

Year & Sem: E1S2	Course Code:CH1202	Course Name: Heat Transfer	No. of Credits: 4	L 2	T&PS 2	P 0
UNIT I: Introduction: Nature of heat flow, conduction, convection, natural and forced convection, radiation. Heat transfer by conduction in Solids: Fourier's law, thermal conductivity, steady state conduction in plane wall & composite walls, compound resistances in series, heat flow through a cylinder, conduction in spheres. Unsteady state heat conduction: Equation for one-dimensional conduction, Semi-infinite solid. UNIT II: Principles of heat flow in fluids: Typical heat exchange equipment, countercurrent and parallel current flows, energy balances, rate of heat transfer, overall heat transfer coefficient, electrical analogy, critical radius of insulation, logarithmic mean temperature difference, variable overall coefficient, multi-pass exchangers, individual heat transfer coefficients, resistance form of overall coefficient, fouling factors, classification of individual heat transfer coefficients, magnitudes of heat transfer coefficients, effective coefficients for unsteady-state heat transfer. UNIT III: Heat Transfer to Fluids without Phase change: Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar flow, heat transfer by forced convection in turbulent flow, the transfer of heat by turbulent eddies and analogy between transfer of momentum and heat, heat transfer to liquid metals, heating and cooling of fluids in forced convection outside tubes. UNIT IV: Natural convection: Natural convection to air from vertical shapes and horizontal planes, effect of natural convection in laminar-flow heat transfer. Heat transfer to fluids with phase change: Heat transfer from condensing vapors, heat transfer to boiling liquids. Radiation: Introduction, properties and definitions, black body radiation, real surfaces and the gray body, absorption of radiation by opaque solids, radiation between surfaces, radiation shielding, radiation to semi transparent materials, combined heat transfer by conduction, convection and radiation. UNIT V: Heat exchange equipment: General design of heat exchange equipment, heat exchangers, condensers, boilers and calandrias, extended surface equipment, heat transfer in agitated vessels, scraped surface heat exchangers, heat transfer in packed beds, heat exchanger effectiveness (NTU method) Evaporators: Evaporators, performance of tubular evaporators, capacity and economy, multiple effect evaporators, methods of feeding, vapor recompression. References/Text Books: 1. Transport processes and Unit operations, Christie J. Geankoplis, PHI. 2. Unit Operations of Chemical Engineering by W. L. McCabe, J. C. Smith & Peter Harriot, 6th Edition. McGraw-Hill 3. Process heat transfer by D. Q. Kern, McGraw-Hill. 4. Heat Transfer, 4th ed., J.P. Holman, McGraw-Hill, New York, 1976. 5. Heat Transfer by B. K. Dutta Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.						