INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING**
SEMESTER	**1**
COURSE TITLE	**ADVANCED SEPARATION PROCESSES**
COURSE CODE	**01CM0112**
COURSE CREDITS	**3**

Objective:

1 The Course aims to identify and setup the novel separation techniques in process industry in order to achieve the desired purity & efficiency of the product.

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

1 Know the need of separation technology

2 Apply modern separation techniques in different industries

3 Analyse the conventional separation methods and to enhance them as per required standards

4 Design & develop the desired separation hybrid system in chemical industry

Pre-requisite of course: Mass Transfer, Basics of separation processes

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	**Introduction to Separation Processes** Industrial Chemical Processes, Basic Separation Techniques, Separation by Phase Addition, Separation by Barriers, Separation by Solid Agents, Selection for Feasible Separations	6
2	**Cascades and Hybrid Systems** Cascade Configuration, Solid-liquid cascades, Single-Section Extraction Cascades, Multicomponent Vapour-Liquid Cascades, Membrane Cascades, Hybrid Systems, Degrees of Freedom and Specifications for Cascades	8
3	**Enhanced Distillation** Extractive Distillation, Salt Distillation, Pressure-Swing Adsorption, Homogeneous Azeotropic Distillation, Heterogeneous Azeotropic Distillation, Reactive Distillation, Supercritical-Fluid Extraction	8

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Contents : Unit	Topics	Contact Hours
4	**Membrane Separations** Membrane Materials, Membrane Modules, Transport in Membranes, Dialysis, Electrodialysis, Reverse Osmosis, Gas Permeation, Pervaporation, Microfiltration, Nano-Filtration, Macro-filtration, Ultra-filtration	8
5	**Supercritical Fluid Separation Processes** Physical Properties of Pure Supercritical Fluids – Thermodynamic Properties, Transport Properties, Phase Equilibria – Liquid-Fluid Equilibria, Solid-Fluid Equilibria, Polymer-Fluid Equilibria and the Glass Transition, Cosolvents and complexing Agents, Surfactants and Colloids in Supercritical Fluids, Phase Equilibria Models; Process Concept in Supercritical Fluids, Phase Equilibrium Models, Applications	12
Total Hours		**42**

Textbook :

1 Membrane separation processes, Nath, K. , PHI Learning Pvt. Ltd.., 2017

References:

1 Separation process principles, Separation process principles, Seader, J. D., Henley, E. J., & Roper, D. K., Wiley Publications, 2006

2 Perry's Chemical Engineers' Handbook, Perry's Chemical Engineers' Handbook, Don W. Green, Robert H. Perry., McGraw Hill, 2008

3 Handbook of separation process technology, Handbook of separation process technology, Rousseau, R. W., John Wiley & Sons., 1987

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	25.00	25.00	10.00	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 white board, may also use any of tools such as collaborative learning, demonstration, role play, Quiz, brainstorming, MOOCs, Active Learning Assignments etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

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Instructional Method:

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, Virtual Laboratory NPTEL videos, e-courses.

Supplementary Resources:

1 https://nptel.ac.in/courses/103/105/103105061/

2 https://nptel.ac.in/courses/103/103/103103163/

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