Department of Mechanical Engineering

ME 435 – Thermodynamics

(Service Course)

Catalog Description: ME 435 (3 0 3)

Intended for non-mechanical engineering students of all disciplines. Topics include the basic laws of thermodynamics, properties of fluids and solids, analysis of open and closed systems, gas and vapor power cycles, refrigeration and air conditioning, and an introduction to heat transfer. Cannot be taken for credit by mechanical engineering students.

Prerequisite(s): Math 211 – Calculus IIIA
Phys 111 – Physics I

Textbook(s)/Materials Required:

1. Sonntag, et al, Introduction to Engineering Thermodynamics, J. Wiley, 2006
2. CATT2 Software, J. Wiley, 2006.

Course Supervisor: Dr. P. J. Florio

Objectives[1]:

1. Students will learn the fundamental concepts and laws of engineering thermodynamics and will apply this knowledge to solve engineering problems.
2. Students will learn to apply the thermodynamic principles to energy conversion devices and cycles.
3. Students will learn the various modes of heat transfer and their use in engineering systems.

Topics[2]:

1. Introductory concepts and definitions (3 hrs.)
2. The first law of thermodynamics, energy transfers – work and heat (6 hrs)
3. Ideal gases (2 hrs)
4. Thermodynamic properties of pure substances, including the use of steam and other table (4 hrs)
5. First law analysis for open systems, steady and transient processes (3 hrs)
6. The second law of thermodynamics and entropy (6 hrs)
7. Air conditioning processes (3 hrs)
8. Power and refrigeration cycles (6 hrs)
9. Heat transfer (3hrs)
10. 3- Tests plus final exam

Evaluation Method:

1. Quizzes
2. Short Quizzes
3. Exam
4. Homework

Schedule: Lecture Recitation: 3 hours, per week
Laboratory: none

Professional Component: Engineering Science/Engineering Design

Program Objectives Addressed: ME program A,B,C,D,E

Course Outcomes[3]:

Objective 1.
1.1 Students will demonstrate an ability to apply the first law of thermodynamics to a variety of physical problems. (1,2,3,4) (a,e,h,k) .
1.2 Students will demonstrate an ability to apply the second law of thermodynamics to a variety of physical problems. (1, 2, 3, 4) (a,e,h,k).
1.3 Students will demonstrate the ability to determine the properties by use of equation or tables. (1, 2, 3, 4) (a,e,h,k).
1.4 Students will demonstrate the ability to use computer software to determine desired properties. (3) (a,e,h,k).
Objective 2.
2.1 Students will demonstrate an ability to thermodynamically analyze systems that possess various energy conversion components. (1,2,3,4) (a,c,e,h,k).
Objective 3.
3.1 Students will demonstrate the ability to analyze simple applications involving conduction, convection and radiation (1,2,3,4) (a,c,e,h,k).

Prepared By: Pasquale J. Florio Date: October 14, 2006

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[1] Capital Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering
Department. Listed in Sec 2 d Tables B-2-9, B-2-12. Table B-2-8 links Program Objectives with the ABET a-k Criterion.
[2] Topic numbers in parenthesis refer to lecture hours. (three hours is equivalent to 1 week)
[3] Outcome numbers in parenthesis refer to evaluation methods used to assess the student performance. Lower case letters in parenthesis refer to ABET a-k outcomes.