

University Of California, Berkeley
Department of Mechanical Engineering

ME 151 - Advanced Heat Transfer [3 units]

Elective Course

Syllabus

CATALOG DESCRIPTION

Basic principles of heat transfer and their application. Subject areas include steady-state and transient system analyses for conduction, free and forced convection, boiling, condensation and thermal radiation.

COURSE PREREQUISITES

ME 105, ME 106 and ME 109.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

A knowledge of first and second law of thermodynamics, basic heat transfer of conduction, convection, and radiation, as well as 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 thermofluid aspects of engineering systems; use appropriate analytical and computational tools to investigate heat and mass transport phenomena; both competent and confident in interpreting results of investigations related to heat transfer, fluid flow, and thermal design; recognize the broad technological context of heat transfer, especially related to energy technology.

DESIRED COURSE OUTCOMES

ME 151 is a senior elective that deepens and broadens the understanding of heat transfer and fluid flow beyond the required ME 109 class, especially related to energy systems.

TOPICS COVERED

Review of steady-state (1-D, 2-D, 3-D) and transient conduction, convection, and radiation heat transfer. Review of external and internal fluid flow. Advanced

TOPICS COVERED (Cont.)

computational and analytical techniques for conduction, convection, and radiation. Boiling heat transfer. Condensation heat transfer. Mass transfer. Design of engineering systems involving thermofluid phenomena.

CLASS/LABORATORY SCHEDULE

Three hours of lecture 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 understanding of professional and ethical responsibilities. An ability to communicate effectively. Knowledge of contemporary issues.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

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

PERSON(S) WHO PREPARED THIS DESCRIPTION: [Arun Majumdar](#) March 23, 2006