

MAE 3310 Section 002: Thermodynamics I
Spring 2017
Tues Thurs 8:00am – 9:20am, WH402

Thermodynamics I is a fundamental course that teaches concepts of energy and thermodynamics. This course provides the basic skills and tools necessary in designing and analyzing *real-life engineering systems*. This course will also serve as preparation for other advanced courses in thermodynamics, energy conversion, heat transfer, etc. Emphasis in this course will be on *engineering concepts*.

Class location and timing: Tues, Thurs 8:00am – 9:20am, WH402.

Class Website: elearn.uta.edu (Blackboard)

Instructor: Dr. Ankur Jain

Instructor's Contact Information: Engineering Lab Building (ELB), Rm 203, email: jaina@uta.edu, (Ph.) 817-272-9338

Instructor's Research Lab Website: www.uta.edu/mtl

Instructor Faculty Profile: <https://www.uta.edu/profiles/ankur-jain>

Graduate Teaching Assistant: Hardik Prajapati
(hardikkumarmang.prajapati@mavs.uta.edu)

Office Hours: Instructor: Tues, Thurs 1:30pm-2:15pm, ELB-203; GTA Office Hours: Mon 2:30-3:15 pm in WH308 (Problem Solving Session) and Fri 2:30-3:15pm in ELB223.

Course Content: Basic concepts and definitions of thermodynamics, properties of pure substance, work and heat, first law of thermodynamics, second law of thermodynamics, entropy, thermodynamics of gases, vapors, and liquids in various non-flow and flow processes.

Textbook: 'Thermodynamics: an Engineering Approach', Y.A. Çengel & M.A. Boles, 8th Edition, McGraw-Hill, ISBN: 978-0073398174. Other recent editions of the book may also be fine, however, problems may often be prescribed based on the 8th edition.

Objectives: At the end of this course, the material covered will enable the students to perform energy calculations of engineering systems and analyze the feasibility of the processes undergone by the systems. The students will have an understanding of the following key topics to be covered this semester.

1. Determining properties of real substances, such as steam and refrigerant 134-a, and ideal gases from either tabular data or equations of state.

2. Analyzing processes involving ideal gases and real substances as working fluids in both closed systems and open systems or control volumes to determine process diagrams. Applying the first law of thermodynamics to perform energy balances, and determining heat and work transfers.

3. Analyzing system, process feasibility and efficiency for open and closed systems.

Student Learning Outcomes: Through this course, it is expected that students will gain an understanding of the fundamental principles of thermodynamics, methods to determine thermodynamic properties of engineering systems and use these methods for analyzing the performance and efficiency of several technologically important devices and systems. Students will gain the background knowledge required for the followup class MAE3311.

Important Dates: 1-Feb – Census Date; 26-Jan, 21-Feb, 23-Feb – Instructor on Travel (No class; Makeup Class TBD); 14,16-Mar – Spring Break (No class!); 31-Mar – Last Day to Drop Class; 5-May – Last Class, May 9 – Final Exam.

Course Schedule:

Lectures	Topics	Textbook Sections
1-2	Introduction, definitions, units, properties, cycles, etc.	1.1-1.10
3-5	Energy and Work, energy transfer, First law of thermodynamics	2.1-2.7
6-9	Properties of pure substances, processes, property diagrams and tables, equations of state	3.1-3.8
10-13	Closed systems, energy balance, internal energy, enthalpy, specific heat	4.1-4.5
14-18	Control Volume analysis, steady-flow analysis, common engineering steady-flow devices, unsteady flow analysis	5.1-5.5
19-23	Second law of thermodynamics, Heat engines and refrigerators, Reversible and irreversible processes, Carnot cycle	6.1-6.11
24-28	Entropy, isentropic processes, isentropic efficiency	7.1-7.13
29	Course Review	

Tentative mid-term exam dates: Feb 28 and April 6.

The schedule may undergo minor tweaks based on class needs and requirements.

Quizzes and Exams: Around 5-6 quizzes will be given during class time. Some quizzes will be unannounced. One worst quiz score will not be considered towards grading. Makeup for

a missed quiz or exam will be permitted only in case of a documented medical or other emergency.

Homework Assignments: Around 10 homework assignments will be given. Late submission penalty is 10% per day, up to a maximum of three days. Chronically late submission may attract greater penalty. Two worst homework scores will not be considered towards grading. Homework will not be accepted more than three days after due date. Extension will be offered only in case of well documented medical or other emergency.

Makeup Policy: Makeup of exams/quizzes/homeworks is allowed only in case of well documented medical emergency or emergency of another nature. Please notify instructor as soon as possible.

Key Assignment: One of the homework assignments will be designated as a **key assignment**, which will be given around March 22. The key assignment is designed to demonstrate the student's comprehension of the fundamental concepts taught in this class. *It is important for students to submit and pass the key assignment.*

Attendance: Attendance is mandatory.

Calculator Policy: TI-30XA and TI-30XIIS calculators will be allowed during exams. These are calculators with basic functionality. If you would like to use a calculator other than these, please get instructor's approval in advance.

Attendance: At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I require all students to attend all classes (in case of remote students, to stay up-to-date with posted lectures). It is easy to lose track of the material and get completely lost if you miss classes. Please attend all classes. I understand the challenges of attending an 8am class, and appreciate your efforts to not miss any classes. Just doing this gives you a strong headstart in the class. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

Grading Policy: Final score will be calculated based on the following weights: Final Exam – 20%, Homeworks – 20%, Mid-term Exam1 – 20%, Mid-term Exam2 – 20%, Quizzes – 20%. Tentatively, final grade will be determined as follows: A=85%+, B=75-85, C=60-75, D=50-60, F=50 or below. Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels; see "Student Support Services," below.

Calculator Policy: Only nonprogrammable calculators with basic computational features, such as arithmetic and transcendental functions will be allowed during exams.

Use of Electronics Policy: Laptops and other electronic devices could be an effective method for taking notes. However, this particular class involves significant mathematics, making it best to take notes on paper. The use of laptops and other electronic devices during class is thus not permitted.

Other Notes:

1. **I am committed for the success of each and every one of my students. I will help you in any way possible to succeed.**
2. **Classroom etiquette:** Please be on time for the class. Working on laptops/cellphones, texting, working on other courses, etc. are not permitted.
3. **Two-way interaction:** It is very boring to teach and learn if students do not ask questions! Asking questions during lectures is highly encouraged. In my teaching, I have noticed a strong correlation between asking questions and getting good grades. Please do not feel shy. No question is too silly to ask!
4. **E-mail communication:** E-mail is the preferred means for communicating with the instructor outside class. To ensure that emails are read and responded to promptly, please include 'MAE3310' in the subject line. Please use your UTA email address.
5. **Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).
6. **Disability Accommodations:** UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA), and Section 504 of the Rehabilitation Act. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of **a letter certified by** the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory)

that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

7. **Non-Discrimination Policy:** *The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit www.uta.edu/eos.*
 8. **Title IX Policy:** The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit www.uta.edu/titleIX or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or jmhood@uta.edu.*
 9. **Academic Integrity:** Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:
I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence. I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.
- UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents' Rule 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.
10. **Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new

law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>.

- 11. Student Support Services:** UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may contact the Maverick Resource Hotline by calling 817-272-6107, sending a message to resources@uta.edu, or visiting www.uta.edu/resources.
- 12. Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.
- 13. Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory will be asked to complete an online Student Feedback Survey (SFS) about the course and how it was taught. Instructions on how to access the SFS system will be sent directly to students through MavMail approximately 10 days before the end of the term. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback data is required by state law; student participation in the SFS program is voluntary.
- 14. Emergency Exit Procedures:** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is marked in Red Signs in the class. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

Emergency Procedures for Disabled Personnel

If the disabled person cannot safely evacuate the building, one person should stay with the disabled individual while another person reports his/her location to the University Police. Hearing impaired and visually impaired persons need only one person each to notify them of a fire alarm or guide them to safe escape routes during an evacuation. After evacuating employees and students have cleared all stairways, disabled persons should be assisted to the stairwell landings to await emergency personnel. All doors to the stairwells must be kept closed during this time.

Environmental Health & Safety would like to offer the following reminders to those who are disabled or have special needs:

- Take control without depending on others to take the first step.
- Don't be afraid to let others know you need assistance.

- Don't hesitate to communicate what your special needs are in order to make the evacuation easier and safer for you and for your assistants.
- Communicate with those who can help as soon as you are able by dialing 3003 to campus Police.
- Plan ahead. Be prepared. Know what you are going to do before an emergency arises. Make a plan and then test it. Determine what your alternatives are.
- When you enter an unfamiliar building, look it over and locate the most available telephones, note horizontal exits and ramps, note exit signs and enclosed stairwells determine if landings are large enough), note rooms that would make good areas of refuge, and note the location of fire alarm pull stations.
- Never take an elevator in a building on fire.
- Don't delay your evacuation or communication to evacuate. Speaking with someone over the telephone will help to keep you calm.

15. Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Good Luck with MAE3310 and all your other endeavors this semester!

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911.