INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING**
SEMESTER	**2**
COURSE TITLE	**ADVANCED TRANSPORT PHENOMENON**
COURSE CODE	**01CM0222**
COURSE CREDITS	**3**

Objective:

1 This course delves into the advanced concepts of transport phenomena, encompassing momentum, heat, and mass transfer.

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

1 Analyze and solve complex transport problems in engineering systems using conservation principles

2 Derive and apply the governing equations of momentum, heat, and mass transfer

3 Utilize advanced analytical and computational techniques for solving transport phenomena problems

4 Interpret and model transport processes in multi-phase systems and non-Newtonian fluids

Pre-requisite of course: Knowledge of concept of Transport Phenomenon

Teaching and Examination Scheme

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

Contents : Unit	Topics	Contact Hours
1	**Fundamentals of Transport Phenomena** Review of Conservation Laws: Mass, Momentum, and Energy, Dimensional Analysis and Scaling, Physical Meaning of Transport Coefficients	8
2	**Momentum Transport** Navier-Stokes Equations: Derivation and Solutions, Flow in Non-Newtonian Fluids, Boundary Layer Theory, Micro- and Nano-scale Flow	8
3	**Heat Transport** Advanced Conduction: Anisotropic and Multilayer Media, Convection: Forced and Natural Convection in Complex Geometries, Radiative Heat Transfer in Participating Media	8

DR. DHARMESH HARESHKUMAR SUR
Digitally signed by (Name of HOD)

DR. RAJENDRASINH BAHADURSINH JADEJA
Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
4	**Mass Transport** Diffusion in Multicomponent Systems, Coupled Heat and Mass Transfer, Applications in Catalysis, Membrane Processes	8
5	**Multiphase Transport and Advanced Topics** Transport in Porous Media, Microfluidics and Nanofluidics • Bio-Transport Phenomena, Energy and Environmental Applications	8
Total Hours		**40**

Textbook :

1 Advanced transport phenomena. , Slattery, J. C., Cambridge University Press., 1999

References:

1 Transport phenomena: an introduction to advanced topics, Transport phenomena: an introduction to advanced topics, Glasgow, L. A. , John Wiley & Sons., 2010

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 and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	30.00	30.00	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, ecourses, Virtual Laboratory.

Supplementary Resources:

1 https://online-learning.tudelft.nl/courses/advanced-transport-phenomena/

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