COURSE TITLE	**TRANSPORT PHENOMENA**
COURSE CODE	**01CH0708**
COURSE CREDITS	**4**

Objective:

1 To develop the fundamental knowledge of the principles which governs the transport of momentum, energy, and mass transfer, with emphasis on mathematical formulation of conservation principles

Course Outcomes: After completion of this course, student will be able to:

1 Setup overall balances for conservation of momentum, energy and mass

2 Recognize and apply analogies among momentum, heat and mass transfer

3 Reduce and solve the appropriate equations of change to obtain desired profiles for velocity, temperature and concentration

4 Utilize information obtained from solutions of the balance equations to obtain Engineering quantities of interest

Pre-requisite of course: Mass Transfer, Heat Transfer and Momentum Transfer

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Transport Phenomenon** Importance of Transport Phenomena, Classification of Transport Processes, Three levels of transport phenomena, Conservation Laws, Basic introduction of Momentum, Heat and Mass Transport. Vector and Tensor Calculus	4
2	**Principles of Momentum Transport** Concept of Viscosity, Newton's Law of Viscosity, Shell Momentum Balance, Application of Shell Momentum Balance, Flow of Falling Film, Flow Through Circular Pipe, Flow Through annulus, Equation of Changes: Continuity Equation, Equation Motion, Navier-Stokes Equation in Cartesian Co-ordinate's and Cylindrical Co-ordinate	12
3	**Principles of Steady State Heat Transport** Steady State Condition and Fourier's Law, Shell Energy Balance, Applications of Shell Energy Balance: Heat Conduction with an Electrical Heat Source, Heat Conduction with a Nuclear Heat Source, Heat Conduction with a Viscous Heat Source, Heat Conduction with a Chemical Heat Source, Heat Conduction through Composite Walls	12

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Contents : Unit	Topics	Contact Hours
4	**Principles of Mass Transport** Diffusion through a Stagnant Gas Film, Diffusion with a Heterogeneous Chemical Reaction, Diffusion with a Homogeneous Chemical Reaction, Diffusion into a Falling Liquid Film (Gas Absorption), Diffusion and Chemical Reaction inside a Porous Catalyst	12
Total Hours		**40**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorial 1** Flow of Falling Film	2
2	**Tutorial 2** Flow through Circular Pipe	2
3	**Tutorial 3** Flow through annulus	2
4	**Tutorial 4** Use of the Equations of Change to Solve Flow Problems	2
5	**Tutorial 5** Heat Conduction with a Nuclear Heat Source	2
6	**Tutorial 6** Heat Conduction with a Viscous Heat Source	2
7	**Tutorial 7** Heat Conduction with a Chemical Heat Source	2
8	**Tutorial 8** Heat Conduction through Composite Walls	2
9	**Tutorial 9** Diffusion with a Homogeneous Chemical Reaction	2
10	**Tutorial 10** Diffusion into a Falling Liquid Film (Gas Absorption)	2
11	**Tutorial 11** Diffusion and Chemical Reaction inside a Porous Catalyst	2
Total Hours		**22**

Textbook :

1 Transport Phenomena, B M Suryavanshi, L R Dongre, Nirali Prakashan, 2016

2 Transport Phenomena Fundamentals , Joel L. Plawsky, CRC press, 2020

References:

1 Transport Phenomena, Transport Phenomena, R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, Wiley Publications, 2007

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References:

2 Fundamentals of Momentum, Heat, and Mass Transfer , Fundamentals of Momentum, Heat, and Mass Transfer , James Welty, Charles E. Wicks, Robert E. Wilson, Gregory L. Rorrer, John Wiley & Sons, 2001

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory

4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1 https://archive.nptel.ac.in/courses/103/105/103105128/

2 https://archive.nptel.ac.in/courses/103/102/103102024/#

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