

**MAE 3310 Section 002: Thermodynamics I**  
**Spring 2014**  
**Tues Thurs 8:00am – 9:20am, Nedderman Hall 109**

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*.

**Instructor:** Dr. Ankur Jain

**Teaching Assistant:** Vivek Vishwakarma

**Instructor's Office:** Engineering Lab Building (ELB), Rm 203

**Class Website:** Blackboard – [elearn.uta.edu](http://elearn.uta.edu)

**Email Address (*primary means of communication*):**

Instructor: [jaina@uta.edu](mailto:jaina@uta.edu)

TA: [vivek.vishwakarma@mavs.uta.edu](mailto:vivek.vishwakarma@mavs.uta.edu)

**Phone Number:** Instructor: 817-272-9338

**Office Hours:**

Instructor: Weds 1:00-1:45pm, Fridays 9:00-9:45am in ELB-203

TA: Mondays 5:30-6:15pm, Tuesdays 12:30pm-1:15pm, Thursdays 5:30-6:00pm 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, 7th Edition, McGraw-Hill, 2011, ISBN: 978-0077782979.

**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.

**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   | 2.1-2.8           |
| 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 20 and April 3.

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

**Important Dates:** 28, 29-Jan – No class (instructor out of town – makeup classes will be scheduled), 29-Jan – Census Date; 11,13-Mar – Spring Break (No class!); 28-Mar – Last Day to Drop Class; May 3-9 – Final Exam (precise date and time TBA).

**Quizzes and Exams:** Around 4-6 quizzes will be given during class time. Some quizzes will be unannounced. Scores on all quizzes will count towards the final grade.

**Homework Assignments:** Around 10 homework assignments will be given. Late submission penalty is 10% per day. Chronically late submission may attract greater penalty. Two worst homework scores will not be considered towards grading.

**Key Assignment:** One of the homework assignments will be designated as a **key assignment**, which will be given around April 3. *In order to pass this class, students must submit and pass the key assignment. If the key assignment is not submitted and passed, the student will not pass the class even if he/she scores perfectly on all exams and other assignments.* Please be aware of this policy and treat it with due importance.

**Attendance:** Attendance is mandatory.

**Grading Policy:** Final score will be calculated based on the following weights: Final Exam – 25%, Homeworks – 20%, Mid-term Exam1 – 20%, Mid-term Exam2 – 20%, Quizzes – 15%. Tentatively, final grade will be determined as follows: A=85%+, B=75-85, C=60-75, D=50-60, F=50 or below.

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

**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. I encourage questions and discussions involving the entire class. Please never feel shy to ask questions.
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. This is an applied class, with ample scope for lots of discussions.
4. **E-mail communication:** E-mail is the preferred means for communicating with the instructor and TA outside class. To ensure that emails are read and responded to promptly, please include 'MAE3310' in the subject line. Please use your UT Arlington 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://wwwb.uta.edu/ses/fao>).
6. **Americans with Disabilities Act:** The University of Texas at 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)*. 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 that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria

and policies for obtaining disability-based academic accommodations is found at [www.uta.edu/disability](http://www.uta.edu/disability) or by calling Office for Students with Disabilities at 817-272-3364.

- 7. Academic Integrity:** Students enrolled in this course 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.

- 8. 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](mailto:resources@uta.edu), or visiting [www.uta.edu/resources](http://www.uta.edu/resources).
- 9. 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>.
- 10. 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.
- 11. 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.

**12. 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!**