ME 312 Thermodynamics 13S- Text- Cengel & Boles Thermodynamics- An Engineering Approach- 7th Ed & Property Table Booklet for 7th Ed.
Prerequisites- ME 311, Math 211 and Physics 111

"The Book and Lecture will 'teach' you little unless are willing to put an active, organized effort into the learning process. Active- directed work is necessary to understand and remember the material."

Course Syllabus -Florio

Week	Topic	Sections	Problems
1	Exergy, Reversible Work, Irreversibility, Second-Law Efficiency	8.1-8.3	8.40,80
	Exergy Change of a System	8.4	
	Exergy Transfer by Heat, Work, and Mass	8.5	61, 139
2	Exergy Destruction	8.6	
	Exergy Balance: Closed System	8.7	
	Exergy Balance: Control Volumes	8.8	
3	Basic Considerations, Carnot cycle, Air standard cycle	9.1-9.4	9-25, 23,
	Otto Cycle	9.5	35, 29C,
	Diesel Cycle	9.6	33, 53,
4	Brayton Cycles	9.7-9.8	9.96, 100,
	Brayton Cycle with Regeneration, Reheating	9.9-9.10	116,129
	Second-Law Analysis	9.11-9.12	154
	Test 1 on Chapters 8 and 9 to 9.6		
5	Rankine Vapor Cycles	10.1-10.3	10.16, 21
	Parameters Affecting Efficiency, Reheat Cycle	10.4-10.5	22,33,41
	Regenerative Rankine Cycle	10.6	,48
6	Second-Law Analysis of Vapor Power Cycles	10.7	To be assigned
7	Refrigerators & Heat Pumps, Reversed Carnot Cycle	11.1-11.2	To be
	Ideal Refrigeration cycle	11.3	assigned
8	Actual Vapor-Compression Refrigeration Cycle	11.4	To be
	Composition of Gas Mixtures	13.1	assigned
	Test 2 Chapter 9.7-11.3		
9	P-v-T Behavior of Gas Mixtures	13.2	
	Properties of Gas Mixtures	13.3	To be
	Properties of Gas-Vapor Mixtures	14.1-14.3	assigned

Week	Topic	Sections	Problems
10	Adiabatic Saturation and Wet-Bulb Temperatures	14.4	To be
	Psychrometric Chart, Air Cond. Processes	14.5-14.7	assigned
11	Review		
	Fuels and Combustion	15.1	To be
12	Theoretical and Actual Combustion Processes	15.2	assigned
	Enthalpy of Formation and Enthalpy of Combustion	15.3	
	Test 3 on Chapters 10, 11, 13, and 14		
13	First-Law Analysis of Reacting Systems	15.4	To be
	Adiabatic Flame Temperature	15.5	assigned
	Entropy Change of Reacting Systems	15.6	
14	Second-Law Analysis of Reacting Systems	15.7	To be
	Stagnation Properties, Speed of sound and		
	Mach number	17.1-17.2	
	One Dimensional Isentropic Flow	17.3	assigned

Course Grading Information. –. Sections 102 ME 312-2013- Tests-closed textbook & notes, use of property table booklet permitted . **No storage of any equations on calculators. A calculator is to be *used* solely for computational operations onl No cell phones, nor any communication devices of any type are permitted**. No sharing of any material or calculator is permitted. All solutions must be **complete** and logical. Equation development must exist before numerical substitution.

a. Tests –50% ; Grade for any missed test will be recorded as a grade of zero .

b. All work submitted must be in pencil. Any required homework problem must be in the format specified–Any problem due must be submitted at the start of class. No Make-up.

c. Thermal Design Project based on principles of thermodynamics applied to basic energy conversions. To be assigned by the instructor- 10%

d. It is expected that the reading assignment will be complete prior to the discussion of the material in class.. Graded material will only be brought to class once. All tests must be returned for proper ABET recording.

e. Class participation –you are expected to sign the attendance sheet at each class and actively participate; Participation+short quizzes+any required homework + attendance= Semester total =10%,

f. Comprehensive Final Exam - 30%

g. Work copied or the use of unauthorized aid will not be accepted or graded.

Cell phones must be turned off during class. Use of any communication device of any type during class or during a test (quiz) is prohibited. Use of Laptops or any equivalent device during a test or class is prohibited
Text and Property booklet are required for each student
Reserve right to modify as necessary.

Homework: Homework is an important part of this course. You are expected to have solved every assigned problem. Questions on the homework problems should be brought up in class.
Format for **submitted work** : **Solutions in pencil.** Each problem starts on a separate page, 8.5 x11, with all pages stapled together. Format

1. Known: A brief summary of the problem, "in your own words".
2. Find: Quantities to be determined.
3. Sketch: The physical system and property diagrams
4. Assumptions: Assumptions to be used in solving the problem are listed.
5. Properties: Material properties needed, values and sources.
6. Analysis: The problem is solved in a systematic and logical manner, showing all steps, the fundamental equation from which the analysis begins and numerical values (with units) shown. Answers clearly indicated.
7. Discussion: Any comments relative to the results.
8. A paper will be assigned that will cover timely to[pcs in thermal sciences.

Quizzes- There could be periodic short quizzes covering assigned problems and lecture material . Any missed quiz is recorded as a grade of zero.

Tests. Generally 4 problems which are similar to the class problems, HW, Short quizzes. Tests stress the following levels: **knowledge, comprehension, application, and analysis**.

Design Project: Teams , as assigned by the instructor, will submit a final report by semester's end. The report will be graded based on technical content, proper writing skills and effectiveness of communication.

Final Grade. Assigned based "on a curve"

Attendance: You are expected to attend all classes and to sign the daily attendance sheet.

Course Motivation: This course places emphasis on the analysis and design of power and refrigeration cycles and the application of the basic principles to engineering design problems with systems involving mixtures of ideal gases, psychrometrics, chemical reactions, combustion, and one-dimensional compressible flow.

Course Objectives: The students will be asked to demonstrate their knowledge of the material covered in this second course on thermodynamics through their mastery of the following course objectives. Through the study of this second course on thermodynamics the student will be able to:

- Sketch figures of systems and control volumes;
    - Sketch process diagrams for the processes occurring within systems and control volumes;
    - **Develop the governing equations for conservation of mass, conservation of energy, and process relations for processes occurring in systems and control volumes**;
    - Determine the required thermodynamic properties from tables for real substances (water and refrigerant 134a), tables for ideal gases, and equations of state for ideal gases. **substitute these property values with units into the governing equations and simplify**;
    - Analyze ideal gas power cycles to perform energy balances, determine heat and work transfers, and calculate the cycle efficiency;
    - Analyze steam power cycles to perform energy balances, determine heat and work transfers, and calculate the cycle efficiency;
    - Analyze vapor compression refrigeration cycles to perform energy balances, determine heat and work transfers, and calculate the cycle coefficient of performance;
- Calculate properties of ideal gas mixtures;
    - Determine the properties of dry air-water vapor mixtures, plot processes on a psychrometric chart, and analyze process involving dry air-water vapor mixtures to perform energy and mass balances for the processes;
    - Determine balanced chemical reaction equations and analyze typical combustion processes to perform energy balances to determine the heat transfer released or estimate the maximum possible product gas temperature during combustion;
    - Apply the results of chemical equilibrium analysis to write balanced chemical reaction equations and to model energy balances for reaction systems;
- Apply the concepts of compressible flow to nozzles.