



B.Tech. (Fifth semester) Mechanical engineering

ME 305- Heat Transfer

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Theory: 60
Continuous Evaluation: 40
Time: 3 Hours
Credit: 3.5

Unit-1: Conduction

Definition of heat; Modes of Heat Transfer; Basic Laws of heat transfer, Electrical Analogy of heat conduction; Conduction through composite Walls; Overall heat transfer coefficient.

The general conduction equation in Cartesian, cylindrical and spherical coordinates Steady one dimensional heat conduction without internal heat generation; The plane slab; The cylindrical shell; The spherical shell; Critical thickness of insulation; Steady one dimensional heat conduction with uniform internal heat generation the plane slab only; Fins of uniform cross section; Governing equation; Temperature distribution and heat dissipation rate; Efficiency and effectiveness of fins.

Unit-2: Convection

Free and forced convection; Newton's law of cooling, Convective heat transfer Coefficient; Nusselt number; Dimensional analysis of free and forced convection; Reynolds analogy Dimensionless numbers; Reynolds, Prandtl Nusselt , Grashoff and Stanton Numbers and their significance; The concept of boundary layer; Hydrodynamic and thermal boundary layer; Analytical formula for heat transfer in laminar and turbulent flow, flow over vertical and horizontal tubes and plates;

Unit-3: Radiation

Theories of thermal radiation; Absorption, Reflection and transmission, Monochromatic and total emissive power; Black body concept; Planck's distribution law; Stefan Boltzman law; Wien's displacement law; Lambert's cosine law; Kirchoff's law; Shape factor; Heat transfer between black surfaces.

Unit-4: Heat Exchangers

Introduction; Classification of heat exchangers; Logarithmic mean temperature Difference; Area calculation for parallel and counterflow heat exchangers; Effectiveness of heat exchangers; N T U method of heat exchanger design; Applications of heat exchangers.

Recommended books:

- 5 1. A Text book of Heat Transfer by S.P Sukhatme, university press
- 5 2. Heat transfer by Holman, TMG
- 5 3. Heat and Mass transfer by D.S Kumar

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.