems and readings if they do not match up.
Lecture:	Monday, Wednesday, Friday at 3:00 pm-4:00 pm in Hearst Mining 390 There may also be a video playlist for each lecture. Please watch the video playlist before attending live lecture or section.
Discussions:	101: Friday, 11:00 am – 12:00 pm in Etcheverry 1165 102: Thursday 5:00 pm – 6:00 pm in Etcheverry 1165 103: Tuesday 5:00 pm – 6:00 pm in Etcheverry 1165
Website	All teaching material is available for download from this link: https://bcourses.berkeley.edu/courses/1535193

Grading		
	Midterm 1	Worth 40 points
	Midterm 2	Worth 40 points
	Final Exam	Worth 70 points
	One Project	Worth 20 points
	Homework	Worth 30 points (there are 12 homework assignments)
	Total of 200 points.	In a typical semester, >70% of students taking the course for a letter grade will receive a B- or higher.

Attendance	Attendance at lectures and discussions is expected not required.
Homework:	We usually will use PrairieLearn for homework submission and grading, and for these homework, retakes are allowed with no penalty for number of attempts. Must submit a document that shows your work for full credit. Depending on the content, we may ask for handwritten homework to be submitted, and in this case, we will only grade a subset of the problems and retakes are not allowed.

Midterm 1: 1 hour. Closed book and notes. We will use the Computer-based Testing Facility (CBTF) to do this assessment. Please read their rules here.

See Lecture 1a slides for date.

You may be required to take the Computer-based Testing Facility (CBTF) Orientation Quiz before the exam.

Midterm 2: 1 hour. Closed book and notes. Programmable calculator (non-transmittable) and 2 letter-sized sheets summary (8.5" x 11", double-sided) for the exam is permitted.

See Lecture 1a slides for date.

Note: We may opt to conduct part or all of the Midterm exam through PrairieLearn and details on the time allowed and learning materials would be communicated well in advance of the assessment. You may be required to take the CBTF Orientation Quiz before the exam.

Final: 3 hours. Closed book and notes. Programmable calculator (non-transmittable) and 3 letter-sized sheets summary (8.5" x 11", double-sided) for this exam is permitted.

Note: We may opt to conduct part of the Final exam through PrairieLearn and details on the time allowed and learning materials would be communicated well in advance of the assessment. You may be required to take the CBTF Orientation Quiz before the exam.

Project: The project is a larger assignment intended to combine ideas from the course in interesting ways. You are allowed and encouraged to pair with a partner. You may also work alone on the project. Projects are graded on correctness. Creativity is encouraged. See Lecture 1a slides for posting and due dates.

Exam Recovery: It is possible to recover points lost in the midterm through improved performance on the final exam. This is consistent with the principle of testing for proficiency. Your midterm percentages will be calculated as:

$$M_{1,\text{final}} = \max\left(M_{1,\text{original}} * 0.6 + \text{Final} * 0.4\right)$$
$$M_{2,\text{final}} = \max\left(M_{2,\text{original}} * 0.6 + \text{Final} * 0.4\right)$$

For example, if you received 80% on midterm 1, 50% on midterm 2, and 75% on the final, your midterm scores would be:

$$M_{1,\text{final}} = \max(0.8 * 0.6 + 0.75 * 0.4) = 0.80$$

$$M_{2,\text{final}} = \max(0.5 * 0.6 + 0.75 * 0.4) = 0.60$$

Regrades:	Any serious concerns about grading should be addressed to the Instructor, not the GSIs or Reader, within seven days of receiving the graded homework, quiz, or exam. Please include a brief written explanation of your concern. Re-graded scores may increase, decrease, or remain the same. The instructor reserves the right to regrade the other problems on the homework, quiz, or exam too.
Absences, Late Work, and Make-ups:	Lectures: Ask a classmate for the notes. Homework: Homework may be turned in one week late for half credit. Exams: Missing an exam will result in a zero grade for that exam unless alternative arrangements are made with the instructor prior to the exam. (Exceptions may be made for severe medical or family emergencies.) When granted, makeup exams may be oral or written.
Other Expectations:	Questions are encouraged. Silence your cellphones. Treat your colleagues, Reader, GSIs, and Instructor with respect. No food or drinks, except for water.
Cheating:	Please review the Berkeley Campus Code of Student Conduct.
Student with Disabilities	If you require course accommodations due to a physical, emotional, or learning disability, contact UC Berkeley's Disabled Students' Program (DSP). Notify the instructor and GSI through course email of the accommodations you would like to use. You must have a Letter of Accommodation on file with UC Berkeley to have accommodations made in the course.
Other	Due to travel, several lectures may be pre-recorded and uploaded or someone else may deliver the lecture. You will be notified well in advance of those dates.
Parting Thought	Grades and penalties are not the purpose of this course. We genuinely just want you to learn. All of us are very excited to be teaching ME40 this semester and look forward to meeting such a large and enthusiastic group of students!