Thermodynamics ENTC 3320  
Department of Mechanical Engineering  
Spring 2019 (1st 7-week term)

A. COURSE INFORMATION  
Course number/section: ENTC 3320.W01  
Class meeting time: Online  
Class location: Online  
Course Website: https://bb9.tamucc.edu/webapps/login/

B. INSTRUCTOR INFORMATION  
Instructor: Rajeev Kumar, Ph. D.  
Office location: EN 210  
Office hours: 3 – 5 PM, Tue/Wed/Thurs, or by appointment  
Telephone: 361-825-2559  
e-mail: rajeev.kumar@tamucc.edu  
Appointments: Correspond using ISLANDER email

C. COURSE DESCRIPTION  
Catalog Course Description  
Theory and application of energy methods in engineering; conservation of mass and energy; energy transfer by heat, work and mass; thermodynamic properties; analysis of open and closed systems; the second law of thermodynamics and entropy; gas, vapor and refrigeration cycles.

Extended Course Description  
Introduction to the basic concepts of thermodynamics and laws governing the conservation of mass and energy in open and closed systems. Emphasis on thermodynamic properties of steam vapor and ideal gas. Theory and application of the first and second laws of thermodynamics into analysis of basic power and refrigeration cycles.

D. PREREQUISITES AND COREQUISITES  
Prerequisites  
PHYS 2425 – University Physics I and MATH 2414 – Calculus II  

Corequisites  
None
E. **REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES**

**Required Textbook(s)**

**Optional Textbook(s) or Other References**
None

**Supplies**
None

F. **STUDENT LEARNING OUTCOMES AND ASSESSMENT**

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Identify the unique vocabulary associated with thermodynamics through the precise definition of basic concepts to form a sound foundation for the development of the principles of thermodynamics.
2. Determine the unknown thermodynamic property values of pure substances (water steams and refrigerant R134-a) from the property tables and illustrate the phase-change processes in the property diagrams.
3. Expand our understanding of energy and to develop the first law of thermodynamics as a general statement of energy conservation.
4. Develop the mass and energy conservation equations for general systems and conduct energy analysis for a variety of closed systems and open systems (or control volume) in which the working fluid can be water, steam, ideal gases, and incompressible substances.
5. Identify valid processes as those that satisfy both the first and second laws of thermodynamics and quantify the second-law effects by the increase of entropy principle.
6. Apply the second law and entropy equations to the calculation of various thermodynamic processes in both open and closed systems.
7. Select and apply a knowledge of Thermodynamics (first and second laws equations, concepts of open/closed systems, entropy, properties of steam and ideal gas, etc.) to various gas and steam power cycles used to model internal combustion engines and power plans.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

This course is structured along the lines of a competency-based education (CBE) model. Students are expected to read/review the chapter contents of each competency folder in a timely manner and understand and grasp the basic principles of thermodynamics. Students, with the help of example problems will develop the ability to apply the knowledge acquired to analyze and solve more practical and challenging exercise problems. This will lead to successfully passing the exams at the end of the semester.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Students must pass each competency with at least 70% grades

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Competency 1 - Basic Concepts of Thermodynamics and Properties of Pure Substance</td>
<td>25</td>
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<tr>
<td>Competency 2 - First Law of Thermodynamics and Its Applications in Closed and Open Systems</td>
<td>25</td>
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<tr>
<td>Competency 3 - Second Law of Thermodynamics and Entropy</td>
<td>25</td>
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<tr>
<td>Competency 4 - Gas and Vapor Power Cycles Analysis</td>
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*Grades will be assigned on a scale: 90 ≤ A ≤ 100, 80 ≤ B < 90, 70 ≤ C < 80, 0 ≤ F < 70.

This is a 7-week, short-format course. There will be no graded homework in the course, as there will not be sufficient time to collect, grade, and return homework prior to tests. There will be example problems posted on the Blackboard site, along with solutions. Students should attempt the problems first and then review the solutions, and address questions to the instructor when necessary. The tests will be shorter than typical tests, since there will be one test for each of the five competencies in the course. The final exam will have at least one problem related to each competency. A grade of 70 is required to pass each competency, and this must be achieved on either the competency pre-test, the competency test, or the final exam, for all five competencies, in order to pass the course. If a sufficient score is achieved on a pre-test or the competency test for a particular competency, it will not be necessary to work the problem for that competency on
the final exam. The final exam may be completed to raise your grade in the class, if you wish to have a grade higher than a “C”. The competency tests and the final exam will be weighted according to the values given in the table above.

I. COURSE CONTENT/SCHEDULE

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

<table>
<thead>
<tr>
<th>WEEK</th>
<th>CHAPTER(S)</th>
<th>TEST DATES</th>
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<tbody>
<tr>
<td></td>
<td>Topic 1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Chapter 1 &amp; Chapter 3</td>
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<tr>
<td>2</td>
<td>Chapter 3 &amp; Chapter 2</td>
<td>Competency-1</td>
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<tr>
<td>3</td>
<td>Chapter 4 &amp; Chapter 5</td>
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<tr>
<td>4</td>
<td>Chapter 6</td>
<td>Competency-2</td>
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<tr>
<td>5</td>
<td>Chapter 7</td>
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<tr>
<td>6</td>
<td>Chapter 7 &amp; Chapter 9</td>
<td>Competency-3</td>
</tr>
<tr>
<td>7</td>
<td>Chapter 9 &amp; Chapter 10</td>
<td>Competency-4</td>
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Note that the course moves at a rapid pace. It will be imperative for each student to maintain a strong work ethic to complete the course.

J. COURSE POLICIES

Time Requirements:

Regular 3-credit undergraduate courses require approximately 6 hours of class time per week plus 12 hours of study time. Therefore, expect to spend a minimum of 18 hours each week for 7 weeks on this class. Because this is an online course, you may have to spend even more time than 18 hours some weeks.

Student login expectations –
Students are required to login often – once every three days at a minimum. It is recommended that students check daily for announcements and updates.
Faculty availability to support students –
I maintain a consistent web presence and am available to meet online in the Blackboard asynchronous or synchronous environment or via phone.

Exams:
- **Closed book and notes**: necessary equations and property tables will be provided.
- Combination of concept questions (fill in blank using word cloud, TF, multiple choice, short answer) and workout problems.
- Only calculators (recommend ones that can interpolate) are allowed. No smart devices, tablets, computers, etc. are allowed.

Online Test Proctoring with Examity
This course requires the use of exam-proctoring involving third party charges. Exam-proctoring charges may range from $1 - $50.00 per exam. Students are required to schedule exams at least 24 hours in advance or incur late scheduling charges. Students are also responsible for providing webcams to be used in test proctoring.

You may access Examity directly from Blackboard, without the hassle of another username and password - [Using Examity with Blackboard Quick Guide](#).

Technical Support:
24/7 Technical Support at 1-855-
Examity [support@examity.com](mailto:support@examity.com)

To use Examity®, you will need to make sure you meet the following technical requirements:
- You have access to a computer with a webcam and a microphone (both built-in and external are fine).
- This computer has sufficient internet speed: at least 700KBPS upload and download speed. You can test your internet speed at [http://www.speedtest.net/](http://www.speedtest.net/)
- You must disable the pop-up blocker on this computer to connect to live proctor.

All costs for exams are the responsibility of the student.
- Students pay Examity® directly for the proctoring service.
- The cost of taking an exam with Examity varies based on the length of the exam, the level of proctoring required by the instructor, and how soon the exam will take place.
- Students are advised to schedule exams at least 24 hours in advance or incur late scheduling charges.
- Cancellations or changes within 24 hours of an examination will result in additional charge per occurrence.
  - Set up time (expected to be less than ten minutes) will not be included in
the examination time.

- Full payment will be required for any no-shows.

**Make-up Exam:** will only be allowed with a valid (university approved) excuse. Exams need to be made up within one week from the missed time. Make-up exam may be different with what was given to other students.

**Missed Exam**
Make-up exam will only be allowed with a valid (university approved) excuse.

**Emailing**
I encourage you to email me often with your questions. Must use your Islander Email. If emailing, must include course number and section in subject heading as well as purpose of email. Example: ENGR2316.001: Missed quiz 10.

**Others**
Blackboard will be used through the semester to provide access to notes, example problems, and notifications regarding quizzes, homework, exams, projects, and so forth.

**K. COLLEGE AND UNIVERSITY POLICIES**

- **Academic Integrity (University)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.
• **Statement of Civility**
Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

• **Deadline for Dropping a Course with a Grade of W (University)**
I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. **Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.** Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

• **Grade Appeals (College of Science and Engineering)**
As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage at [http://sci.tamucc.edu/students/GradeAppeal.html](http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

• **Disability Services**
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other
things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.

**Navigating Blackboard 9.1**

Once you are in the course, read the “Announcements” on the home page. Check this each time
you enter your course. You will see a Course Menu on the left of the page. The menu is a list of links that connect to materials and tools associated with the course. Blackboard has several features and tools for communicating content delivery that you should use almost daily. Links to information about how to use these tools include: Bb Help, which contains a complete guide to learning how to use the many tools and features in Blackboard, and Bb Video Tutorials, which link to a page with videos to show you how to do tasks such as submitting an assignment.

**Library resources** (including print, electronic, and human) can be accessed through the Mary and Jeff Bell Library website that supports electronic searches of articles, books, journals, course reserves, and databases. It includes information such as Ask a Librarian, research tools, remote access information and tutorials, information about plagiarism and copyright, and interlibrary loan (http://rattler.tamucc.edu/distlearn/). The library is a member of TexShare which provides you with a card that allows you to checkout materials from libraries across Texas. Librarians’ contact information is also on the website and you are encouraged to contact librarians for assistance.