Southern Polytechnic State University
ME 3410: THERMODYNAMICS (3-0-3)
Course Syllabus Summer 2014

Course Number/Name

ME 3410: Thermodynamics (3-0-3) meets TR 3:30-5:55 PM in room Q 315

Instructor:

Kevin McFall, Ph.D., Assistant Professor of Mechatronics Engineering
Office: Q 344, Phone: 678-915-3004, Email: kmcfall@spsu.edu

Textbook

Cengel, Yunus A, and Boles, Michael A., Thermodynamics an Engineering Approach, 7th Edition , McGraw-Hill, New York, 2011. An earlier edition of the textbook is permissible with the understanding the student is responsible for accounting for discrepancies in end of chapter homework problems between versions; homework problems refer to those in the 7th edition.

Course Description

Fundamentals of Thermodynamics including the concept of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the first and second law analysis of systems and control volumes. Integration of these concepts into the analysis of basic power cycles is introduced.

Prerequisites

MATH 2253, PHYS 2211 or PHYS 1111

Learning Outcomes

Upon completion of the course, the students should be able to:

1. Demonstrate understanding of key thermodynamics concepts
2. Determine properties of real substances, such as steam and refrigerants and ideal gases from either tabular data or equations of state.
3. Analyze processes involving ideal gases and real substances as working fluids in both closed systems and open systems.
4. Apply the first and second laws of thermodynamics to perform energy balances and to determine heat and work transfers
5. Analyze thermodynamic cycles (heat engines including gas/steam cycles) and reverse cycles (heat pumps, refrigerators).

Topics Covered

1. Introduction and Basic Concepts
2. General Energy Analysis
3. Properties of a Pure Simple Compressible Substance
4. Energy Analysis of Closed Systems
5. Energy Analysis of Control Volumes
6. Second Law of Thermodynamics
7. Entropy

Grading Policy

Homework (20%): Homework is an essential component of the learning experience in this course. Students who successfully complete and understand all the assigned homework problems will find themselves well prepared for the written tests. Content and numerical results are certainly important in homework problems, but problem presentation is of equal importance. This includes a well-conceived diagram when appropriate, an algebraic solution for the desired quantity in terms of given/known quantities, correct and consistent use of notation, units, and significant figures, as well as overall neatness and clarity. The assigned homework sets will be collected during class periods as detailed in the course schedule, and approximately one third of the problems will be graded. The lowest homework problem grade for the semester will be dropped. Each submission may include two students' names. A grade of zero will be recorded for any problem whose solution appears copied, even in part, from any source. Be sure to write the solution "in your own words" when collaborating with students from other groups on the solution method. Students who feel they are unfairly assessed a zero for copying homework may request referring the matter to be resolved by the SPSU Honor Council. The instructor may decide to refer directly to the Honor Council in especially egregious cases or when a student is involved in multiple incidences of copying. Problems are graded according to the rubric:

- Problem solution is neat and legible (1 point)
- Proper and consistent use of units (1 point)
- All work necessary to complete the problem is presented (1 point)
- The correct answer is obtained with reasonable accuracy (1 point)

Group exercises (20%): Most lecture periods with a reading assignment will begin with a "five-minute" group exercise. The purpose of these exercises is to stimulate learning of new material in groups of two members. Questions on group exercises will be short and generally require only that students have thoroughly read the day's reading assignment. Examples of question topics include definitions, identifying symbols or notation, and drawing/interpreting diagrams. The lowest group exercise grade for the semester will be dropped. Group exercises are graded:

- Student(s) names appear on submission (1 point)
- Some effort was made (1 point)
- Some part of the question is appropriately addressed (1 point)
- The answer is reasonably close to the correct answer (1 point)

Tests (2×20%): Two 1-hour long in-class tests will be used to assess progress in the course. Four function calculators will be allowed on the test, but graphing and programmable calculators are not allowed. Additionally, a subset of the property tables in the back of the book will provided. Generally, tests will be curved in an attempt to maintain an overall class average of a mid C.

Final exam (20%): The format of the comprehensive final exam will be similar to that of the other tests but twice as long in length. Material not covered on the previous tests will be given more emphasis on the final exam. The final exam will be scheduled during the standard final exam period.

The scale for the final course grade is as follows:

A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

Attendance Policy

Forcing everyone to come to every class is not practical. Each student bears responsibility for material covered in class. If students choose to miss class, that is their decision. However, completion of group exercises goes hand-in-hand with attendance. Note also that late arrival to class will result in working alone on group exercises. Class time will be spent explaining the day's content and working problems, under the assumption that all students have read and understood the reading assignment. In general, late assignments are not accepted nor can make-up tests be administered. Extenuating circumstances can result in exceptions to these rules, but agreement must be reached with the instructor in advance of the assignment or test that will be missed.

Academic Misconduct

At SPSU, academic misconduct is defined as "any act that could have resulted in unearned advantage or that interferes with the appropriate academic progress of others". Any act of academic misconduct can be reported to the Honor Council by the instructor. For more information see www.spsu.edu/honorcode. The application of the definition of academic misconduct for each category of assignment in this course is describes as follows:

Discussion of homework problems among peers and even other sources is wholeheartedly encouraged. A single homework submission is allowed for groups of no more than two members. Note, however, that this submission must be a reflection of the group's work alone. Multiple submissions may follow the same solution process, but they may not be copied, not even in part. If more than one group collaborates on the homework, be sure each group sits down individually to write the solution so that each is written in their own words. Be aware that copying of any

kind from any source, including clandestine solution manuals, will be considered a violation of academic integrity. If you have a copy of the solution manual, you are strongly recommended to delete it. Using the solution manual as a crutch when solving homework is detrimental to your learning, and the temptation is great to rely heavily on it when rushed to complete a homework set. The majority of reported academic integrity violations in this course result from students copying from the solution manual. Additionally, possession of the solution manual is unnecessary as you will be provided with solutions of all homework problems after they are due, as well as for non-assigned problems upon request.

Collaboration among group members during group exercises is obviously encouraged, but assistance of any kind from outside the group will be considered a violation of academic integrity.

Tests and the final exam are to be reflections of the individual's work alone. Assistance of any kind, other than a simple four-function calculator, such as mobile devices, other class members, notes, equations sheets, etc. will be reported as a violation to the Honor Council.

Disability Statement

If you have a documented disability as described by the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) that may require you to need assistance attaining accessibility to instructional content to meet course requirements, please contact the ATTIC at 678-915-7361 as soon as possible. It is then your responsibility to contact and meet with the instructor. The ATTIC can assist you and the instructor in formulating a reasonable accommodation plan and provide support for your disability. Course requirements will not be waived but accommodations will be made, when appropriate, to assist you to meet the requirements.

Communication

Course material will be disseminated in D2L including lecture notes, homework solutions, old tests, etc. All official course announcements, including instructions when class may be cancelled, will be posted in the D2L course news. Be sure to check D2L regularly. The instructor does not check D2L email; relay all email correspondence to kmcfall@spsu.edu.

Course Schedule

Date		Topic	Reading	Assignment due
May	20	Energy	1.1-2.5	
May	22	First law	2.5-2.8	
May	27	Properties	3.1-3.8	1.7/42/58, 2.13/35/38/44/62/74/87
May	29	Closed systems	4.1-4.5	
Jun	03	Review/Test 01		3.22/30/62/82/91, 4.8/27/32/60/74/86
Jun	05	Steady open systems	5.1-5.4	
Jun	10	Unsteady open systems	5.5	5.9/36/53/67/84/96
Jun	12	Second law	6.1-6.11	
Jun	17	Entropy	7.1-7.7	5.121/132, 6.17/53/81/96/99
Jun	19	Entropy balance	7.8-7.13	
Jun	24	Review/Test 02		7.28/32/38/70/95/111/123/135/144/161
Jun	26	Internal combustion	9.1-9.7	
Jul	01	Brayton cycles	9.8-9.11	
Jul	03	Rankine cycles	10.1-10.6	9.14/37/53/79/101/116/131/143
Jul	08	Refrigeration cycles	11.1-11.4, 11.7	
Jul	10	Review		10.14/39/60, 11.4/20/42/49
Jul	?	Final Exam		