ME 3322 Syllabus

Thermodynamics – Section D, 3 Credits

Fall 2026

Instructor Information

Instructor: Prof. Bachir El Fil

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Office: Love 237

Office Hours: [Days and times TBD] (in-person, Love 237). Email to schedule an appointment if you cannot attend these office hours. Graders, recitation leader, and tutoring contacts will be announced on Canvas during the first week of class.

General Course Information

Lecture Times: Mondays and Wednesdays, 9:30 – 10:45 AM

Location: MRDC 2407

Class Website: https://canvas.gatech.edu/

Prerequisites: PHYS 2211 or 2231 & MATH 24X3 or 25X2

Description

Introduction to thermodynamics, including thermodynamic properties, energy and mass conservation, entropy and second-law analysis. The course also covers the thermodynamic analysis of power, refrigeration, and heat pump systems. Together these topics provide the foundation engineers use to analyze and design real energy-conversion systems.

Course Topics

Part I

- Conservation of mass, conservation of energy, and the 1st Law of Thermodynamics
- Definitions: property, state, closed and open systems, temperature, pressure, work interactions, and heat transfer
- Forms of energy: kinetic, potential, internal, work, and heat

Part II

- 2nd Law of Thermodynamics, Kelvin–Planck and Clausius statements, Clausius inequality, entropy, and TdS relations
- 2nd-law analysis, irreversibility, and exergy

Part III

- Properties of pure substances, equilibrium diagrams, quality, ideal gas and incompressible substance treatments
- Air-standard cycles: Otto, diesel, Brayton, Stirling, Rankine, and Carnot; regeneration, intercooling, reheating, and component efficiencies

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

- Apply the basic principles of thermodynamics, including conservation of mass, conservation of energy, and the 2nd law, as well as work interaction, heat transfer, and the thermodynamic properties of compressible substances.

- Formulate and solve engineering problems involving both steady-state and transient processes in open and closed systems by determining thermodynamic properties.
- Perform 2nd-law analysis on thermodynamic systems.
- Perform power and refrigeration/heat pump cycle analyses.

Required Course Materials

Moran, M. J., Shapiro, H. N., Boettner, D. D., & Bailey, M. B. Principles of Engineering Thermodynamics. Wiley. ISBN: 979-8-203-06962-7 (any edition 7+).

Grading Policy

Final grades will follow the standard Georgia Tech scale (no +/- grades): A ≥ 90, B = 80–89, C = 70–79, D = 60–69, F < 60.

Grade Breakdown

Component	Weight	Notes
Homework (P-sets)	17%	10 problem sets; due at beginning of class time.
Attendance & Participation	3%	Attendance required for on-campus students
Midterm 1	20%	In-class, [date TBD ~Week 5]
Midterm 2	25%	In-class, [date TBD ~Week 10]
Final Exam	35%	In-class during the scheduled final-exam slot

Exam dates will be announced during the first week of class.

Description of Graded Components

Homework (P-sets).
Approximately 10 problem sets will be assigned over the semester, each posted roughly one week before its due date. Homework is due at 11:59 PM ET on the date listed; no late homework will be accepted. For full credit, follow the problem-solving methodology in Section 1.9 of the textbook (clear schematic, list of assumptions, balanced equations, step-by-step solution, and a sanity check). You may work in groups, but the work you turn in must be your own.

Attendance & Participation.
Attendance is required and highly encouraged for on-campus students. Active participation—asking questions, contributing to discussions, and engaging with in-class problem-solving—is expected in every class.

Midterms.
Two midterm exams, each 90 min + 10 min grace period. A sample will be given for the first midterm. Formula sheets will be provided; both midterms are closed-book closed-notes exams. Each midterm focuses on material covered since the previous exam, but concepts are cumulative, so earlier topics will reappear. You may bring (1) a calculator, and (2) a pencil/pen and eraser. Cell phones, smartwatches, smart glasses, and laptops are not permitted during exams.

Final Exam.
The final exam is comprehensive and closed-book closed-notes. The same materials allowed for the midterms (calculator, writing utensils) may be used. The exam meets during the scheduled final-exam slot for the full period.

Course Policies

Attendance and Participation

Attendance is strongly recommended; if you miss a lecture, it is your responsibility to obtain notes from a classmate and to ask about homework. Random attendance checks will contribute to the 3% participation grade. If you must miss class for an approved reason (illness, religious observance, or an Institute-approved activity), notify the instructor by email as soon as possible so we can make a plan for catching up. Review the Institute's expectations and restrictions related to attendance, including information about excused absences, in the GT Catalog.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations. The perception of non-compliance with the guidelines for in-class exams or with the AI policy below will result in a non-disputable 0 on that assignment, midterm, or final.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your needs and to obtain an accommodations letter. Please also email me as soon as possible so we can set up a time to discuss your learning needs and accommodations.

Student–Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Collaboration, Group Work, and Use of Generative AI

You are allowed to work in groups on all homework, but any work you turn in must be your own. In-class midterms and the final are to be only your own work; you may not receive or offer help to other students. You may only use the resources enumerated above (calculator, pencil/pen, eraser) during the midterms and final.

The use of AI-based tools is permitted as a learning aid (e.g., to clarify concepts or check understanding), but all submitted work must reflect your own reasoning and original effort. Using AI to generate solutions, explanations, or text that you present as your own is considered a violation of academic integrity. The perception of non-compliance with these guidelines will result in a non-disputable 0 on that assignment, midterm, or final.

Extensions, Late Assignments, & Missed Exams

Homework is due at 11:59 PM ET on the date listed; no late homework will be accepted. Make-up midterms and finals are granted only for documented illness or approved Institute activities, and must be arranged with the instructor as far in advance as possible.

Student Use of Mobile Devices in the Classroom

The use of cell phones is not allowed during lectures, midterms, or the final. Laptops and tablets may be used during lecture for note-taking and working through in-class problems, but not for activities

unrelated to the course. During exams, all electronic devices other than a non-graphing calculator must be put away.

Inclement Weather and Digital Learning Days

If a weather-related event affects campus operations, the instructor may cancel class or pivot to a digital learning day in accordance with the Institute's Digital Learning Days policy. In that case, lecture will be conducted synchronously over the Canvas Zoom link and any due dates that fall on the affected day will shift to the next class meeting. Watch your Georgia Tech email and Canvas announcements for updates.

How to Succeed in This Course

Plan to spend a minimum of 6 hours per week on this course outside of class. I strongly recommend you spend roughly 2 hours per day, 6–7 days per week, on this material. This includes time to read the text, study solved examples, and work assigned homework. You should be working on homework throughout the week; do not try to solve all the assigned problems the evening before they are due—you cannot learn the material well by cramming. If you get behind, you will have difficulty catching up.

Campus Resources for Students

Undergraduate Student Academic Success Resources

A list of resources for undergraduate students' academic success and information about advising can be found at Success at Tech. Academic Success and Advising provides free support for your courses—students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. Visit success.gatech.edu/tutoring or email tutoring@gatech.edu.

Student Well-Being

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness-related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being. If you are struggling with the workload, your health, or anything else, please reach out—I would much rather hear from you early than learn about it after a missed assignment.