ENME 232 THERMODYNAMICS
Spring 2021
3 credit

Prerequisites: Physics 261 and 262.
Course Format: Hybrid/Blended
Class Hours: **12:30- 1:45** PM., TuTh,
Class Room: Rm. CSC 327
Instructor: Dr. Julie Wang, Ph.D., P.E.,
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Office : Compton Science Center, 102

Text: *Fundamentals of Engineering Thermodynamics*, 8th edition (2014), M.J.Moran (or 7th), and etc., Wiley.

Course Description
Introduction to thermodynamics, Thermodynamic properties or matter, First and second law of thermodynamics, cycles, reactions, mixtures

Course Objectives
In this course, the student will develop and/or refine the following areas of knowledge:

- Fundamental understanding of how basic laws of thermodynamics and properties of matter describe states of systems and processes involving heat and work.
- Ability to use tabulated charts, state equations, and computer programs to calculate thermo- physical properties
- Knowledge of mathematical relationships between basic thermodynamic properties (such as temperature, entropy, enthalpy, etc…)
- Ability to perform energy and mass balances for the design and/or analysis of cycles for steam power plants. Gas turbines, refrigeration cycles, and HVAC systems.

Topics Covered
- Description of matter and phase diagrams
- Concepts of energy, work and heat
- First law of thermodynamics for open and closed systems
- Second law of thermodynamics for open systems, irreversibilities, and Carnot cycle
- Entropy and state relations
- Cycle analysis
- Brayton cycle and modified Brayton cycle
- Rankine cycle and its derivatives and vapor compression refrigeration and heat pumps
- Ideal gas mixtures, and humid air analysis
- Combustion

Learning Outcomes

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to identify, formulate, and solve engineering problems

Relationship to program outcomes

This course provides the fundamental basis for energy and mass balances on the macroscopic scale. These principals will be used in future courses on the macroscopic scale to develop governing equations in fluid mechanics, heat transfer, and other disciplines. The laws of thermodynamics express the fundamental concepts of energy conservation and entropy generation, both of which play a critical underpinning for all disciplines of science and engineering.

This course should develop the skills that will be applied to power plants, refrigeration cycles, and humid air cycles. Such skills will be critical for students seeking careers in the following industries: utility industry, gas turbine or diesel engine industry, chemical process industry, HVAC industry, etc…

Attendance:

Attendance is essential to keep up-to-date with coursework. Be familiar with University Regulations. Major medical incidences and emergencies that affect any student's participation in the course need to be reported to the instructor as soon as possible. Extended medical absences will require documentation. If you miss a class, you will be responsible for all material covered in class and in the homework assignments. There is no make-up quiz.

Homework/Quizzes

Homework problems are assigned. There is no credit given for any homework problems copied from solution manual. Late homework is not accepted. The questions of the homework problems could be discussed in the class.

Examinations

There will be two hourly tests and final exam. You are expected to take the exams on the scheduled dates. There is no any electronic device allowed during exam except calculator.

Grading

Homework/quizzes	40%
Tests	40% (20% for each)
Final Exam	20%
Total	100%

The letter grades will be determined as follows:

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

2021 Spring ENME 232 Thermodynamics:

Tentative Schedule of Meetings and Reading and Homework Assignments

Week/Day	Chapter/Topic	Reading
Week 1 1/26 1/28	**Ch, 1 Concepts & Definitions** **HW1: 1.27, 1.28**	1.1-1.9
Week 2 2/2 2/4	**Ch. 3 Properties of pure substances** **HW 3.10, 3.14**	3.1-3.3 3.4-3.5 3.6-3.14
Week 3 2/9 2/11	**Ch, 2 Energy and the 1st law of Thermodynamics** **Energy balance for Closed Systems** m(u2-u1) = Q -W Examples: 2.1,2.2	2.1-2.3 (Omit 2.2.3-2.2.8) 2.4-2.7 (Omit2.4.2-2.4.3)
Week 4 2/16/ 2/18	**Review** **Test 1**	 4-1, 4-2,4-3(Omit 4.3.2) 4-4, 4-5
Week 5 2/23 2/25	**Ch 4 Control Volume Analysis Using Energy** **Energy balance for Open Systems**	4.6-4.9 4.10-11
Week 6 3/2 **3/4**	Eqs. 4.20(a0, 4.20(b) Diffuser, Nozzle, Turbine, compressor, Throttling process valve HW: 4.19,4.20, 4.21,4.48	
Week 7 3/9 3/11	**Ch 5 The 2nd law of thermodynamics** Carnot Cycle, Clauius inequality HW: 5.19, 5.205.43,5.45	5.1-5.2 5.5-5.7
Week 8 3/16 3/18	 **Ch 6 Using Entropy** Entropy change of an idea gas, water	5.8-5.11 6.1-6.5
Week 9 3/23 3/25 3/26	Examples 6.1, 6.2,6.6, 6.11, 6.12 HW 6.36,6.38,6.77 **Last day withdraw with a grade of "W"**	6.6-6.10 6.11-6.13
Week 10 3/30 4/1	 Review **Test 2**	
Week 11 4/6 4/8	**Ch 8 Vapor Power Systems** Ranking cycle	8.1-8.2 8.3-8.4
Week 12		9.1-9.2

4/13 4/15	**Ch 9 Gas Power Systems** **Air cycle. Otto, Diesel Cycle**	9.3-9.4
Week 13 4/20 4/22	**Ch 10 Refrigeration and Heat Pump Systems** Refrigeration cycle	9.5-9.11
Week 14 4/27 4/29	Review	10.1-10.6
Week 15	Final	