University Of California, Berkeley
Department of Mechanical Engineering

ME 109 - Heat Transfer [3 units]

Required Course

Syllabus

CATALOG DESCRIPTION

This course covers transport processes of mass, momentum, and energy from a macroscopic view with emphasis both on understanding why matter behaves as it does and on developing practical problem solving skills. The course is divided into four parts: introduction, conduction, convection, and radiation.

COURSE PREREQUISITES

ME 105 or ME 40, and ME 106.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

A knowledge of first and second law of thermodynamics as well as some elements of fluid mechanics such as external and internal flow. An ability to analytically and computationally solve ordinary and partial differential equations.

Textbook: "Fundamentals of Heat and Mass Transfer," by F. P. Incropera & D. P. DeWitt, Wiley (5th edn).

COURSE OBJECTIVES

Apply scientific and engineering principles to analyze and design aspects of engineering systems that relate to conduction, convection and radiation heat transfer; use appropriate analytical and computational tools to investigate conduction, convection and radiation heat transfer; are both competent and confident in interpreting results of investigations related to heat transfer and thermal design; recognize the broad technological and historical context of where heat transfer is important.

DESIRED COURSE OUTCOMES

Ability to apply knowledge of heat transfer to solve thermal engineering problems; ability to design, analyze, and interpret heat transfer related data; ability to identify, formulate, and solve heat transfer related problems; recognition of the importance of heat transfer historically as well as in contemporary engineering systems.

TOPICS COVERED

Introduction to heat transfer; steady state heat conduction (1-D, 2-D, 3-D); transient heat conduction (lumped capacitance, 1-D, 3-D); introduction to convective heat transfer; external forced convection; internal forced convection; natural/free convection; heat exchanger analysis and design; blackbody radiation and radiative properties; radiative exchange between surfaces.

CLASS/LABORATORY SCHEDULE

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

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

This course requires that students have: the ability to apply advanced mathematics through multivariate calculus and differential equations; the ability to work professionally in thermal systems areas including the design and realization of such systems.

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

This is achieved through: homework; midterms; finals; discussion sections and class discussions.

PERSON(S) WHO PREPARED THIS DESCRIPTION: Arun Majumdar March 14, 2006