



**Ahmedabad  
University**

Course	CHE300 Mass Transfer Operations - II	Semester	Monsoon Semester 2024							
Faculty Name(s)	Sridhar Dalai	Contact	sridhar.dalai@ahduni.edu.in							
School	SEAS	Credits	3							
GER Category:	Not Applicable	Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP							
Schedule	<table> <tr> <td rowspan="2">Section 1</td><td>01:00 pm to 02:30 pm</td><td>Tue</td><td>01-08-24 to 26-11-24</td></tr> <tr> <td>01:00 pm to 02:30 pm</td><td>Thu</td><td>01-08-24 to 26-11-24</td></tr> </table>			Section 1	01:00 pm to 02:30 pm	Tue	01-08-24 to 26-11-24	01:00 pm to 02:30 pm	Thu	01-08-24 to 26-11-24
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Prerequisite	CHE204 Mass Transfer Operations - I & CHE221 Thermodynamics - II & CHE260 Stoichiometry and Process Calculations									
Antirequisite	Not Applicable									
Corequisite	Not Applicable									
Course Description	In this course, applications of mass transfer will be discussed. This will include distillation, liquid-liquid extraction, solid-liquid extraction and adsorption.									

Course Objectives	<p>This course introduces the student to the following aspects:</p> <ul style="list-style-type: none"> <li>❖ Batch, flash and continuous distillation operations, Steam Distillation, McCabe Thiele and Ponchon Savarit methods.</li> <li>❖ Liquid-liquid operations.</li> <li>❖ Leaching and Adsorption operations.</li> </ul>
Learning Outcomes	<p>After learning the course the students should be able to:</p> <ul style="list-style-type: none"> <li>• Generate the VLE data.</li> <li>• Determine the feed tray location, total reflux, minimum and optimum reflux ratios.</li> <li>• Design and operate packed bed and tray towers for distillation and extraction operations.</li> <li>• Select suitable solvent for extraction of solute.</li> <li>• Design and operate various extractors and equipment for leaching.</li> <li>• Basic understanding of drying and crystallization operations. Select suitable adsorbent for recovery of solute and draw adsorption isotherms.</li> <li>• Build a basic knowledge of mass transfer operations and separation processes carried out in chemical industries.</li> </ul>
Pedagogy	Lectures, Tutorials, Problem solving, Discussions

Expectation From Students	Students must read the books and references after the lectures and practice the numerical from the prescribed books. Participation in-class discussions and other activities are compulsory. Practice the numerical. They must solve the home assignments on their own.
Assessment/Evaluation	<ul style="list-style-type: none"> <li>• Mid-Semester Examination: <ul style="list-style-type: none"> <li>◦ Written - 20%</li> </ul> </li> <li>• End Semester Examination: <ul style="list-style-type: none"> <li>◦ Written - 40%</li> </ul> </li> <li>• Other Components: <ul style="list-style-type: none"> <li>◦ Quiz-1 - 15%</li> <li>◦ Assignment - 15%</li> <li>◦ Class participation (Including attendance) - 10%</li> </ul> </li> </ul>
Attendance Policy	As per Ahmedabad University Policy. As per Ahmedabad University attendance policy.
Project / Assignment Details	<ul style="list-style-type: none"> <li>• Faculty will give home assignments which contains numerical and theory type questions.</li> </ul> <p>Students have to make a model based on MTO-II course theory.</p>
Course Material	<p>Coursepacks</p> <ul style="list-style-type: none"> <li>• Principles of Mass Transfer and Separation Processes, Binay K Dutta, 2nd Edition, Prentice Hall Learning press,</li> <li>• Text Book, Treybal E., Mass transfer operations, 3rd Edition, 1981, macgraw hill education,</li> <li>• Principles of Mass Transfer and Separation Processes, Binay K Dutta, 2nd Edition, Prentice Hall Learning press,</li> <li>• Text Book, Treybal E., Mass transfer operations, 3rd Edition, 1981, macgraw hill education,</li> </ul>
Additional Information	B.Tech Chemical 5 <sup>th</sup> semester- Core Course

## Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Unit-I (Distillation)	Introduction and fields of applications, Distillation-Stage wise contact operation	Treybal (Chapter 9)	Lecture	
2	Distillation	Boiling Point Diagram, Volatility and relative volatility, Generation of Txy diagram	Treybal (Chapter 9)	Lecture	
3	Distillation	Problem solving based on vapor-liquid diagram	Treybal (Chapter 9)	tutorial	
4	Distillation	Methods of distillation: Batch and Flash distillation	Treybal (Chapter 9)	Lecture	
5	Distillation	Problem solving on batch and flash distillation	Treybal (Chapter 9), Dutta (Chapter-7)	tutorial	
6	Distillation	Steam distillation, Numericals	Treybal (Chapter 9)Dutta (Chapter-7)	Lecture	
7	Distillation	Continuous distillation / rectification, Rectifying and Stripping section equations	Treybal (Chapter 9)	Lecture	
8	Distillation	Methods for plates calculations, McCabe Thiele method	Treybal (Chapter 9)Dutta (Chapter-7)	Lecture	
9	Distillation	Problem solving on McCabe Thiele method	Treybal(Chapter 9)	tutorial	
10	Distillation	Problem solving on McCabe Thiele method	Treybal (Chapter 9)	tutorial	
11	Distillation	Feed plate and feed line, Numerical	Treybal (Chapter 9)Dutta (Chapter-7)	Lecture	
12	Distillation	Use of open steam and cold fluid as reflux, Numerical	Treybal (Chapter 9)	Lecture	

13	Distillation	Ponchon-Savarit methods, numerical	Treybal (Chapter 9) Dutta (Chapter-7)	Lecture	
14	Distillation	Positive and negative deviations from ideality ,Azeotropic, reactive and extractive distillation	Treybal (Chapter 9) Dutta (Chapter-7)	Lecture, Assignment -II	
15	Mid Term Duration	Mid Term Exam			
16	Unit –II (Liquid -liquid extraction)	General principles of extraction, choice of solvent, Graphical representation of ternary liquids and effect of temperature and pressure.	Treybal (Chapter 10)Dutta (Chapter-8)	Lecture	
17	Liquid-liquid extraction	Percentage extraction calculation for single stage Extraction for partiallt miscible sonvents	Treybal (Chapter 10)Dutta (Chapter-8)	Lecture	
18	Liquid-liquid extraction	Percentage extraction calculation for multi stage when liquids are partially miscible,	Treybal (Chapter 10)	Lecture	
19	Liquid-liquid extraction	Problems on single and multistage crosscurrent operations when liquids are partially miscible.	Treybal (Chapter 10) Dutta (Chapter-8)	Tutorial	
20	Liquid-liquid extraction	Calculation for single stage and multi stage countercurrent when liquids are insoluble, numerical	Treybal (Chapter 10) Dutta (Chapter-8)	Lecture	
21	Liquid-liquid extraction	Minimum solvent rate and number of theoretical stages for continuous countercurrent, multistage extraction operation when liquids are insoluble.	Treybal (Chapter 10) Dutta (Chapter-8)	tutorial	
22	Unit-III (Leaching)	General principles of leaching, Graphical representation for SLE	Treybal (Chapter 13) Dutta (Chapter-9)	Lecture	
23	(Leaching)	Calculations for single stage and multistage cross current	Treybal (Chapter 13) Dutta (Chapter-9)	Lecture	

24	(Leaching)	Problems based on single stage and multistage cross current leaching	Treybal (Chapter 13) Dutta (Chapter-9)	Lecture, Assignment -III	
25	Unit-IV (Adsorption)	Introduction to adsorption, adsorbents and adsorption processes, adsorption Isotherms	Treybal (Chapter 11) Dutta (Chapter-12)	tutorial,	
26	Adsorption	Application of Freundlich equation to single and multistage adsorption (cross current & countercurrent).	Treybal (Chapter 11) Dutta (Chapter-12)	Lecture	
27	Adsorption	Problems on single and multistage adsorption	Treybal (Chapter 11) Dutta (Chapter-12)	Lecture, Assignment -IV	
28	Quiet Reading	Quiet Reading			
29	Reflections and Review	Reflections and Review			
30	Reflections and Review	Reflections and Review			

