

1. Introduction

Conduction, convection, radiation; conservation of energy requirement; units and dimensions

2. Governing Equations of Heat Conduction

Conduction rate equations; thermal conductivity and other thermal properties; heat diffusion equation; boundary and initial conditions

3. One Dimensional, Steady-State Conduction

Heat transfer through plane walls, cylinders and spheres; heat transfer with thermal energy generation in plane walls, cylinders and spheres; heat transfer from extended surfaces with different shapes of fins

4. Two-Dimensional, Steady-State Conduction

Graphical solutions; analytical solutions using the method of separation of variables; numerical solutions using finite difference methods

5. Transient Conduction

Lumped capacitance method; exact and approximate solutions for plane and radial systems with convection at the surfaces; finite difference methods; graphical analysis- Schmidt plot

6. Introduction to Convection

Convection boundary layer; convection heat transfer equations; similarity equations; dimensionless parameters

7. Forced Convection: External Flow

Flat plate in parallel flow and cylinder and sphere in cross flow; flow across banks of tubes

8. Forced Convection: Internal Flow

Hydrodynamic considerations; thermal considerations; energy balance; laminar flow in circular tubes; convection correlations

9. Heat Exchangers

Types, overall heat transfer coefficient; analysis using LMTD and NTU

10. Introduction to Radiation (Self Study)

Fundamental concepts, radiation intensity, black body radiation, absorptivity, reflectivity and transmissivity, Kirchoffs law; the gray surface

Text Book:

Fundamentals of Heat and Mass Transfer
Incropera/ DeWitt/ Bergman/ Lavine 6th Ed.

References:

1. Heat Transfer – A Practical Approach Yunus A. Cengel
2. Heat Transfer J. P. Holman
3. Heat Transfer A. J. Chapman
4. Heat Transfer Eckert and Drake
5. Engineering Heat Transfer C. P. Gupta

Assessment:

Assignment, Lab Report → 20%
Intermediate Exam 1 → 20%
Intermediate Exam 2 → 20%
Final Exam → 40%