PMT3I103 TRANSPORT PHENOMENA

Module I (14 hours)

Classification of fluids, ideal & real, Newtonian & Non-Newtonian, Newton's law of viscosity. Types of fluid flow – streamline & turbulent, continuity equation for incompressible and compressible fluid and its application. Concept of velocity bounds layer.; Bernoulli's equation and its application for flow measurement by venturimeter, orifice meter, pilot tube and rotameter. Dimensional analysis by Rayleigh's method of indices and Buckingham's π theorem. Example of analysis of pressure gradient, mass transfer co-efficient & convective heat transfer co-efficient, concept of similarly and dimensionless criteria. Dimensionless groups & their significance. Pressure drop & friction factor in various configurations, flow in packed bed & fluidized bed. Free and partially restricted jets, high velocity fluid jets.

Module II (14 hours)

Heat Transfer: Internal & External modes of heat transfer, steady state heat conduction in monolayer and composite flat walls & cylinders. Unsteady state heat conduction, thin & massive body heating & cooling. Finite difference method in solving unsteady state heat conduction. Natural and forced convection, concept of heat transfer co-efficient, thermal boundary layers, some examples of connective co-relations. Law of radiation – Steffan-Boltzmann's law, Kirchoff's law & Lambarth's law, Black & grey body concepts, view factor, Radiation from flames & gases. Radiation between simple surfaces with & without absorbing gas media. Radiation shields. Overall Heat transfer co-efficient.

Module III (12 hours)

Mass transfer: Mass Transfer: Law of diffusion and their application, concept of mass transfer co-efficient & concentration boundary layer, Interfacial mass transfer, overall mass balance.

Books for Reference:-

1. *Transport Phenomena by R. B. Bird, W. E. Stewart and E. N. Lightfoot, Wiley, 1960*
2. *Transport Phenomena in Metallurgy by G. H. Geiger and D. R. Poirier, Addison-Wesley,*
1. *1973.*
2. *Rate Phenomena in Process Metallurgy by J. Szekely and N. J. Themelis*
3. *Rate Processes in Metallurgy by A. K. Mohanty, PHI*
4. *J. R. Welty, R. E. Wilson and C. E. Wicks, Fundamentals of Momentum Heat and Mass Transfer, Wiley, 1976.*