

ENFP312 Heat and Mass Transfer

Credits: Three (3)

Contact hours: Two lectures per week, 75 minutes each. One discussion session per week, 50 minutes.

Table 5-1 category: Engineering topic

Instructor: Raffan-Montoya

Textbooks: Fundamentals of Heat and Mass Transfer, 8th Ed. by Bergman, et al. Wiley..

Other supplemental materials: N/A

Catalog description:

Fundamentals of heat and mass transfer. Conduction, convection, and radiation modes of heat transfer. Diffusion concepts and evaporation phenomena. Problem solving techniques with application to fire problems.

Prerequisites and Corequisites:

Prerequisite: ENES232 and ENFP300. Restriction: Permission of ENGR-Fire Protection Engineering department.

Credit only granted for: ENFP312 or ENME332.

Table 5-1 Course Type: Required

Specific outcomes of instruction:

- Application of conservation of thermal energy to engineering systems and identification of modes of heat transfer involved
- Ability to calculate heat (mass) transfer rates, heat fluxes and system temperatures using fundamental laws of heat and mass transfer
- Understand fundamental differences among heat transfer modes
- Implement finite difference methods to the solution of complex conduction (including multi-dimensional and unsteady) heat transfer problems
- Understand the relevance of heat transfer to fire protection engineering

Student outcomes assessed: SO1

Brief list of topics covered:

Basic principles of heat transfer: conservation of thermal energy; modes of heat transfer and governing laws.

Conduction heat transfer (steady and unsteady up to 3D), numerical techniques used for computer-based solutions of the steady and unsteady heat equation (with Matlab implementation).

Convection heat transfer: structure of thermal and mass boundary layers (momentum-driven or buoyancy-driven flow; laminar or turbulent flow), Reynolds analogy; forced and free convection heat and mass transfer.

Radiation heat transfer: black body radiation, reflection/absorption/emission of radiation energy at opaque surfaces; diffuse/gray surface approximations; calculation methods for radiation exchanges between surfaces in enclosures (with/without participating medium).