

ES 3073 Heat Transfer

(Required course for ChE, ME and PE programs)

Current Catalog Description: Transfer of heat by conduction, radiation, and convection. Analysis of steady-state and transient heat processes. Introduction to heat exchanger design. Introduction to numerical heat transfer using finite-element analysis.

Prerequisites: ES 3003 (Fluid Mechanics) Corequisite: Math 3073 (Differential Equations)

Prerequisites by Topic: Solution of ordinary differential equations; energy balances; fluid properties; laminar and turbulent flow and the basic concepts of boundary layer theory.

Recent Textbook: *Heat Transfer*, 9th Edition by J.P. Holman; McGraw Hill (2002).

Other Required Material: None

Course Objectives:

At the end of this course, students will be able to:

1. Solve steady state and transient conduction problems.
2. Solve forced convection and natural convection systems.
3. Solve basic radiation problems.
4. Size basic heat exchangers.
5. Work effectively in multi-disciplinary teams.

Major Topics Covered in the Course: Steady-state conduction; unsteady-state conduction; principles of convection; forced convection heat transfer; natural convection; radiation heat transfer; condensation and boiling heat transfer, heat exchanger design and analysis; steady and transient numerical heat transfer using finite-element analysis.

Class/Laboratory Schedule: Lecture meets for two 75-minute sessions each week for 14 weeks.

Professional Component Contribution: This course applies mathematics and basic chemistry and physics to engineering applications of heat transfer. Computer skills are extended in this course to numerical solution of differential equations. A minimum of one design project is assigned in this course. Throughout the course, safety and ethics are emphasized.