



Chemical Engineering

Subject Code: 01CH0409

Subject Name: Introduction to Membrane Technology

B.Tech. Year – II (Semester IV)

Objective: This course helps the students to obtain knowledge on membrane-based separation processes.

Credits Earned: 3 Credits

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

1. Understand the basic phenomena of membrane technology.
2. Understand the working and application of reverse osmosis, ultra-filtration and nano filtration.
3. Compare the types of membrane reactors.
4. Evaluating the best suitable membrane process as per process requirement.

Pre-requisite of course:

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (I)	CSE (C)	Viva (V)	Term work (TW)	
3	0	0	3	50	30	20	0	0	100

Contents:

Unit	Topics	Contact Hours
1	Introduction To Membrane Technology: Water shortages and need for membrane technology, Principles, mechanisms, types of the membrane, cross flow, membrane materials and various membrane modules used in membrane separation processes, Classification, application & advantages of membrane separation processes.	8
2	MEMBRANE TRANSPORT THEORY Introduction, Solution-diffusion Model, Structure-Permeability Relationships in Solution-diffusion Membranes, Pore-flow Membranes,	10
3	Reverse Osmosis, Ultra-filtration and Nano filtration Concept of osmosis and reverse osmosis, Advantages and commercial applications of Reverse Osmosis, Concept & working principal ultrafiltration & microfiltration and their commercial application	10
4	Membrane Reactor: Concept & working, Various modules of membrane used for membrane reactor, Advantages & Disadvantages	8
Total Hours		36

References:

1. "Membrane separation Processes", Kaushik Nath, PHI Pvt. Ltd., 2008.
2. "Introduction to process Engineering & Design" S.B. Thakore & B.I. Bhatt, Tata McGraw-Hill Ltd., 2007.
3. "Principles of Mass transfer & Separation Processes", Binary K. Dutta, PHI Publication, 3rd edition, 2007.



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	Understand	Apply	Analyze	Evaluate	Create
20%	35%	25%	20%	-	-

Instructional Method:

- The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Design Based Problems (DP)/ Open Ended project (OEP) :

In the beginning of the session, subject faculty will allot an OEP / DP to the students. Students will be free to choose a topic of their choice which will be relevant to the syllabus and they will either prepare a working model/ report / presentation / poster on their topic.

Web Resources:

- <https://www.coursera.org/lecture/industrial-biotech/membrane-processes-in-industrial-biotechnology-fySmD>
- <https://nptel.ac.in/courses/103103163>