Heat Transfer 1

Course Code: 28113
Credits: 3
Course Type: Theoretical
Prerequisites: Thermodynamics 1
Corequisite: Fluid Mechanics 2
Course Length: 51 hours

Outline:

1 - BASICS OF HEAT TRANSFER

Heat Transfer Mechanisms (Conduction, Convection, Radiation), Thermal Resistance Concept, Units and Dimensions, Analysis of Heat Transfer Problems: Methodology

2 - STEADY STATE HEAT CONDUCTION

Thermal Conductivity, One-Dimensional Heat Conduction Equation, General Heat Conduction Equation, Boundary and Initial Conditions, Heat Generation in a Solid, Heat Transfer from Extended Surfaces, Thermal Contact Resistance, Two-Dimensional Heat Conduction Equation, The Method of Separation of Variables,

3 - TRANSIENT CONDUCTION

The Lumped Capacitance Method, Spatial Effects, The Plane Wall with Convection, Radial Systems with Convection, Finite-Difference Methods, The Semi-Infinite Solid,

4 - FUNDAMENTALS OF CONVECTION

The Convection Boundary Layers, Local and Average Convection Coefficients, Laminar and Turbulent Flow, The Boundary Layer Equations, Boundary Layer Similarity, Boundary Layer Analogies

5 - EXTERNAL FORCED CONVECTION

The Flat Plate in Parallel Flow, Laminar and Turbulent Flow, Flow across Cylinder and Sphere, Flow Across Banks of Tubes, Impinging Jets

6 - INTERNAL FORCED CONVECTION

The Mean Velocity and temperature, Newton’s Law of Cooling, Fully Developed Conditions, The Energy Balance, Laminar and turbulent flow in Circular Tubes, Convection

Correlations: Turbulent Flow in Circular Tubes, Noncircular Tubes and the Concentric Tube Annulus

References:

1. “Introduction to Heat Transfer”. F. P. Incropera and D. P. DeWitt, Wiley
2. “Heat Transfer”, J. P. Holman, McGraw-Hill
3. "Heat transfer, a practical approach", Y.A. Cengel, McGraw-Hill