THERMODYNAMICS
20-MECH-2010
Summer Semester 2015

Textbooks: Fundamentals of Engineering Thermodynamics, Wiley, 8th Edition
by Moran, Shapiro, Boettner, and Bailey. *(7th edition also can work)*
IT (Interactive Thermodynamics) and EES (Engineering Equation Solver)
Software is not required

Instructor: Prof. M. Kazmierczak, 627 Rhodes, mike.kazmierczak@uc.edu, 556-0259

Office Hours: M-T-W-TH 12:30 -1:30 pm, and by appointment

Teaching Assistant: Ms. Rachel Schwind , schwinra@mail.uc.edu Office hrs by appointment

Grading System:

H.W.	10%	(no late assignments accepted)
Hourly Exam #1	20%	
Hourly Exam #2	20%	
Hourly Exam #3	20%	
2-hr Final Exam	30%	

Class Project: There is no formal class project.

Class Handouts: For your convenience and to help with the class instructions, all of the class handouts, all homework assignments/solutions, lecture notes and example problems, some sample exams, will be on-line using Blackboard.

Goals: Course objective is to learn the **1st and 2nd Laws of Thermodynamics,** and thermodynamic properties of pure substances (tables, equations & relations).

Engineering analysis of thermodynamic systems and processes; steam (vapor) power cycles, gas power cycles, and refrigeration and heat pump systems.

First 1) gain **fundamental understanding** of the underlying concepts and principles, 2) learn how to **solve basic / applied engineering** thermodynamic problems, and 3) analyze typical power and refrigeration cycles.

This is first required "core" class in Thermal-Fluid stem of the ME program.

COURSE OUTLINE

Week	Topics	Material	Homework
1.	Basic Concepts in Thermodynamics - system, properties, state, process	Chapter 1	1
2.	First Law of Thermodynamics **(Closed System)** - energy balance, energy, heat transfer, work - examples, power cycle, refrigeration cycle, heat pump	Chapter 2	2a 2b
3.	Thermodynamics Properties of Pure Substances - PVT surface, steam tables (sat., superheat, compressed liq.)	Chapter 3 *p. 94-123 of 8th*	3a
	Exam I (week 4)		
4 - 5.	Thermodynamics Properties of Pure Substances cont. - examples of 1st law analysis using property data, - perfect gas equation of state, - incompressible substance model	Chapter 3 *p.132-148 of 8th* *p.123-126 of 8th*	3b 3c
6.	First Law applied to Open Systems **(Control Volume)** - examples of energy analysis involving, turbines & pumps, heat exchanger, nozzles & valves, etc.	Chapter 4 *(skip 4.12)*	4
	Exam II (week 7)		
7.	Entropy and the Second Law of Thermodynamics: Basics - Statement (based on entropy generation concept), reversible and irreversible processes, Carnot Cycle, max performance of cycles operating between two reservoirs	Chapter 5	5
8 - 9.	Second Law Analysis: - **Closed systems**, entropy balance, entropy of pure simple compressible substance, Tds equations, T-S diagram - entropy rate balance for **open systems**. Isentropic efficiencies, isentropic relations for perfect gas	Chapter 6 6.1 - 6.8 6.9 - 6.13	6a 6b
	Exam III (week 10)		
10.	Vapor Power Systems - Rankine, superheat, reheat, regeneration	Chapter 8 *(skip 8.6)*	8a, 8b
11.	Gas Power Systems - Otto, Diesel, Brayton, combined cycles	Chapter 9 9.1-9.9 only	9a, 9b
12.	Refrigeration and Heat Pump Systems - vapor compression, other *(time permitting)*	Chapter 10 *(skip 10.5, 10.7)*	10
	Final Exam		