AMAC-9 HEAT TRANSFER

UNIT-1 PRINCIPLES OF HEAT TRANSFER
1.1 Introduction, Modes of Heat Transfer, Fourier Law of Heat Conduction, Newton's Law of Cooling for Convection,
1.2 Thermal Radiation, Electrical Analogy, Heat Transfer by Combined Modes and Through Composite Bodies.

UNIT-2 GENERAL HEAT CONDUCTION EQUATION
1.1 Introduction, General Heat Conduction Equation for an Anisotropic Materials in Cartesian Co-ordinates, Cylindrical Co- ordinates, Spherical Coordinates,
1.2 Thermal Diffusivity, Initial and Boundary Conditions.

UNIT-3 STEADY-STATE CONDUCTION
3.1 Introduction, Heat flow through a Slab or a Plane Wall, Heat flow through Radial Systems
3.2 Cylinders Heat Flow Through Radial Systems, Spheres, Heat Flow through Composite Wall , Overall Heat Transfer Coefficient,
3.3 Heat Flow through Wall with Variable Thermal Conductivity, Critical Thickness of Insulation, Steady state Conduction with Internal Heat Generation,
3.4 Steady-State Conduction–Two Dimension.

UNIT-4 STEADY-STATE CONDUCTION WITH HEAT DISSIPATION TO ENVIRONMENT
4.1 The Controlling Coefficients, A Thin Rod, The Rectangular Fin, The Circular Fin, Fin Efficiency and Effectiveness, Condition for Using Fins.

UNIT-5 UNSTEADY STATE CONDUCTION
5.1 Unsteady-State Process, Solids of Infinite Thermal Conductivity- Lumped Heat Capacity Analysis,
5.2 Solution of Unsteady-State One Dimensional Heat Conduction Equation.

UNIT-6 FORCED CONVECTION
6.1 Convection, Hydrodynamic Boundary Layer, Thermal Boundary Layer, Determination of Dimensionless Correlation for Forced Convection,
6.2 Empirical Correlations for Flow Inside Tubes, Empirical Correlation for Flow Outside Tubes, Differential Equations, of Boundary Layer on a Flate Plate,
6.3 Solution of Differential Equations of Boundary Layer, The Integra; Equations of the Boundry Layer, Analogy between Fluid Friction and Heat Transfer,
6.4 Heat Transfer in Laminar Flow in Tubes, Solution for Constant Wall Temperature, Heat Transfer in Turbulent Flow in Tubes.

UNIT-7 FREE OR NATURAL CONVECTION
7.1 Characteristic Parameters in Natural Convection,

7.2 Determination of Dimensionless Correlation for Free Convection, Empirical Correlations for Free convection,

7.3 Momentum and Energy Equations for Laminar, Free Convection Heat Transfer on a Vertical Flate Plate, Integral Equations for Momentum and Energy on a Flat Plate.

UNIT-8 THERMAL RADIATION

8.1 Thermal Radiation in Electromagnetic Spectrum , Radiation Properties, Planck's Law for Monochromatic Thermal Radiation of a Black Body,

8.2 Emissive Power an Radiation Intensity, Monochromatic Emissive Power of a Black Body, Stefan- Boltzmann Law of Black Body Radiation,

8.3 Heat Exchange by Radiation between Black Surfaces, Radiation Shape Factor and Reciprocity Theorem,

8.4 Heat Exchange between Non- black Bodies, Heat Exchange by Radiation between Gray Surfaces, Radiation Shields, Radiation from Gases and Vapours.

UNIT-9 MASS TRANSFER BY MOLCULAR DIFFUSION

9.1 Introduction to Mass Transfer, Fick's Law of Diffusion, Definitions of Quantities, Fick's Law in Terms of Mass and Mole Fractions,

9.2 Equivalence of Diffusion in Stationary- Media - Species Conservation Equation, Diffusion in Binary Gas mixture.

Reference books:
1. Introduction to Heat Transfer Book by Frank P. Incropera
2. Heat and Mass Transfer: Fundamentals & Applications Book by Afshin Jahanshahi Ghajar and Yungus A. Cengel
3. Process Heat Transfer Book by Donald Kern