EML 3100 - Thermodynamics I
Common Course Syllabus

Catalog data: 3 Credits. The study of the behavior of a system when it exchanges heat and work with the surroundings. Topics include properties of a simple pure compressible substance, equations of state, the first law of thermodynamics, internal energy, specific heats, enthalpy, and the application of the first law to a system or a control volume. The study of the second law of thermodynamics is also discussed leading to the discovery of entropy as a property and its ramifications. Applications to systems of power generation and refrigeration are given.

Goals: This course introduces the student to the basic knowledge of energy production, conversion and utilization from natural resources. Development and application of the basic principles of thermodynamics to systems and control volumes are illustrated and emphasized.

Prerequisite:
1. Physics for Engineers I - PHY 2043 or equivalent

Corequisite:
1. Calculus III - MAC 2313.

Topics: (the number of sessions merely provides guidelines and is subjected to change by individual instructor)
1. Definitions, terminology, properties of systems, pressure, temperature scale, heat and work as path dependent functions, zeroth law of thermodynamics, concept of a thermodynamic equilibrium, different kinds of work (3 sessions).
2. The first law of thermodynamics, and its application to systems (4 sessions).
3. Properties of a pure compressible substance, Phases and their transitions, p-V-T relation for a gaseous medium, specific heats (4 sessions).
4. Application of the first law to a control volume: energy relationship for flow processes (5 sessions).
5. Transient flow processes (2 sessions).
6. Cycles of heat engines, different kinds of processes, thermal efficiency of heat engines (2 sessions).
7. The second law of thermodynamics, Corollaries of the second law of thermodynamics, reversible processes and irreversible processes (6 sessions).
8. Entropy and entropy production (2 sessions).
9. Entropy rate balance for a control volume (3 sessions).
10. Example of a power generation system (3 sessions).

Course Outcomes: (letters in parentheses indicate correlation of the outcome with the appropriate ABET Outcomes a-k)
1. The students will have learned that classical thermodynamics is based upon deductions from experimental observations. (a,e,k)
2. The students will have learned that energy is conserved based on the first law of thermodynamics. (a,e,k)
3. The students will be able to apply thermodynamic analysis to a system or a control volume. (a,e,k)

4. The student will be able to effectively communicate in writing a report. (g)

Design Content:
This course has no requirement for design content.

1/01, modified 10/04
updated 3/08