



Thermodynamics (ENGR 234)

Charles V. Schaefer, Jr. School of Engineering & Science

Spring 2023

Course:	ENGR 234 Sections: A, C, RA, RB, RC, and RD		
Lecture Hours & Room:	A: MW	9 AM – 9:50 AM	Room: Kidde 228
	C: MW	12 PM – 12:50 PM	Room: Burchard 111
Recitation Hours & Room:	RA: F	9 AM – 9:50 AM	Room: EAS 222
	RB: T	12:30 PM – 1:20 PM	Room: McLean 211
	RC: F	12 PM – 12:50 PM	Room: EAS 230
	RD: T	9:30 AM – 10:20 AM	Room: Gateway S 122

Instructor	Section	Office #	Office Hours	Contact info
Chang-Hwan Choi	C, RC	C205	MWF 1-2 PM or by appointment! In-person and Zoom @ https://stevens.zoom.us/j/8119755935	cchoi@stevens.edu (201) 216-5579
Zahra Pournorouz	A, RA, RB	EAS 322	MW 11 AM – 12 PM, and R 1 PM – 2 PM Or by appointment! In-person and Zoom @ https://stevens.zoom.us/j/98472702463	zpournor@stevens.edu (201) 216-8052
Younna Mahmoud	RD	Carnegie 2nd Floor Mezzanine Area	WR 12 PM - 1PM Or by appointment! In-person and Zoom @ https://stevens.zoom.us/j/93071195371	yelsayed@stevens.edu

Textbooks (recommended): Thermodynamics: An Engineering Approach, 9th Ed. Yunus A. Çengel & Michael A. Boles ISBN:-13 978-1259822674

Course Description: To gain an understanding of the basic concepts and laws of thermodynamics and the application of these laws or principles to simple engineering technology systems. Basic concepts and definitions of thermodynamics, properties of pure substance, work and heat, the first law of thermodynamics, the second law of thermodynamics, entropy, thermodynamics of gases, vapors, and liquids in various non-flow and flow processes.

Grading Policy:

Midterm Tests	30% (15% each)
Final Test	20%
Homework	10%
Recitations	30% (20% Group Questions and 10% Project)
Quiz	10%

Grading Scale:

A (93%), A- (90%),
B+ (87%), B (83%), B- (80%),
C+ (77%), C (73%), C- (70%),
D+ (67%), D (60%)

Objective: Upon completion of the course, students are expected to:

1. Determine the thermodynamic properties of solids, liquids and ideal gases and their changes in isothermal, isobaric, isochoric or isentropic processes.
2. Transform problem statements into their graphical and mathematical representations and use a methodical approach to problem-solving.
3. Utilize mass and energy balances to determine the characteristics of steady-flow devices undergoing simple processes and cycles.
4. Describe in words and by using sketches of major thermodynamic devices and systems such as nozzles, diffusers, pumps, compressors, turbines, and throttling valves.
5. Apply the second law of thermodynamics to cycles and cyclic devices and determine the efficiencies of reversible heat engines, refrigerators, and heat pumps.
6. Calculate entropy changes that take place during processes for pure substances and apply the entropy balance to various systems.

Students will also exhibit the following learning objectives from the ABET ETAC criteria:

SO #B: Ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;

SO #C: Ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;

SO #F: Ability to identify, analyze, and solve broadly-defined engineering technology problems;

Format and Structure

- Lecture classes will generally consist of an active lecture in which the instructor will deliver course material and students have the chance to ask questions and complete related activities.
- The recitation classes will feature a workshop format with group problem-solving under guidance from the instructor & TA. Students will break into small groups and work together to solve these problems.
- Class material will be posted to Canvas for viewing later if required or for those unable to join.
- Office hours will be used to supplement student learning and should be used for further discussion of course material with the instructor/TA.

Classroom Procedures and Policies: No food is allowed. Please be on time for the class, either face-to-face or online. Using laptops/cellphones are not permitted except for accessing the book, note taking, and/or calculations. Cell phones should be on silent mode and no texting is allowed. Questions and discussions involving the entire class are encouraged. Please never feel shy to ask questions.

Attendance: Students should arrive at the classroom on time. DO NOT KNOCK.

If you must miss a class, please email me beforehand. Don't forget to check with your group members and/or me for missed notes, announcements, and/or assignments.

Attendance is mandatory and will be recorded per Title IV Federal Aid requirements.

On-Line Access: Supporting material, homework assignments, and grades are available on Canvas. Announcements, group emails, and individual student emails will be sent through the Canvas system which uses your official Stevens email account.

Homework: Homework is intended to reinforce course material covered in the lecture. I will assign Homework for each chapter. Practicing the Homework will help you to understand the material better. Homework must be completed using the Given, Find, Solution, Answer (GFSa) format. Do not omit steps! You will likely receive partial credit for a problem even if the final answer is wrong. However, it is impossible to give credit for the work not shown. All submissions are online through Canvas. You can either write on paper and submit pictures or scanned copies or submit digital copies if you are using iPad notes or etc. Late submissions are allowed for only

three days after the due date with a 20% reduction.

Recitations: Recitations for this course are problem-solving sessions to reinforce the course material and to facilitate independent homework solutions. During this time, we will solve additional problems, similar to the homework assignments. We will also have a project throughout the semester to reinforce creativity. All submissions are online through Canvas.

Exam and Quiz: Exams will be comprehensive up through material covered either from the first day of class through the previous meeting or material covered since the previous exam through the previous meeting. See Table 1 for exam dates. If you know you will be unable to attend a scheduled exam, prior arrangements must be made with the instructor to take the exam at a different time. Makeup exams not arranged prior to the originally scheduled time will not be allowed without a valid reason. Makeup exams will be only arranged if you are away on a completion (Athlete students), conference (letter of confirmation is required), for Medical reasons (Doctor's note required), or family emergency (documentation is required). If you don't show up for the scheduled agreed-upon makeup exam, there will be no second makeup exam and you have to agree with the instructors' alternatives. You will be provided a formula page and the necessary tables for the exam.

Quizzes are assigned after each chapter is done (one quiz per chapter), and they are purely conceptual and theoretical. Quizzes are online through Canvas and will be open for three days after publication. You will have two attempts per quiz.

Academic Integrity

Undergraduate Honor System: Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the [Honor System Constitution](#). More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at <http://web.stevens.edu/honor/>.

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

Learning Accommodations

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/office-disability-services>. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone 201-216-3748.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

Inclusivity

Name and Pronoun Usage: As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement: Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

Mental Health Resources

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). CAPS is open daily from 9:00 am – 5:00 pm M-F. Evening hours are available by appointment in the Fall / Spring semesters and up-to-date information regarding the availability of evening appointments can be found by visiting www.stevens.edu/CAPS. To schedule an appointment, call 201-216-5177.

Due to the pandemic, in-person appointments may be limited until further notice. Up-to-date information about the availability of in-person services can be found at www.stevens.edu/CAPS. Teletherapy (therapy via secure video platform) is available to registered students physically located in the states of New York or New Jersey. Students located outside of NY / NJ are encouraged to pursue local treatment through their personal health insurance. To learn more about the process of finding a therapist please visit the CAPS webpage on [Seeking Help Off-Campus](#).

Emergency Information

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year-round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is not urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.

Tentative Schedule: The tentative course schedule follows; however, I reserve the right to change or move topics and due dates as necessary.

Week	Lecture Dates	Lecture Activities	Recitation Activities
1	W – 01/18	Syllabus / Introductions / meet and greet	No recitation
2	M – 01/23 W – 01/25	Introduction, Dimensions, and Units – Ch 1 Basic Concepts, Definitions and Pressure – Ch 1	Groups Pressure Workshop

3	M – 01/30 W – 02/01	The 1st law, Work & Heat – Ch 2 Energy & Energy Transfer – Ch 2	Chapter 2 Workshop
4	M – 02/06 W – 02/08	Properties of Pure Substances – Ch 3 Properties Tables (Steam) – Ch 3	Properties Workshop
5	M – 02/13 W – 02/15	Properties Tables (R-134a) – Ch 3 Review Session for Exam I	Chapter 3 workshop
6	W – 02/22	Monday Class Schedule: Exam 1 (chapters 1, 2, and 3)	Group Q#1
7	M – 02/27 W – 03/01	Energy Analysis of Closed Systems – Ch 4 Energy Analysis of Closed Systems – Ch 4	Chapter 4 Workshop
8	M – 03/06 W – 03/08	Specific Heats and Ideal gases – Ch 4 Energy Analysis of Control Volumes – Ch 5	Chapter 4&5 workshop
9	M – 03/13 W – 03/15	Spring Recess	
10	M – 03/20 W – 03/22	Energy analysis of steady-flow devices – Ch 5 Energy analysis of steady-flow devices – Ch 5	Chapter 5 workshop
11	M – 03/27 W – 03/29	Review Session for Exam II Exam II (chapters 4 and 5)	Group Q#2
12	M – 04/03 W – 04/05	Refrigerators and heat pumps – Ch 6 Reversibility, Carnot efficiency – Ch 6	Chapter 6 workshop No recitation for RA and RC
13	M – 04/10 W – 04/12	Entropy – Ch 7 Reversible & isentropic processes – Ch 7	Chapter 7 workshop (6&7 for RA and RC)
14	M – 04/17 W – 04/19	Rankine Cycles – Ch 10 Refrigeration Cycles – Ch 11	Chapter 10 and 11 workshop

15	M – 04/24 W – 04/26	Cycle Examples for Ch 10 and 11	Project Presentations
16	M – 05/01 W – 05/03	Review Sessions for Final Exam	Project Presentations RA and RC will present on May 4 (Friday Class Schedule)
<p>Last Class Day: Thursday, May 4, 2023 Reading Day: Friday, May 5, 2023</p> <p>Final Exam Date: TBD</p>			