Maharashtra State Board of Technical Education, Mumbai

K-2

LABORATORY PLAN (LP)

Academic Year: 2025-26

Institute Name & Code: K. K. Wagh Polytechnic, Nashik-3 (0078) **Class: TYCH**
Program and Code: Chemical Engineering (CH) **Course Index: CO604**
Course Name: Mass Transfer Operation (MTO) **Course Code &. Abbr.:316303 (MTO)**
Total Hrs: 48 **Semesters: VIth** **Scheme: K** **Name of Faculty: Mr.P.M.Pathak**

1. TEACHING AND EXAMINATION SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316303	MASS TRANSFER OPERATION	MTO	DSC	4	-	4	2	10	5	03	30	70	100	40	25	10	25#	10	25	10	175

- **Course Outcomes (COs): Theory & Practical**

TYCH- Students will be able to achieve & demonstrate the following COs on completion of course based Learning.

CO No.	Course Outcomes
CO1	Diffusion: Fundamentals and Applications in Mass Transfer
CO2	Distillation
CO3	Gas Absorption
CO4	Liquid-Liquid Extraction
CO5	Crystallization and Drying

- **Laboratory Learning Outcome (LLO): NA for I scheme**
- **Practical Plan:**

Sr. No	CO	PrO	Title	Date of Performance Planned		Date of Completion		Remark/ Assessment Date
1	a	1	Determination of the diffusion coefficient of a given gas or	Batch A	18/12/2025	Batch A	25/12/2025	

Sr. No	CO	PrO	Title	Date of Performance Planned		Date of Completion		Remark/ Assessment Date
			vapour in air using a diffusion cell	Batch B	19/12/2025	Batch B	26/12/2025	
2	a	2	Determination of the diffusivity of a solute in a liquid medium using a diffusion cell	Batch A	25/12/2025	Batch A	01/01/2026	
				Batch B	26/12/2025	Batch B	02/01/2026	
3	a	4	Experimental validation of Rayleigh's equation in a binary distillation setup	Batch A	01/01/2026	Batch A	08/01/2026	
				Batch B	02/01/2026	Batch B	09/01/2026	
4	a	7	Determination of Vapour-Liquid Equilibrium (VLE) Data for a Binary Mixture	Batch A	08/01/2026	Batch A	15/01/2026	
				Batch B	09/01/2026	Batch B	16/01/2026	
5	a	17	Performance Evaluation of a Fractional Distillation Column for separation of binary mixtures	Batch A	15/01/2026	Batch A	22/01/2026	
				Batch B	16/01/2026	Batch B	23/01/2026	
6	e	14	. Performance Evaluation of a Packed Column for Gas Absorption	Batch A	22/01/2026	Batch A	29/01/2026	
				Batch B	23/01/2026	Batch B	30/01/2026	
7	e	15	Determination of distribution coefficient of a solute from a liquid mixture using a suitable solvent for Liquid-Liquid Extraction in a Mixer Settler unit	Batch A	29/01/2026	Batch A	05/02/2026	
				Batch B	30/01/2026	Batch B	06/02/2026	
8	a	16	Determination of the crystal yield and crystal size distribution by performing batch crystallization of a solution in a batch crystallizer	Batch A	05/02/2026	Batch A	12/02/2026	
				Batch B	06/02/2026	Batch B	13/02/2026	
9	d	18	Determination of the drying rate and equilibrium moisture content using a tray dryer	Batch A	12/02/2026	Batch A	19/02/2026	
				Batch B	13/02/2026	Batch B	20/02/2026	
10	b	9	Determination of pressure drop and flooding velocity in a packed absorption column	Batch A	19/02/2026	Batch A	26/02/2026	
				Batch B	20/02/2026	Batch B	27/02/2026	
11	c	10	Determination of Height Equivalent to Theoretical Plates (HETP) in a Packed Distillation Column	Batch A	26/02/2026	Batch A	05/03/2026	
				Batch B	27/02/2026	Batch B	06/03/2026	
12	d	12	Evaluation of the impact of solvent-to-feed ratio on the efficiency of liquid-liquid extraction.	Batch A	05/03/2026	Batch A	12/03/2026	
				Batch B	06/03/2026	Batch B	13/03/2026	

- **Reference:**

2. SUGGESTED LEARNING RESOURCES

Sr.No	Author	Title	Publisher with ISBN Number
1	K.V. Narayanan, B. Lakshmikutty	Mass Transfer Operations: Theory and Application	CBS Publishers & Distributors Pvt. Ltd. 978-9354666094
2	Robert E. Treybal	Mass Transfer Operations	McGraw-Hill 978-0070666153
3	Warren L. McCabe, Julian C. Smith, Peter Harriott	Unit Operations of Chemical Engineering	McGraw-Hill 978-0072848236
4	Binay K. Dutta	Principles of Mass Transfer and Separation Processes	PHI Learning 978-8120345187
5	Christie J. Geankoplis	Transport Processes and Separation Process Principles	Pearson Education 978-0131013674
6	J.M. Coulson, J.F. Richardson	Chemical Engineering: Volume 1 & 2	Butterworth Heinemann 978-0750644457 (Vol. 1), 978 0750644464 (Vol. 2)
7	J.D. Seader, Ernest J. Henley	Separation Process Principles	Wiley 978-0470481837
8	Morton M. Denn	Process Fluid Mechanics Prentice Hall 978-0137232093	Prentice Hall 978-0137232093

Sr.No	Link / Portal	Description
1	COMSOL Multiphysics:	This versatile software is used for simulating various mass transfer processes, including diffusion, heat and mass transfer in packed beds, and distillation column performance. It helps in modeling concentration profiles, velocity distributions, and transport mechanisms in mass transfer systems.

3. SOFTWARE/LEARNING WEBSITES

Sr.No	Link / Portal	Description
2	Aspen Plus:	A widely used process simulation software in chemical engineering, Aspen Plus allows the modeling and optimization of mass transfer operations such as distillation, absorption, liquid-liquid extraction, and drying. It helps in designing separation columns and evaluating mass transfer efficiency.
3	MATLAB:	MATLAB is a powerful tool for numerical analysis and simulation. It can be used to solve mass transfer equations, develop control algorithms for distillation and absorption processes, and perform data analysis related to separation processes.
4	CHEMCAD:	CHEMCAD is an advanced process modeling software that enables simulation, design, and optimization of distillation, absorption, and extraction processes. It helps engineers analyze phase equilibria and mass transfer coefficients for industrial applications.

5	ANSYS Fluent:	ANSYS Fluent is a Computational Fluid Dynamics (CFD) software used to simulate fluid flow, heat, and mass transfer in separation processes such as packed columns, spray dryers, and evaporators. It is particularly useful for analyzing flow patterns and optimizing mass transfer equipment.
6	LabVIEW:	LabVIEW is widely used for data acquisition and process control in mass transfer experiments. It helps in monitoring distillation column performance, gas absorption rates, and drying kinetics through real-time data analysis.

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

Mr.P.M.Pathak
(Name & signature of staff)

Dr. P.S. Bhandari
(Name & signature of HOD)