THE UNIVERSITY OF TEXAS RIO GRANDE VALLEY

College of Engineering and Computer Science

Department of Mechanical Engineering

MECE 2335-01 Thermodynamics I – 3 Credits – Spring 2016

Room: ENGR 1.236 **Time:** TR 9:25 – 10:40 am

Instructor: Dr. Constantine Tarawneh **Office:** ENGR 3.228 **Phone:** (956) 665-2607

Office Hours: MTWR 1:10 - 2:25 pm **Strict**, or by Appointment

Email: constantine.tarawneh@utrgv.edu **Website:** http://faculty.utpa.edu/tarawneh/

Prerequisites:

CHEM 1307 (Chemistry I), MATH 2414 (Calculus II), and PHYS 2425 (Physics I) with a minimum grade of "C".

Textbook:

M. J. Moran and H. N. Shapiro, ***Fundamentals of Engineering Thermodynamics***, Eighth Edition, John Wiley & Sons, 2014. **[ISBN 9781118412930]**

Course Objectives:

At the conclusion of this course, students will be able to:

1. Determine the properties of pure substances using thermodynamic tables.
2. Use the ideal gas law to determine unknown states and properties
3. Calculate changes in internal energy, enthalpy, and entropy using specific heat relationships.
4. Calculate the work done by a closed system via integration.
5. Apply the first law of thermodynamics to a closed system
6. Apply the first law of thermodynamics to an open system using control volume approach for both steady and unsteady states.
7. Apply the second law to thermodynamic cycles.
8. Analyze the Carnot cycle to determine maximum efficiency.
9. Calculate changes in entropy using thermodynamics tables.
10. Calculate changes in entropy for ideal gases.
11. Apply the second law of thermodynamics to a closed or open system.
12. Understand the isentropic efficiencies of turbines, nozzles, compressors, and pumps.
13. Analyze the performance of an engine, a power plant, and a refrigerator.

Grading Policy:

There will be weekly homework assignments and quizzes (15%), a project (10%), four midterm exams (15% each), and a final exam (15%). Exams will be **closed-book and notes** but you will be allowed to bring the thermodynamics booklet posted on BlackBoard. [$A \geq 88\%$, $88\% > B \geq 78\%$, $78\% > C \geq 68\%$, $68\% > D \geq 58\%$, $F < 58\%$].

Homework:

Homework assignments will be posted after each class through **Blackboard** and must be submitted by the next class period. Each assignment has an ungraded practice assignment and a timed graded version

of the same homework. Please work through the practice assignment until you are prepared for the graded assessment. Using the **Blackboard** assignments, students performed more than a letter grade higher on in-class exams than in semesters where students submitted end of chapter problems.

Tentative Class Schedule:

Week	Lecture Topic	Reading
1	Introduction, Basic Concepts	Ch. 1
2	Heat Transfer and Work / First Law of Thermodynamics	Ch. 2
3	Tuesday (February 9th): Example Problems and Chapters 1&2 Review Tuesday Evening 7:00 - 9:00 (February 9th): EXAM #1. Chapters 1&2.	
4	State Postulate, Phase Change Diagrams, Evaluating Properties	Ch. 3.1 – 3.5
5	Specific Heat, Internal Energy, Generalized Compressibility Chart	Ch. 3.6 – 3.11
6	Ideal Gas Model and Property Relationships, Polytropic Processes	Ch. 3.12 – 3.15
7	Tuesday (March 8th): Example Problems and Chapter 3 Review Tuesday Evening 7:00 - 9:00 pm (March 8th): EXAM #2. Chapter 3.	
8	1st Law of Thermodynamics – Analysis of Control Volumes	Ch. 4.1 – 4.10
9	System Integration and Unsteady Flow Processes	Ch. 4.11 – 4.12
10	Second Law, Carnot Cycle, and Clausius Inequality	Ch. 5.1 – 5.11
11	Entropy and Entropy Change Tuesday (April 12th): Example Problems and Chapters 4&5 Review Tuesday Evening 7:00 - 9:00 pm (April 12th): EXAM #3. Chapters 4&5.	Ch. 6.1 – 6.6
12	Entropy Balance for Closed and Open Systems	Ch. 6.7 – 6.10
13	Processes, Second Law Efficiency, and Determining Work	Ch. 6.11 – 6.13
14	Exergy Analysis Tuesday (May 3rd): Example Problems and Chapter 6 Review Tuesday Evening 7:00 - 9:00 pm (May 3rd): EXAM #4. Chapter 6.	Ch. 7
15	Final Exam Review	
Final	FINAL EXAM: Thursday, May 12th, 8:00 pm - 9:45 am. The final exam will cover all lecture material, reading assignments, and homework assignments.	Comprehensive

Design Project:

A group (3-4 students) semester design project will be assigned to create a computer program that determines the efficiency of a two-stage gas compressor with intercooling. The program will calculate thermodynamic properties of three different ideal gasses (one being air) based on variable specific heats. The program will be used to generate data for plots showing the impact of intercooler pressure on thermal efficiency for each of the three gasses. Each group must turn in the computer program and a report that interprets the results, presents the property relationships used, and gives the optimum intercooler pressure for each gas based on given conditions. The project will be worth 10% of the total grade for the course.

Attendance Policy:

1. Attendance will be taken every time the class meets. Any student arriving to class **5 minutes** after the class has started will not be allowed in class. Students will be allowed a **maximum** of *three* absences for the whole semester for classes meeting twice a week, *two* absences for classes meeting once a week, and *one* absence for laboratory courses. **Five points** will be deducted from the total (100%) for each absence exceeding the maximum allowable unless documentation justifying that absence is provided.
2. Students **will not** be permitted to leave the classroom during lectures and exams except for **extreme emergencies**.

Homework and Exam Policy:

1. **Absolutely no late** assignments will be accepted.
2. **Absolutely no** cell phones, laptops, iPads, iPods, or any other smart technology devices are allowed in exams.
3. Make-ups for in-class exams for **documented emergencies** will be scheduled during the last week of class.

Scholastic Integrity:

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

Drop Policy:

Students can withdraw from a course through the *Office of the Registrar* on or prior to:

- February 3rd, 2016, Wednesday: Census Day; last day to drop a class before it appears on the transcript and counts toward the "6-drop" limit. Last day to receive a 100% refund for dropped classes (other policies apply when a student is withdrawing from all classes).
- April 13th, 2016, Wednesday: Drop/Withdrawal Deadline; last day for students to drop the course and receive a "DR" grade. After this date, students will be assigned a letter grade for the course that will count on the GPA.

Course Drops:

According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the "3-peat rule" and the "6-drop" rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

Students with Disabilities:

If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your

instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. **Brownsville Campus**: Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at accessibility@utrgv.edu. **Edinburg Campus:** Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at accessibility@utrgv.edu.

Sexual Harassment, Discrimination, and Violence:

In accordance with UT System regulations, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and so must report any instance, occurring during a student's time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

Mandatory Course Evaluation Period:

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Online evaluations will be available April 13 – May 4, 2016 for the regular spring semester. Students who complete their evaluations will have priority access to their grades.

Important Dates:

January 18	MLK Day
January 19	Classes Begin
February 3	Census Day
March 14-18	Spring Break
March 25-26	Easter; no classes
April 13	Drop/Withdrawl Deadline
May 5	Study Day; no classes
May 6- 12	Final Exams
May 14	Commencement

ACKNOWLEDGEMENT OF RECEIPT OF SYLLABUS

By signing below, I hereby affirm that I have received a copy of the syllabus for **MECE 2335 Thermodynamics I** and have been informed by the **Instructor** that it is my responsibility to **carefully** read and understand this document. I also agree to prepare and submit to the **Instructor**, at the end of the semester, a folder that contains all my lecture notes, homework assignments, quizzes, exams, projects, reports and/or literature review (if applicable).

_____	_____
Student ID Number	Printed Name
_____	_____
Date	Signature

Thermodynamics Recitation

In an effort to improve overall student performance in this course, a special recitation has been created. A recitation is a regularly scheduled weekly session designed to review and apply concepts presented in the lecture portion of the course. The recitation is designed to provide structure to your individual study time and homework preparation. The intent is to greatly reduce the outside time that you spend on the course by providing you a supportive and efficient learning environment. During the recitation session you will have the assistance of a teaching assistant and work in small groups with students in the class. The goal of each weekly session is that you understand and complete the homework assignment. In most cases, the only activities that you will need to do on your own are to read the text for the upcoming lecture, review any material that is giving you trouble, and prepare for exams.

The recitation will meet once each week. Your homework grade will be fully based on submitted homework whether or not you elect to participate in the recitation. On weeks that contain a mid-term exam, the instructor will review the exam and help you understand problems you may have missed. As time permits, you will be given the opportunity in recitation to discuss the reading assignments and go over additional problems with the instructor. Participation in the recitation should reduce the total time that is required for you to do well in the course as you are being provided access to a supportive and efficient learning environment. To be effective, regular attendance of both the class lecture and the recitation is required. Please indicate your preference below concerning the Thermodynamics Recitation which will be held every week on **Friday from 2:00 to 5:00 pm in ACSB 2.150**.

I plan on attending the Thermodynamics Recitation:
- [ ] every week
- [ ] occasionally

I do not plan on attending the Thermodynamics Recitation because:
- [ ] of a schedule conflict
- [ ] I am not interested
- [ ] I do not need additional assistance
- [ ] of other reasons