4th Semester	RMM4C001	Transport Phenomena	L-T-P 3-0-0	3 CREDITS

Module-I (9 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.

Module-II (9 hours)

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 imilarly 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-III (9 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.

Module-IV (10 hours)

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-V (8 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:

- Transport Phenomena by R. B. Bird, W. E. Stewart and E. N. Lightfoot, Wiley, 1960
- Rate Processes in Metallurgy by A. K. Mohanty, PHI

- Transport Phenomena in Metallurgy by G. H. Geiger and D. R. Poirier, Addison-Wesley, 1973.
- Rate Phenomena in Process Metallurgy by J. Szekely and N. J. Themelis
- J. R. Welty, R. E. Wilson and C. E. Wicks, Fundamentals of Momentum Heat and Mass Transfer, Wiley, 1976.