MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 311: Engineering Thermodynamics I (3 credits)

Course Description (2008-2010 Catalog):

Engineering applications of thermodynamics including the first and second laws, behavior of condensable and non-condensable substances, analysis of open and closed systems, equations of state, power and refrigeration cycles.

Prerequisite Course: Prerequisites PHYS 181, 181L or PHYS 182, 182L

Prerequisite by Topic:

- fluid mechanics, thermodynamics, temperature and thermometry, heat, gases
- Differential equations

Textbook: Thermodynamics: An Engineering Approach, 6th edition, Y. Cengel, M. Boles, McGraw Hill

Other Reference Material: N/A

Course Coordinator: Samir Moujaes, Ph.D., P.E.

Course Learning Outcomes:

a. Be able to identify which substances typically used in engineering systems can be analyzed with ideal gas assumptions and which require the use of liquid/vapors tables. The student should show competency applying both of these concepts and the appropriate properties in the solution of problems.
b. Recognize the differences between thermodynamic processes cycles and, and be able to perform basic analyses of both.
c. Comprehend the differences between work, heat, internal, energy, potential energy, and kinetic energy as they apply to typical engineering systems. As part of this understanding the distinction between concepts of path functions (inexact differentials) and point functions (exact differentials) should be clear.
d. Be able to express and apply the First Law of Thermodynamics (Conservation of Energy) for closed systems and open systems of the steady-state steady-flow (ss-sf) and uniform-state and uniform-flow (us-uf) types. Understand the concept of conservation of mass as it applies to flow systems. Realize the basis and application of the property enthalpy.
e. Have a basic understanding of the Second Law of Thermodynamics and how it applies to cycles. Particularly appreciate the implications and applications of the Carnot Cycle idealization as an upper bound to actual operation.
f. Understand the applications of the Second Law of Thermodynamics and how it applies to processes. Recognize the influence of heat transfer and irreversibilities on the entropy change. Be able to apply this law to situations that involve ideal gases or liquid/vapor substances.
g. Be able to analyze basic Rankine (seam power), Brayton (gas turbines and jet engines), and Vapor-Compression (refrigeration) cycles to determine component and overall performance.

h. Develop an understanding of the basic ideas of psychrometrics (air/water vapor mixtures) and apply them to elementary concepts related to heating, ventilating, and air conditioning (HVAC) systems. Be aware of the simplicity afforded by the Psychrometric Chart in solving practical problems, as well as realize its limitations.

Relationship of Course to Mechanical Engineering Program Educational Outcomes:

Goal1: Provide mechanical engineering graduates with technical capabilities.					Goal 2: Prepare the mechanical engineering graduates to have effective workplace skills.				Goal 3: Instilling a sense of responsibility as a professional member of society.			
1.a	**1.b**	**1.c**	**1.d**	**1.e**	**2.a**	**2.b**	**2.c**	**2.d**	**3.a**	**3.b**	**3.c**	**3.d**
M		**L**		**L**	**L**			**M**			**M**	

(L)ow (M)edium (H)igh

Topics Covered:

1. definitions of basic properties of a system
2. general energy transfer and analysis
3. properties of pure substances
4. energy analysis of closed systems
5. mass and energy of control volumes
6. second law of thermodynamics
7. entropy
8. gas powered cycles
9. vapor and combined cycles
10. refrigeration cycles
11. gas-vapor mixtures

Laboratory Projects: None

Assessment of Student Progress toward Course Objectives

Two written exams, home-works and final exam

Class/Laboratory Schedule: MW 1:00-2:15 (Fa09)

Contribution of Course for meeting Professional Component:

(a) Mathematics and basic sciences:	0 credit
(b) Engineering Topics (Design/Science):	3 credit
(c) General Education:	0 credit
(d) Others:	0 credits

Prepared By: **Date:**

Samir Moujaes October 12, 2009