Course Outline:

1. **Introduction**: Definition of heat transfer, Modes of heat transfer: conduction, convection, radiation; Combined modes of heat transfer; Analogy between heat transfer and flow of electric current; The overall heat transfer coefficient
2. **One Dimensional Steady-State Conduction:** Physical mechanism of conduction; General heat conduction equation in: rectangular -, cylindrical - and spherical co-ordinate systems; Plane wall with specified boundary temperature; Multi-layer wall with specified boundary temperature; Conduction with uniformly heat generation; Effect of variable thermal conductivity; Critical thickness of insulation; Heat transfer from extended surfaces.
3. **Two Dimensional Steady State Heat Transfer:** Analytical method (the method of separation of variable); Numerical method (the finite difference method); Graphical method.
4. **Transient Heat Conduction:** The lamped capacitance method; Validity of lumped capacitance method; One-dimensional system with convective surface conditions (application of Heisler and Grober Charts); Graphical method - Schmidt Plot.
5. **Introduction to convection:** The convection transfer equation; Convection boundary layers: Velocity boundary layer and thermal boundary layer; Significance of boundary layer; Laminar and turbulent flow
6. **Forced Convection:** Methodology for convection calculation of flat plate in parallel flow with laminar; Mixed and turbulent flow conditions; The cylinder in cross flow; The sphere; Flow across bank of tubes; Internal flow; The mean velocity; Velocity profile in fully developed region; The mean temperature; Convection correlation laminar flow in circular tubes for fully developed and entry regions; Convective correlation for turbulent flow in circular tubes; Convection correlation for non-circular tubes.
7. **Free Convection:** Physical considerations; The governing equation; Free convection on a vertical plate; Empirical correlations for external flows of vertical- plate, inclined and horizontal plates.
8. **Heat Transfer with phase change:**
9. **Heat Exchangers:** Heat exchanger types; The overall heat transfer coefficient; Heat exchanger analysis using lo mean temperature difference and the effectiveness-NTU method; Method of heat exchanger calculation

Radiation Heat Transfer: Blackbody radiation exchange; Radiation exchange at surface; The view factor; View factor relations; Radiation exchange between surfaces.