ESC 321: Engineering Thermodynamics I (3 credits)
Spring 2021

Instructor: Dr. Maryam Younessi
Email: m.younessisinaki@csuohio.edu

Lectures: Synchronous
Mon, Wed, Fri 9:10 AM-10:00 AM

Asynchronous
Videos on Blackboard
Office hours: Wed, Thu 10:00 AM-11:30 AM

TA: Andrew Ross, a.ross18@vikes.csuohio.edu

Prerequisite: MTH 182

Catalog Description

Classical thermodynamic approach to systems and to control volumes containing simple compressible substances; establishment of important thermodynamic properties and their application to the zeroth, first and second laws analysis of systems and control volumes; analysis of ideal and actual gas cycles.

Textbook

"Thermodynamics: An Engineering Approach", 8th or 9th Edition
Yunus A. Çengel and Michael A. Boles

Reference

"Fundamentals of Engineering Thermodynamics," 8th Edition,
Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey

Objectives of the Course

Thermodynamics I is a fundamental course. It is one of the main topics of the engineering field known as thermal sciences. The knowledge and skills that you will acquire in this course will be applicable in several other courses and many engineering problems.

Thermodynamics I is a challenging course. There is a wide range of materials that you will need to master. Therefore, it is necessary to dedicate an adequate amount of time for this course. However, you will find this course enjoyable and interesting, since in every step you will experience solving real life engineering problems using the concepts learned.

If you learn the concepts and take the time to obtain an engineering feeling of the problems to make sound assumptions, not only will you score well, but you will also gain a valuable knowledge that you will certainly use in your future.

The course is designed to:

1. Provide students with an understanding of the fundamental principles of thermodynamics;
2. Encourage creative thinking and conceptual comprehension of subject matter;
3. Prepare students in problem solving methodology and the use of tabulated property data;
4. Develop necessary skills to effectively perform practical system analysis and design.

Expected Outcomes

When you complete this course, you should be able to:

1- Determine properties of a variety of materials from either tabular data or equations;
2- Properly define thermodynamic systems to permit analysis of thermal devices;
3- Apply the conservation of mass to a variety of systems;
4- Apply the First Law of Thermodynamics to a variety of devices and situations;
5- Apply the Second Law of Thermodynamics to a variety of devices and situations;
6- Have a realistic feel of the effect of the Laws of thermodynamics in engineering applications.

ABET Outcomes

Outcomes **(What students are expected to know at the time of graduation)**	**Course Contribution**
(0) An ability to demonstrate the principles of engineering science, college level mathematics, and the basic sciences	Minor
(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics **Performance Indicators:** - Evaluate properties of pure substances - Apply the first law of thermodynamics - Apply the second law of thermodynamics	**Major**
(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Minor
(3) An ability to communicate effectively with a range of audiences	Minor
(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Minor
(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Minor
(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	-
(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Minor

Topics Covered

Chapter 1- Introduction and Basic Concepts (3 hours)

Chapter 2- Energy, Energy Transfer, Energy Balance (2 hours)

Chapter 3- Properties of Pure Substances (7 hours)

Chapter 4- Energy Analysis of Closed Systems (4 hours)

Review/First Mid-Term (Ch. 1 to 4) (3 hours) **(March 12, 8:15 to 10:00 AM)**

Chapter 5- Mass and Energy Analysis of Control Volumes (6 hours)

Chapter 6- Second Law of Thermodynamics (3 hours)

Review/Second Mid-Term (Ch. 5, and 6) (3 hours) **(April 14, 8:15 to 10:00 AM)**

Chapter 7- Entropy (9 hours)

Chapter 9- Gas Cycles (4 hours)

Review/Final Exam (3 hours) **(Friday May 7, 8:00 AM to 10:00 AM)**

Lectures

Synchronous: The lectures will be via Zoom on Mondays, Wednesdays, and Fridays from 9:10 am to 10:00 am.

Asynchronous: The lecture will consist of videos that will be posted in Panopto (Blackboard). The link to each video and the schedule of each week will be available on the homepage of the course (Blackboard). Each video will be available for one week.

Grading:

1st mid-term exam	20%
2st mid-term exam	25%
Final exam	30%
Homework (Team)	15%
Quizzes/Attendance	10%
TOTAL	100%

There is no limit to the number of good grades in this course. If you know the material, attend all classes and do homework you should score well!

Grading Scale

	93.3% - 100% A	90.0% - 93.2% A-
86.6% - 89.9% B+	83.3% - 86.5% B	80.0% - 83.2% B-
76.6% - 79.9% C+	73.3% - 76.5% C	70.0% - 73.2% C-
60.0% - 69.9% D	0% - 59.9% F	

Exams

Two mid-term exams will be given during the semester. The exact exam dates will be announced two weeks prior to the exams. The final exam takes place during finals week. You can use a one-page cheat sheet, and print-outs of my presentations (theory). Solved problems and the electronic version of the book are not allowed during the exams. You will have access to the pdf files of the presentations and SI Tables during the exam.

All exams will be online tests (Blackboard). They will consist of several problems similar to a regular exam. However, they will be in two parts:

Part 1- Test: You will use Respondus Lockdown to access the test and type your final answers in Blackboard. This software will close all applications on your computer and record you with your webcam while you are taking the exam.

Part 2- Assignment: you will submit pictures of your solution through an assignment in Blackboard.

Download Respondus using the following link:
https://download.respondus.com/lockdown/download.php?id=492137130

If you don't have a webcam, you can borrow one from the University. There will be a mandatory mock test a few days before the first midterm exam.

Homework

The homework will consist of several problems posted on Blackboard. Each homework set is completed as a team of students, and only one set of solution is to be submitted per team through Blackboard by the due date. The solution to the homework problems will be posted a few days after they are due. Late homework will receive 10% less points per day and will not be accepted after the solution has been posted. It is the responsibility of each group member to **make sure that the homework is turned in on time**. Each member is **responsible for knowing how to solve all the problems assigned.** The TA will grade the homework. If you have questions about your homework grade, email her/him and CC me.

The submitted problems are expected to be **neat and readable** and the following format is required for each problem:

- **Group number**
- **Name of group members and their contribution**
- **Problem number**
  - **Known**
  - **Find**
  - **Schematics with data**
  - **List of assumptions**
  - **Properties**
  - **Analysis and results**

Always write the symbolic equations you are using in a problem before substituting the numerical values.

The team experience is in accordance with the outcomes submitted by the Department of Mechanical Engineering to ABET (Accreditation Board of Engineering and Technology), the

national board responsible for accrediting engineering and technology programs in the United States. The general rules regarding the "team" are as follows:

1. The students will form teams of **three to four members** during the first week of the semester.
2. All team members should **work together to solve all the problems.** Each team will submit **one set of solutions** and, if the contribution of all members is the same, each member of the team will receive the same grade for that assignment.
3. If an individual is dissatisfied with the team and wants to quit, he/she must petition the instructor for permission; if you do quit, you will have to link up with another group or work on your own.
4. If the group decides that one of the members is not pulling his/her weight in the process, that group may petition the instructor to "fire" that group member; if that person is fired, they must hook up with another team or they will have to work alone.

It is the responsibility of each group member to **make sure that the homework is turned in on time**. Each member is also **responsible for knowing how to solve all the problems assigned.**

If the grade of your midterm exam is less than 75%, you will not be allowed to work in a group anymore, and will have to work on your own.

Quizzes

During the semester, some quizzes will be assigned through Blackboard. These quizzes will be graded, and the grades will count toward the final grade. The quizzes are closed book and closed notes. Each quiz will be available to the students for 24 hours. You can take the quiz anytime during these 24 hours, however, you only have one attempt at each quiz. If you do not complete any of these quizzes, you will get zero for that quiz.

Attendance & Absence Policy

Synchronous: Participation in the Zoom meetings will count as attendance. Enter you full name when entering the Zoom meeting. The number of minutes of the student's participation will be used to calculate attendance. During some sessions, questions in form of polls will be asked. Students who do not answer these questions will be marked absent.

Asynchronous: Watching the videos posted on Blackboard will count as attendance. The percentage of each video completed will be considered to calculate attendance.

Academic Misconduct

You are expected to practice academic integrity in every aspect of this course and all other courses. Familiarize yourself with the CSU Student Conduct Code and the policies around academic misconduct, view at https://www.csuohio.edu/sites/default/files/3344-21-02_0.pdf. Students who engage in academic misconduct are subject to university disciplinary procedures, and will get an F for the final course grade.

Some forms of academic dishonesty:

Obtaining unauthorized information. Information is obtained dishonestly, for example, by copying graded homework assignments from another student, by working with another student

on a take-home test or homework when not specifically permitted to do so by the instructor, by looking at your notes or other written work during an examination when not specifically permitted to do so, or obtaining work from an online homework or exam warehouse.
Tendering of information. Students may not give or sell their work to another person who plans to submit it as his or her own. This includes giving their work to another student to be copied, sharing work when the instructor's directions were that work be completed independently, giving someone answers to exam questions during the exam, taking an exam and discussing its contents with students who will be taking the same exam, or giving or selling a term paper to another student.
Misrepresentation. Students misrepresent their work by handing in the work of someone else. Examples include: purchasing a paper from a term paper service; reproducing another person's paper, project, research, or examination (even with modifications) and submitting it as their own; having another student do their computer program, complete their design project, or complete their online quiz.
Bribery. Offering money or any item or service to a faculty member or any other person to gain academic advantage for yourself or another is dishonest.
Plagiarism. Unacknowledged use of the information, ideas, or phrasing of other writers is an offense comparable with theft and fraud, and it is so recognized by the copyright and intellectual work laws. Offenses of this kind are known as plagiarism.
Use of electronics. Using electronic devices such as cell phone, iPad, tablet, … during the exams is considered cheating.
Additional note: As part of the University's ongoing efforts to prevent cheating, and based on evidence of increased use of headphones and ear piece devices to permit cheating on exams, all students are required to display their ears for the duration of any exam. This policy may require students to tuck long hair behind ears or pull it into a ponytail or hair clip; remove hoods, caps or hats, or pull hats and caps up above ears; pull back headbands, beanies, hijabs, bandanas or other head coverings to display the student's ears. Any student not complying with this policy will, after a warning, be issued a zero on the exam. Students with concerns about their compliance with this policy must speak to me before the final.

Office of Disability Services

In accordance with federal law, if you have a documented disability, you may be eligible to request accommodations from The Office of Disability and Testing Services. For more information regarding available accommodations and registration, please call 216.687.2015 or stop by their office in Rhodes West 210. Please keep in mind that accommodations are not retroactive.

Final Notes

To get a good grade, follow these suggestions:

- Follow the examples solved in class
- Try to solve the homework problems
- Think about the equations and problems and their physical meaning
- Write neatly and be organized for homework and exams