

22PCM302T					Mass Transfer - II					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

To study the stage wise mass transfer operations, principles of various stage wise contact processes like extraction, adsorption, drying and crystallization.

UNIT I: Extraction**14 Hr.**

Solids-Liquid, Liquid-liquid extraction - solvent characteristics-equilibrium stage wise contact calculations for batch and continuous extractors- differential contact equipment-spray, packed and mechanically agitated contactors and their design calculations-packed bed extraction with reflux. Pulsed extractors, centrifugal extractors-Supercritical extraction.

UNIT II: Drying**13 Hr.**

Drying: Equilibrium, Definitions, and Drying Conditions - Rate of Batch Drying under constant drying conditions, Mechanisms of batch drying, Drying time Through Circulation Drying. Classification Of Drying Operations: Batch and Continuous Drying Equipment, Material and Energy Balances of Continuous Driers, rate of drying for continuous direct heat driers.

UNIT III: Crystallization**13 Hr.**

Crystallization - Equilibrium, classification of crystallizers, mass and energy balance; kinetics of crystallization – nucleation and growth; design of batch crystallizers; population balance model and design of continuous crystallizers.

UNIT IV: Membrane Separation Process**12 Hr.**

Materials, types and preparation of membranes, membrane characterization, membrane modules, pressure-driven membrane processes for liquid separation, Concentration – Driven processes, Membrane gas separation.

Max. 52 Hr.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1:** Describe the theory and derivations of extraction operations.
- CO2:** Design the various industrial extraction equipment.
- CO3:** Analyse the moisture by various drying operations
- CO4:** Determine the materials and energy balance for drying operations.
- CO5:** Familiar with crystallization operation and its equilibrium stage.
- CO6:** Understand the different types of membrane processes.

TEXT / REFERENCES BOOKS

1. Treybal, R.E., "Mass Transfer Operations ", 3rd Edn., McGraw-Hill, 1981.

2. Dutta, B.K., "Principles of Mass Transfer and Separation Processes", Printice Hall of India Pvt Limited, New Delhi.
3. Wankat, P., "Equilibrium Stage Separations", Prentice Hall, 1993.
4. Geankoplis, C.J., "Transport Processes and Unit Operations", 4th Edition, Prentice Hall Inc., New Jersey, 2003.
5. Seader, J.D. and E.J. Henley, "Separation Process Principles", 2nd Ed., John Wiley, 2006.
6. McCabe, W.L., Smith, J.C., and Harriot, P., "Unit Operations in Chemical Engineering", 7th Edn., McGraw-Hill, 2005.
7. King, C. J., "Separation Processes ", 2nd Edn., Tata McGraw-Hill 1980.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Part A: 10 Questions each carrying 5 marks

Part B: 5 Questions each carrying 10 marks

Exam Duration: 3 Hr.

50 Marks

50 Marks