

## PCH206 TRANSPORT PHENOMENA

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### Course Objective:

To be able to analyze various transport processes with understanding of solution approximation methods and their limitations.

**Introduction:** Basic concepts of transport phenomena, Newtonian and non-Newtonian fluids, Basic laws of momentum, energy and mass transport, Laminar and turbulent flow, Equation of continuity.

**Momentum Transport:** Shell momentum balance, Equations of motion, Navier's-Stokes equation, Velocity distributions with one and more than one independent variable, Time dependent flow, Velocity distributions in turbulent flow, viscous flow, Flow past immersed bodies, Boundary layer theory, Lubrication theory, Turbulent flow, Fluctuations and time smoothed equations for velocity, Time smoothed equation of change, Turbulent flow in ducts, Equation of energy, Equation of continuity, Reynolds stress, Inter-phase transport, Friction factor for flow in tube, around sphere and for packed columns, Polymeric liquids.

**Energy Transport:** The equation of change of non-isothermal system, Temperature distribution for more than one variable, Temperature distribution in turbulent flow, Inter-phase transport in non-isothermal system, Energy transport by radiation.

**Mass Transfer:** Equations of change for multi-component systems, Concentration distributions with more than one independent variable, Concentration distributions in turbulent flow, Inter-phase transport in non-isothermal mixtures.

### Course learning outcomes (CLOs):

The students will be able to

1. analyze heat, mass and momentum transport in a process
2. formulate industrial problems along with appropriate boundary conditions
3. develop steady and time dependent solutions for the problem involving heat, mass and momentum transfer

### Recommended Books:

1. Bird, R.B., Stewart, W.E., and Lightfoot, E.N., *Transport Phenomena*, Wiley (2002).
2. Brodkey R.S. and Hershey H.C., *Transport Phenomena: A Unified Approach, Volume 1*, McGraw Hill (1988).
3. Brodkey R.S. and Hershey H.C., *Transport Phenomena: A Unified Approach, Volume 2*, McGraw Hill (2003).
4. Gandhi, K.S., *Heat and Mass Transfer: A Transport Phenomena Approach, New age international* (2011).

### Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1.	MST	30
2.	EST	45
3.	Sessional (may include Assignments/Projects/Tutorials/Quizes/Lab Evaluations)	25