ME 312-17S Thermodynamics 2- Text- Cengel & Boles Thermodynamics- An Engineering Approach- 8th Ed & Property Table Booklet for 8th Ed. Prerequisites:- ME 311 and Math 211 , 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."

Technicians are told how, engineers know why as well as how, i.e. they analyze

Week	Topic	Sections	Problems
1.	Review Exergy		
Review	**Exergy, Reversible Work, Irreversibility, Second-Law Efficiency**	**8.1-8.3**	
	Exergy Change of a System	8.4	8.38, 80
	Exergy Transfer by Heat, Work, and Mass	8.5	62, 98
	Exergy Destruction	8.6	
	Exergy Balance: Closed System	8.7	
	Exergy Balance: Control Volumes	8.8	
2	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,
3	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
4	Carnot and 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
Test 1 on Chapters 8, 9 and 10.1-10.3			
5	Second-Law Analysis of Vapor Power Cycles	10.7	To be assigned
	Refrigerators & Heat Pumps, Reversed Carnot Cycle	11.1-11.2	To be
	Ideal Refrigeration cycle	11.3	assigned
6	Actual Vapor-Compression Refrigeration Cycle	11.4	To be
	Composition of Gas Mixtures	13.1	assigned
7	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	
8	Adiabatic Saturation and Wet-Bulb Temperatures	14.4	To be
	Psychrometric Chart, Air Cond. Processes	14.5-14.7	assigned
9	Review		
	Test 2 on Chapters 11, 13, and 14		
	Fuels and Combustion	15.1	To be
10	Theoretical and Actual Combustion Processes	15.2	assigned
	Enthalpy of Formation and Enthalpy of Combustion	15.3	
11	First-Law Analysis of Reacting Systems	15.4	To be
	Adiabatic Flame Temperature	15.5	assigned
	Entropy Change of Reacting Systems	15.6	
12	Second-Law Analysis of Reacting Systems	15.7	
	Stagnation Properties, Speed of sound and Mach number	17.1-17.2	To be
	One Dimensional Isentropic Flow	17.3	assigned
Test 3 on Chapters 15 and 16			
13	Isentropic Flow through Nozzles	17.4	To be
	Shock Waves and Expansion Waves	17.5	assigned

Course Grading Information.

ME 312 17S- All Tests and short quizzes are closed book and notes. As necessary, a formula sheet may be provided. A **standard calculator, with no storage of equations or information permitted, and property tables are required. Cell phones, laptops, tablets and any other communication devices are not permitted.**

No sharing of any material or calculator is permitted. All solutions must be complete and logical. (See Homework section) All solutions must begin with the problem defined, and a **system definition**. This must be followed by the development of the modeling equation and if necessary numerical substitution.

Graded tests will be brought to class only once, and must be returned to the instructor.

It is the student's responsibility to notify the instructor of any possible errors in grading of the test on the day the test is returned.

Any possible test conflicts must be reported one week prior to the date of the test/exam and will not be accepted after the test is given. Any reported conflicts must be consistent with the NJIT policy or procedure and/ or approved by the Dean of students.

All students are expected to act in a professional respectful manner in this course.

Integrity: **"A student signature is required on any exam or assignment and is understood as compliance with the academic integrity policy. No unauthorized aid was given or received. Work copied or obtained through the use of any unauthorized aid (only aid -by the instructor) will not be accepted. For general homework problems- only- form of authorized aid includes discussing the problem statement, approaches for problem solving, and basic concepts related to the problem with other students in your class. Unauthorized aid includes but is not limited to use of solutions manuals or other solution materials or another individual's work." LAF**

Attendance: You are expected to attend all classes, act in a professional, non-disruptive manner and to sign the daily attendance sheet.

Cell phones, tablets and laptops, etc. must be turned off during class. Use of any communication device during an exam, test(quiz) is prohibited.

Assignment Sheet usually available at: *moodle and* ***web.njit.edu/~florio/FLORIO.htm***

The instructor reserves the right to modify this syllabus as needed

Course Grading Information. .
a. **Tests – 18Pts each ; 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 due problems must be submitted at the start of class. No Make-up.
c. **Class participation** –you are expected to sign the attendance sheet at each class and actively participate. Class participation - If your average grade on tests is at least 60 % and an active class participation score, at **most 5pts,** could be added to your score.
d. **Comprehensive Final Exam - 36Pts** - No make-up except with the prior approval of the Dean of Students.
e. Short quiz- and any required homework maximum **5Pts No make –up permitted .**
f. Work copied or the use of unauthorized aid will not be accepted or graded. See Integrity

g. Final grades will be based on a curve and consistent with the course objectives.

Attendance: You are expected to attend all classes, act in a professional, non-disruptive manner and to sign the daily attendance sheet.

This course is an introduction to the concept of energy. It provides the basic tools necessary for the analysis of any engineering system in which energy transfer or energy transformations occur; thus, thermodynamics is an important part of the training of almost all engineering disciplines.
Homework (HW) is an important part of the course. You are expected to solve every assigned problem.
See homework format

There **might** be a number of –"special" take home assignments.
For these take home assignments – they must be done solely by you without consulting any other individual or individuals.
The instructor reserves the right to change homework assignments.

Homework Format

"Homework is an important part of this course. It is a necessary part of understanding and learning of the course material. You are expected to have solved every assigned problem. Usually numerical results or expressions will be given after the assignment is due. It is the student's responsibility to learn how to arrive at the final solution." LAF

It is not necessary to memorize numerous equations, for problems are best solved by use of the definitions and the applications of the laws of thermodynamics as well as proper property relations and evaluation.

Format: **Solutions in pencil. Each problem starts on a separate page, 8.5 x11, with all pages stapled together.**

1. **Known:** A brief summary of the problem, "in your own words".
2. **Find:** Quantities to be determined.
3. **Sketch**: An energy diagram. Properly labeled and indicated- physical system transfer directions and in addition property diagrams
4. **Assumptions:** Modeling assumptions that are used in solving the problem are listed and clearly indicated as a constraint.
5. **Properties**: Substance identified and needed properties, value with units and source.
6. **Analysis:** The problem is solved in a systematic and logical manner, showing all steps, include modeling assumptions as needed, **starting from the fundamental equation(s)** from which the analysis begins [and numerical values (with units) are shown]. Final results clearly indicated.
7. **Discussion:** Any comments relative to the resulting equations , results, effects, validity of assumptions, etc. are

Quizzes- There could be periodic, short quizzes covering assigned problems and lecture material. Any missed quiz will be recorded as a grade of zero , there will be no make-ups permitted..

Tests. Generally 3-4 problems which are similar to the Class problems, Text Problems, HW, or Short quiz Problems. Tests stress the following levels: knowledge, comprehension, application, and analysis. The tests are graded accordingly. Format for tests is the same as that for homework.

Course Motivation: This course places emphasis on the analysis of power and refrigeration cycles and the application of the basic principles to engineering design problems with systems involving mixtures of ideal gases, psychrometrics, nonideal gases, 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, shock waves, and Rayleigh flow.