

ES2310-40 Thermodynamics
Summer 2022 Syllabus
College of Engineering and Applied Science
University of Wyoming

Instructor: Ian Hammontree
Time/Place: Online (No meetings, course website on WyoCourses)
Office/Phone: TBD
Email: ihammont@uwyo.edu
Announcements: Check your University email and the course website **regularly**
Office Hours: Tuesday/Thursday 1-3 PM, and available via Zoom by appointment with 24-hour notice (see section “Expectations for the Instructor”)

Required Items:

- **Course text:** “Thermodynamics: An Engineering Approach”, Y. A. Çengel, M. A. Boles, and M. Kanoglu, 9th Edition, McGraw-Hill Education, New York, NY.
- Accompanying Property Tables Booklet
- Scientific calculator with the capability of trigonometric and logarithm functions along with the capability to solve simultaneous linear equations
- Exams will be given over Canvas, and you will be required to submit written work as a scanned PDF document. Three free software apps you can download onto Android or Apple smartphones from Google and Apple stores include the following: Genius Scan, CamScanner, and Adobe Scan. You may also want to consider purchasing an inexpensive printer; many students seem to find it easier to download the exams, solve directly on the pages, then scan the solutions.

Prerequisites: Students must have successfully completed ES2120 (Dynamics) **or** PHYS1210 (Physics I), **and** MATH2210 (Calculus III) with a grade of “C” or better.

Course Description: An introduction to macroscopic systems involving energy and its various forms. Fundamental concepts include energy, mass, and entropy balances, pure substances and availability, and reversible and irreversible processes.

Expectations for the Student:

- Engage with all course materials (lecture videos, example videos, assigned readings, etc...). The course material is cumulative; if you fall behind you will struggle as the course goes along.
- Seek assistance from the instructor when you are having difficulties – I will do my best to be available to you but I won’t know you’re struggling if you don’t tell me!
- Communicate professionally. Whenever you send class-related email or messages, please include a clear, specific subject line and use the body of the email or message to explain the purpose for the email and any attached materials.
- Notify the instructor if you will be unable to take an exam due to an excused absence, and go through the proper channels to ensure you have an opportunity for a make-up exam.

- Allow yourself sufficient time to absorb the material and work practice problems (this is a summer course with a 6-week duration, we will be moving fast!).
- Be honest and ethical in your dealings with the instructor and with your peers (no academic dishonesty).

Expectations for the Instructor:

- Prepare lecture videos discussing basic concepts and showing simple derivations.
- Prepare videos of example problems that discuss problem solving strategies and simplifying assumptions.
- Provide practice problems and the solutions to those practice problems.
- Be available through appointment office hours to answer questions, address concerns, and provide advice and insight – I will try my best to be available on short notice, but I guarantee I will meet with you if you schedule a time at least 24 hours in advance.

Assignments:

Because this is a summer course, and because Thermodynamics is a fairly complicated course with a high number of new concepts, vocabulary, and problem-solving strategies to learn, there is too much material to learn in a short amount of time to allow for homework assignments and exams. As a result, the only assignments given in this course will be three exams (see below for what each exam will cover). As of now, exams are expected to be open book/open note, and given online through WyoCourses, with a 24-hour window available to start the exam on the date listed in the syllabus, and a 90-minute time limit once the exam is started. All exams are to be completed alone, without assistance or collaboration – evidence suggesting otherwise will be treated as academic dishonesty. Note that exam policies are subject to change. To prepare for the exams, it is suggested that you read the sections listed in the syllabus, work the provided practice problems, and work any additional problems you wish, from the listed chapters in your textbook (each listed topic corresponds to one or two chapters from the textbook) and seek help from the instructor as needed.

Exams cannot be made up except in cases of approved absences. Approved absences are defined in UW Regulation 2-108.

Major Topics Covered:

Introduction and General Energy Analysis (Chapters 1 and 2)

Properties of Pure Substances (Chapter 3)

Analysis of Closed Systems (Chapter 4)

EXAM 1 – Friday, July 15

Analysis of Open Systems (Chapter 5)

Second Law of Thermodynamics and Entropy (Chapters 6 and 7)

EXAM 2 – Friday, July 29

Refrigeration Cycles (Chapter 11)
Gas Power Cycles (Chapter 9)
Vapor and Combined Power Cycles (Chapter 10)

EXAM 3 (FINAL EXAM) – Friday, August, 12

Note: The Final Exam is comprehensive, but special emphasis will be given to the materials covered after EXAM 2.

Grades: The different assignments in this course will be weighted for grading purposes according to this scale: Exam 1: 30%, Exam 2: 30%, Exam 3 (final exam): 40%.

Final grades for this course will be assigned following this scale:

A > 90%
80% < B < 90%
70% < C < 80%
60% < D < 70%
F < 60%

Course Learning Objectives

1. Understand the course vocabulary (e.g., heat, work, system, process, cycle, enthalpy, etc...)
2. Understand how to determine volumetric and thermodynamic properties through the use of tables, diagrams, equations of state or through other calculations ($\Delta h = c_p \Delta T$, $\Delta u = c_v \Delta T$). Understand phase change phenomena, and P-v and T-s diagrams. Assess whether a gas can be treated as ideal through familiarity with the general compressibility chart, and calculate the volume of a gas that does not exhibit ideal behavior
3. Understand various forms of energy and their relationships to heat and work. Recognize a control mass or open system problem, label a control volume, and simplify the general form of the open system energy equation while identifying all necessary assumptions. Be able to use a differential energy balance. Understand unsteady applications for a control volume. Be able to evaluate boundary (PdV) work.
4. Understand entropy and its use in solving engineering problems. Understand the 2nd Law of Thermodynamics. Understand the Carnot Cycle and its implications.
5. Model various applications with irreversibilities, including piston-cylinder engines, pumps, gas turbines, simple Rankine steam cycles, and refrigeration cycles.

Course Behavior Policy

At all times, treat your presence in this course as you would a job. You will be respectful towards your classmates and instructor. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere. As the instructor, I have the right to dismiss you from our electronic forum or any other area where disruptive behavior occurs.

Classroom Statement on Diversity

The University of Wyoming values an educational environment that is diverse, equitable, and inclusive. The diversity that students and faculty bring to class, including age, country of origin, culture, disability, economic class, ethnicity, gender identity, immigration status, linguistic, political affiliation, race, religion, sexual orientation, veteran status, worldview, and other social and cultural diversity is valued, respected, and considered a source for learning.

Disability Support

The University of Wyoming is committed to provided equitable access to learning opportunities for all students. If you have a disability, including but not limited to physical, learning, sensory or psychological disabilities, and would like to request accommodations in this course due to your disability, please register with and provide documentation of your disability as soon as possible to Disability Support Services (DSS), Room 128 Knight Hall. You may also contact DSS at (307) 766-3073 or udss@uwyo.edu. It is in the student's best interest to request accommodations within the first week of classes, understanding that accommodations are not retroactive. Visit the DSS website for more information at: www.uwyo.edu/udss

Academic Dishonesty

Academic dishonesty will not be tolerated in this class. Cases of academic dishonesty will be treated in accordance with UW Regulation 2-114. The penalties for academic dishonesty can include, at my discretion, an "F" on an exam, an "F" on the class component exercise, and/or an "F" in the entire course. Academic dishonesty means anything that represents someone else's ideas as your own without attribution. It is intellectual theft – stealing – and includes (but is not limited to) unapproved assistance on examinations, plagiarism (use of any amount of another person's writings, blog posts, publications, and other materials without attributing that material to that person with citations), or fabrication of referenced information. Facilitation of another person's academic dishonesty is also considered academic dishonesty and will be treated identically.

Duty to Report

UW faculty are committed to supporting students and upholding the University's non-discrimination policy. Under Title IX, discrimination based upon sex and gender is prohibited. If you experience an incident of sex- or gender-based discrimination, we encourage you to report it. While you may talk to a faculty member, understand that as a "Responsible Employee" of the University, the faculty member MUST report information you share about the incident to the university's Title IX Coordinator (you may choose whether you or anyone involved is identified by name). If you would like to speak with someone who may be able to afford you privacy or confidentiality, there are people who can meet with you. Faculty can help direct you or you may find info about UW policy and resources at <http://www.uwyo.edu/reportit>

You do not have to go through this experience alone. Assistance and resources are available, and you are not required to make a formal complaint or participate in an investigation to access them.

Substantive changes to syllabus

All deadlines, requirements, and course structure are subject to change if deemed necessary by the instructor. Students will be notified on our WyoCourses page announcement and via email of these changes.

Student Resources

DISABILITY SUPPORT SERVICES: udss@uwyo.edu, 766-3073, 128 Knight Hall,

www.uwyo.edu/udss

COUNSELING CENTER: uccstaff@uwyo.edu, 766-2187, 766-8989 (After hours), 341 Knight Hall, www.uwyo.edu/ucc

ACADEMIC AFFAIRS: 766-4286, 312 Old Main, www.uwyo.edu/acadaffairs

DEAN OF STUDENTS OFFICE: dos@uwyo.edu, 766-3296, 128 Knight Hall, www.uwyo.edu/dos

UW POLICE DEPARTMENT: uwpd@uwyo.edu, 766-5179, 1426 E Flint St, www.uwyo.edu/uwpd

STUDENT CODE OF CONDUCT WEBSITE: www.uwyo.edu/dos/conduct