University Of California, Berkeley
Department of Mechanical Engineering

ME 40 - Thermodynamics (or Thermophysics and Thermodynamics) [3 units]

Required Course

Syllabus

CATALOG DESCRIPTION

This course introduces the fundamentals of energy storage, thermophysical properties of liquids and gases, and the basic principles of thermodynamics which are then applied to various areas of engineering related to energy conversion and air conditioning. Students will receive no credit for 105B after taking ME 40.

COURSE PREREQUISITES

Chemistry 1A, Mathematics 1B, Physics 7B, and Engin 7

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

A supplement covering fundamentals of quantum molecular energy storage, plus:

Thermodynamics, an Engineering Approach, Y.A. Cengel and M.A. Boles, McGraw Hill, Fifth Edition, New York, 2006.
or:
Introduction to Thermodynamics, Classical and Statistical, R.E. Sonntag and G.J. Van Wylen, John Wiley & Sons, Third Edition, New York, 1991.

COURSE OBJECTIVES

The objectives of this course are:
1) to provide fundamental background of thermodynamics principles, and
2) to develop analytic ability in real-world engineering applications using thermodynamics principles.

DESIRED COURSE OUTCOMES

After completion of the course, students are expected capable of performing basic analysis of performances for energy systems using thermodynamics principles.

TOPICS COVERED

Conservation of energy; definitions of heat and work for a macroscopic system; system states; implications of molecular energy storage and force interactions for systems containing large numbers of molecules, statistical nature of properties; internal energy. Properties of solids, liquids and gases; phase equilibrium; First Law analysis for closed systems; enthalpy. First Law control volume analysis; applications. Introduction to the Second Law; the Carnot Cycle. Definition and interpretation of entropy; entropy change for substances; second law analysis of engineering systems; First and second law analysis of engineering systems. The Rankine cycle; Analysis of gas power cycles. refrigeration cycles; Thermodynamic relations. Air/water vapor mixtures; psychrometrics. Introduction to HVAC component analysis. Thermodynamics of reactive mixtures. Chemical equilibrium. Special topics, review.

CLASS/LABORATORY SCHEDULE

Three hours of lecture and one hour of discussion per week.

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

Thermodynamics is a basic science dealing with energy and it has long been an essential part of engineering practices. This course provides essential knowledge for students to develop professional skills needed for engineering practices.

RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES

An ability to apply knowledge of mathematics, science, and engineering. An ability to identify, formulate, and solve engineering problems. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

Grade will be based on two midterms, homework problem sets and a final exam.

PERSON(S) WHO PREPARED THIS DESCRIPTION: **Van Carey** Sept. 28, 2006