

GANPAT UNIVERSITY					
FACULTY OF DIPLOMA ENGINEERING					
Programme	Diploma in Chemical Engineering				
Semester	IV	Version	1.0.0.0		
Effective from Academic Year	2026-27	Effective for the batch Admitted in	JULY 2025		
Course code	1CH4101	Course Name	Mass Transfer - 1		

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical			Based on SL		Total Marks	
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
		MAX	MAX	MAX	MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN		
DSC	1CH4101	3	-	0	3	6	3	40	60	100	40	-	-	-	-	20		8

Abbreviation:	CL- Classroom Learning	TL - Tutorial Learning	LL - Laboratory Learning
	SLH - Self Learning Hours	NLH - Notional Learning Hours	SLA - Self Learning Assessment
	FA - Formative Assessment (Term work + Mid Sem Exam + Attendance)		SA - Summative Assessment

II. PRE-REQUISITES

None

III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES

Industry and employers expect chemical engineers to gain fundamental knowledge of basic mass transfer operations.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1: Understand the fundamentals of mass transfer operations

CO2: Understand diffusion and estimate the diffusivity for molecular diffusion in gases and liquids.

CO3: Learn the local and overall mass transfer coefficient for interphase mass transfer

CO4: Understand mass transfer processes like diffusion, gas absorption, liquid-liquid extraction and leaching

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's)&CO's	Marks	Hours
Unit 1: Introduction	TLO1.1 Understand the importance of mass transfer operations. TLO1.2 Learn the classification of mass-transfer operations TLO1.3 Know the methods of conducting mass transfer operations and fundamental design principles	1.1 Importance of mass transfer operations 1.2 Classification of mass-transfer operations 1.3 Methods of conducting mass transfer operations and fundamental design principles	6	6
Unit 2: Molecular diffusion and inter-phase mass transfer	TLO2.1 Understand the concept of molecular and eddy diffusion TLO2.2 Learn the Fick's law for diffusion. TLO2.3 Understand the concept of equilibrium	2.1 Concept of molecular and eddy diffusion 2.2 Fick's law for diffusion 2.3 Concept of equilibrium 2.4 Local and average overall mass transfer coefficient	18	12

	TLO2.4 Learn the local and average overall mass transfer.			
Unit 3: Gas absorption	<p>TLO 3.1 Understand the basic of absorption and their applications.</p> <p>TLO 3.2 Learn the equilibrium solubility of gases in liquids.</p> <p>TLO 3.3 Understand the Effect of temperature and pressure on solubility</p> <p>TLO 3.4 Know the characteristics of ideal solutions using Raoult's law</p> <p>TLO 3.5 Learn the Choice of solvents</p> <p>TLO 3.6 Explore the Material balance for the component transfer in counter-current and co-current flow with numerical.</p>	<p>3.1 Definition and application of absorption</p> <p>3.2 Equilibrium solubility of gases in liquids</p> <p>3.3 Effect of temperature and pressure on solubility</p> <p>3.4 Characteristics of ideal liquid solution</p> <p>3.5 Choice of solvents</p> <p>3.6 Mass balance in counter-current and co-current flows</p>	18	12
Unit 4: Equipment for gas-liquid operation	<p>TLO4.1 Understand the operation and construction of different gas-liquid equipment's in the chemical industry</p> <p>TLO4.2 Understand liquid dispersed equipment's like venturi scrubbers, wetted wall column, spray tower, packed tower with types of packing's utilized.</p> <p>TLO4.3 Know about comparison between tray and packed tower</p>	<p>4.1 Construction and working of gas dispersed equipment's like bubble column (Sparged vessel), agitated vessel, tray tower along with types of trays etc.</p> <p>4.2 Liquid dispersed equipment's like venturi scrubbers, wetted wall column, spray tower, packed tower with types of packing's utilized</p> <p>4.3 Comparison between tray and packed tower</p>	18	15

VI. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Presentation - Role of mass transfer operations in chemical industries with real-world examples.
- Case study - Identify an air or water pollution problem and propose a gas absorption-based solution
- Design project: Generate a working model using Excel/ASPEN/MATLAB calculation efficiency in gas absorption using spray, packed, or plate towers based on data available in literature.

VII. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1.	Unit Operations of Chemical Engineering	McCabe, Warren L., Julian C.	McGraw Hill Publication, New York

		Smith	
2.	Mass Transfer Operations	Robert E. Treybal	McGraw Hill Publication, New York
3.	Principles of Mass Transfer and Separation Processes	Binay K. Dutta	Prentice Hall India Learning Private Limited
4.	Unit Operations of Chemical Engineering	Kiran D. Patil	Nirali Publication
5.	Unit Operation – I	Gavhane, K.A.	Nirali Prakashan

VIII. LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in/courses/103103034
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XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Introduction	CO1	6	2	2	2	6
2	Molecular diffusion and interphase mass transfer	CO2	12	3	9	6	18
3	Gas absorption	CO3	12	3	9	6	18
4	Equipment for gas-liquid operation	CO4	15	3	9	6	18
Grand Total			45	11	29	20	60

X. COs AND POs AND PSOs MAPPING

Course outcome (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	3	3	2	2	2
CO2	2	2	2	1	1	2	2	1	2	2
CO3	2	2	2	2	1	2	2	2	3	2
CO4	3	1	1	2	1	1	1	2	1	1

Legends: - 3- High 2-Moderate/Medium 1-Slight/Low 0-None