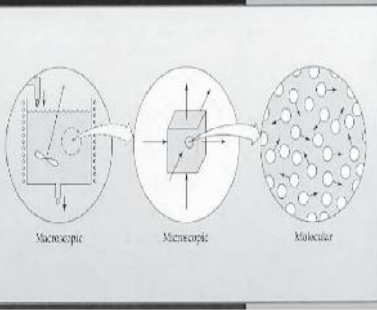# 16CH404 TRANSPORT PHENOMENA

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	20	50	-	-	5	5

Course Description and Objectives:

The course provides fundamental understanding of various transport processes occurring in process industries. The objective of this course is to train the student in momentum transfer, heat transfer and mass transfer phenomena and their applications.

Course Outcomes:

The student will be able to:

- understand transport processes occurring in engineering applications.
- derive a constitutive equation for determining the transport characterstics of a given scenario.

SKILLS:

- ✓ *Estimation of transport properties.*
- ✓ *Predict appropriate boundary conditions for fluid flow.*
- ✓ *Determine flow characteristics.*
- ✓ *Develop velocity distribution profile for simple geometries.*

UNIT - 1
L-9, T-3

TRANSPORT PROPERTIES : Introduction, Newton's law of viscosity, Estimation of transport properties and their dependency on Pressure, Temperature and Concentration.

UNIT - 2
L-9, T-3

MOMENTUM BALANCE : Boundary conditions, Flow problems, Flat plate, Circular pipe, Annulus, Creeping flow.

UNIT - 3
L-9, T-3

ENERGY BALANCE : Boundary conditions, Fourier's law of conduction, Composite wall, Extended fin surface, Viscous heat source, Chemical heat source, Electric heat source.

UNIT - 4
L-9, T-3

MASS BALANCE : Boundary conditions, Diffusion through a stagnant gas film, Homogeneous, Heterogeneous reactions, Falling liquid film, Chemical reaction inside a porous catalyst.

UNIT - 5
L-9, T-3

FLOW PROBLEMS : Equation of change for isothermal, Non isothermal systems, Use of equation of change to solve flow problems, Introduction to turbulent flow.

TEXT BOOKS:

1. Bird R. B., Stewart W.E. and Lightfoot, B., "Transport Phenomena", 3rd edition, McGraw-Hill, 2003.

REFERENCE BOOKS:

1. James. R. Welty, Robert. E. E. Wilson, "Fundamentals of Momentum, Heat and Mass Transfer", 2nd edition, John Wiley & Sons, 2002.

2. Theodore L., "Transport Phenomena", 2nd edition, John Wiley & Sons, 2002.

3. Geankoplis J., "Transport Processes & Unit Operations", 3rd edition, Prentice Hall of India, 2003.

ACTIVITIES:

o *Estimation of transport properties like viscosity, conductivityand diffusivity using MAT Lab.*

o *Property estimation using ASPEN Plus.*

o *Velocity, temperature and concentration distributions using MAT Lab.*