GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering Syllabus

Subject Code : 3154401

Subject Name : Mass Transfer - I

WEF Academic Year :	2021-22
Semester :	5
Category of the Course :	Professional Core

Prerequisite : Basics of Heat transfer, fluid mechanics, and unit process.

Rationale : The goal of this course is to study the principles of mass transfer and their practical implementations in separation and purification procedures within the chemical industry. The course aims to provide a comprehensive understanding of essential concepts in mass transfer operations, including diffusion, mass transfer coefficients, and Interphase mass transfer. By studying deeply into these fundamentals, students will gain the proficiency to address intricate problems related to various mass transfer operations. Additionally, the course empowers students to comprehend the underlying principles and functionalities of diverse mass transfer equipment.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Course Content :

Sr. No.	Course Content	No. of Hours	% of Weightage
1	**Introduction** : Definition and aim of mass transfer operations, Classification of mass transfer operation with examples, Direct Vs Indirect Mass transfer operations, choice of separation method, Methods of conducting mass transfer operations, Design principles	4	10
2	**Diffusion Mass transfer :** Molecular Diffusion, Fick's Law of Diffusion, Steady state molecular diffusion in fluids, Diffusion coefficient: Measurement and Prediction, and Diffusivity in Solids.	8	20
3	**Mass transfer coefficient :** Concept of Mass Transfer Coefficient, Dimensionless Groups and Co-relations for Convective, Mass Transfer co-efficient in Laminar Flow Condition, Boundary Layer Theory and Film Theory in Mass Transfer, Mass Transfer Coefficients in Turbulent Flow, Interphase Mass Transfer and Mass Transfer Theories	8	20

4	**Equipments for Gas Liquid Operations :** Gas Dispersed: Sparged vessels, Mechanically agitated vessels, Gas-Liquid contact, Tray Tower, Tray tower internals, Different types of trays, Weirs, Down comers and criteria of their selection, Flooding, Loading, Coning, Weeping & dumping in tray tower Liquid Dispersed: Ventury scrubber, Wetted wall towers, spray towers, Packed Towers, Packed tower internals, Different types of packings and their selection criteria, mass transfer coefficient for packed towers, Co-current flow of gas & liquid, End effects and axial mixing, Tray tower vs. Packed tower.	8	15
5	**Absorption :** Introduction to Absorption and Solvent selection, Packed Tower Design, Mass Transfer Coefficients Correlation and HETP Concept, Tray Tower Design and Introduction to Multicomponent System	10	15
6	**Distillation :** Introduction to Distillation and Phase diagrams, Azeotropes and Enthalpy Concentration Diagrams, Flash Distillation, Batch and Steam Distillation, Fractional Distillation, Packed Tower Distillation, Multicomponent Distillation	10	20

Reference Book :

1. Principles of Mass Transfer and Separation Processesby Dutta B.K
2. Mass Transfer Principles and Operations by A.P. Sinha and P. De
3. Mass Transfer Operations by R. Treybal

List of Experiments :

1. To determine the diffusion co-efficient of CCl4 in air & with varying temperature.
2. To determine the mass transfer coefficient in Wetted wall column.
3. Study of Simple Distillation
4. Study of Fractional Distillation
5. Study of Steam distillation
6. Study of Distillation in packed columns, HETP.
7. Study of Adsorption in packed bed column.
8. To study the heat and mass transfer of cooling tower under different flow and thermodynamic conditions.

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