UG Department: **Chemical Engineering**
Course Code: **CH312** Course Name: **Transport Phenomena**
Credit: **4** L-T-P: **3-1-0**
Version: **1** Approved on:
Prerequisite Course: **Nil**

1. Continuum fluids, Newton's law of viscosity, Introduction to non-Newtonian fluids, pressure and temperature dependency of viscosity, viscosity of gases at low density, Laminar flow, shell momentum balance, boundary conditions, selected applications. Equations of change for isothermal systems – Navier-Stokes equation, use of equations of change to set up steady state flow problems with Newtonian fluids, friction factor, similarity and dimensionless parameters, Buckingham pi-theorem, Microscopic mass, momentum and energy balance for isothermal systems, Bernoulli's equation, compressible flow, pipe flow.
2. Shell energy balances, Fourier's Law of heat conduction, boundary conditions. Application to steady and unsteady problems, convective heat transfer, heat transfer coefficients for forced convection around submerged objects, for free convection for condensation of pure vapours on solid surface. Macroscopic energy balance, Bernoulli's Equation, parallel/counter flow heat exchanger – concepts, heating of a liquid in an agitated tank, similarity parameter.
3. Fick's Law of diffusion, analogy with heat transfer, shell mass balances, boundary conditions, applications, species continuity equation, conductive mass transfer, mass transfer coefficients, applications, correlations, macroscopic balances and application to solve steady state problems.

Books

1. Bird, R. B., Stewart, W. E. and Lightfoot, E. N., "*Transport Phenomena*," 2nd ed., John Wiley, Singapore, 2002.

2. Thomson, W. J., "*Introduction to Transport Phenomena*," Pearson Education Asia, 2000.

3. Brodkey, R. S. and Hershey, H. C., "*Transport Phenomena: A Unified Approach*," McGraw-Hill, NY, 1988.