



SARVAJANIK
UNIVERSITY

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SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology



Bachelor of Technology (B.Tech)

B.Tech. Semester VII

Subject Code: BTCH13703

Subject Name: Separation Processes

Type of course: Professional Core Course

Prerequisite: Basic Concepts of unit operations including mass transfer

Rationale: The course is intended to familiarize the students of chemical engineering with the new, emerging and non-traditional separation techniques and their potential applications in chemical and allied process industries. The course will provide exposure to membrane based techniques, super critical fluid extraction and various other technologies..

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
2	0	0	2	60	15	25	00	00	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Fundamentals of separation processes: separation factor, chemical potential in interface mass transfer, equilibrium and rate governed separation, drawbacks of the conventional separation processes, need for advanced separation processes. Major areas of applications of advanced separation processes Membrane Separation Processes: Membrane types, materials, synthesis and characterization; Different membrane modules; Working principle, operating parameters, membranes used, transport processes/mechanisms and industrial applications for individual membrane processes such as (i) Reverse osmosis, (ii) Nano filtration, (iii) ultrafiltration, (iv) microfiltration (v) dialysis	15	18
2.	Supercritical extraction: Working Principle, unique properties and solubility behaviour of supercritical fluids, Advantages of supercritical extraction, Decaffeination, ROSE process for purification of crude oil, hydrothermal oxidation, and Commercial applications of supercritical extraction.	5	13
3.	Short path Distillation Unit : Concept & working of short path Distillation Unit (SPDU), Difference between short path Distillation & molecular distillation, applications of SPDU Pressure Swing Distillation: Concept & Working, Advantage Disadvantages of PSD over azeotropic and extractive distillation and applications Reactive and catalytic distillation: Concept, advantage & disadvantages, BALE & KATMAX packing Manufacturing of MTBE and ETBE and its comparison with conventional techniques	15	16



Approved Version from the Academic Year 2021-22



4.	Pressure Swing Adsorption: Concept & Working, Advantages Disadvantages of pressure swing adsorption(PSA) over Concept & Working, Advantages Disadvantages of PSA over cryogenic distillation, four step PSA, six step PSA, Purification of Hydrogen, Oxygen, Nitrogen and other commercial applications of PSA	10	18
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Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	25	05	00	00

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Membrane Separation Processes	KaushikNath	PHI Pvt. Ltd.	2017	2 nd
2.	Introduction to process Engineering & Design	S.B. Thakore & B.I Bhatt	Tata McGraw-Hill Ltd	2015	--
3.	Perry Chemical Engineers Handbook	R.H Perry and D. Green.	McGraw-Hill	2007	8 th Edition
4.	Ullman's Encyclopedia of Industrial Chemistry,	Ullman's	Wiley-VCH	--	7th edition

Course Outcome:

Sr. No.	CO Statement	Marks % weightage
	After learning this subject, students will be able to	
CO-1	Differentiate the selection criteria between advanced separation techniques and conventional separation techniques	10
CO-2	Explain the concept and working principle of Advanced Separation Techniques such as Supercritical Fluid Extraction, Short Path Distillation Unit, Reactive Distillation, Pressure swing adsorption, pressure swing distillation, Membrane Separation	45
CO-3	Analyse the performance characteristics of membrane separation techniques for various applications	10
CO-4	Apply the Advanced separation techniques for real life and industrial applications where conventional techniques are not fruitful and require replacement.	35

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 0	PO 1	PO 1	PO 1	PSO 1	PSO 2	PSO 3
CO-1	3	3	2	3	2	1	2	2	3	3	2	3	3	2	2	3
CO-2	3	3	2	3	2	1	2	2	3	3	2	3	3	3	2	3

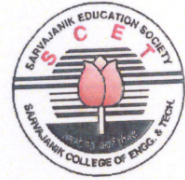




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CO-3	3	3	3	3	2	1	2	2	3	3	2	3	2	2	3
CO-4	3	3	2	3	2	1	2	2	3	3	2	3	2	1	3
Rationale*	12	12	9	12	8	4	8	8	12	12	8	12	9	7	12

Rationale*: Explaining why it is matching this particular program outcome

List of Open Source/learning website:

- <https://nptel.ac.in/courses/103/105/103105060/>
- <https://nptel.ac.in/courses/103/105/103105061/>
- <http://www.nptelvideos.in/2012/11/novel-separation-processes.html>

