DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

AA 260 THERMODYNAMICS

SPRING AND SUMMER QUARTER

CREDITS AND CONTACT HOURS: 4 credits**,** Four 50-minutes meeting times per week one 50 minute time may be used for recitation review or quiz section.

COORDINATOR: Carl Knowlen, Research Scientist in Aeronautics and Astronautics

TEXTBOOK: Thermodynamics; An Engineering Approach, Cengel, Y.A. Boles, M.A., 7th Edition, McGraw-Hill, N.Y. 2010

SUPPLEMENTAL MATERIALS: None

CATALOG DATA: **THERMODYNAMICS**, Required
Introduction to the basic principles of thermodynamics from a macroscopic point of view. Emphasis on the First and Second Laws and the State Principle, problem solving methodology, air-standard cycles. Prerequisites: CHEM 142 or CHEM 145; either MATH 126, MATH 129, or MATH 136; and PHYS 121. Offered Sp, S

PREREQUISITES BY TOPIC:
1) Calculus and analytic geometry
2) General Chemistry
3) Calculus based physics (mechanics)

OUTCOMES:
1) Students will understand the *P-V-T* behavior of pure substances as determined by analytical equations of state and tabulated properties.
2) Students will understand first law of thermodynamics and its application to closed and open systems under steady and transitory conditions.
3) Students will understand second law of thermodynamics and its application to analysis of closed and open systems and energy conversion mechanisms.
4) Students will understand vapor and gas power cycles and refrigeration.

RELATIONSHIP TO STUDENT OUTCOMES:
a) An ability to apply knowledge of mathematics, science, and engineering
c) An ability to design a system, component, or process to meet desired needs
e) An ability to identify, formulate, and solve engineering problems
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

TOPICS:
1) Introduction
   a. Concepts of units and dimensions, pressure, temperature, heat, work.
2) Macroscopic Properties of Substances
   a. P-V-T relationships for simple substances including ideal gas law and steam tables.
3) 1st Law of Thermodynamics

    a. Principles of first law analysis for closed systems.
    b. Principles of Energy Analysis: Procedure for energy analysis of closed and open systems, including flow work and shaft work concepts.

4) 2nd Law of Thermodynamics
    a. Definition and concepts of the second law of thermodynamics in its macroscopic form. Consequences of the second law of thermodynamics for open and closed systems and engineering devices.

5) Power and Refrigeration Cycles;
    a. Vapor power, gas power, and refrigeration cycles. One cycle (instructor's choice) is covered in depth either the remaining two being introduced. Chapters 8, 9, and 10 in the current book (2 weeks).

6) Instructor's Choice: To expand on previous topics or introduce a new topic (1 week)