



Jordan University of Science and Technology
Faculty of Engineering
Chemical Engineering Department

CHE581 Membrane Separation Processes - JNQF Level: 7

Second Semester 2023-2024

Course Catalog

3 Credit Hours. Membranes and module preparation: symmetrical, asymmetrical, ceramic and metal, and liquid membranes, microfiltration, ultrafiltration, reverse osmosis, gas separation, pervaporation, electrodialysis, enhanced transport, and membrane distillation.

Teaching Method: Electronic Course

Text Book

Title	Separation of Molecules, Macromolecules and Particles: Principles, Phenomena and Processes
Author(s)	Kamalesh K. Sirkar
Edition	1st Edition
Short Name	Sirkar
Other Information	2014

Course References

Short name	Book name	Author(s)	Edition	Other Information
Matsuura	Synthetic Membranes and Membrane Separation Processes	Takeshi Matsuura	1st Edition	1993
Mulder	Basic Principles of Membrane Technology	Marcel Mulder	1st Edition	1996
Notes	Lecture Notes	Yazan A. Hussain	1st Edition	eLearning

Instructor

Name	Dr. Yazan Hussain
Office Location	CH2-L2

Office Hours	Mon : 11:30 - 13:00 Tue : 13:00 - 14:30 Wed : 11:30 - 13:00 Thu : 13:00 - 14:30
Email	yahussain@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Sun, Tue : 18:00 - 19:00 Room: متزامن الحضور منصة الكترونية

Prerequisites		
Line Number	Course Name	Prerequisite Type
223640	CHE364 Mass Transfer	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	Topic	References
Week 1	Course introduction, Introduction to membranes, Global membrane market	From Notes
Week 2	Membrane structure, Membrane fabrication, Membrane separation processes, General characteristics of membrane	From Sirkar , From Matsuura
Weeks 3, 4	Reverse osmosis, Principles. Membrane transport, Concentration polarization, Geometrical configurations of RO modules, Design of tubular, hollow fiber and spiral wound modules, Forward osmosis, Pressure retarded osmosis, Nanofiltration	From Sirkar , From Matsuura , From Mulde
Week 5	First Exam + Review	
Week 6	Principles of Ultrafiltration, Transport in UF membranes, Solute retention in microporous and diffusive UF, Gel polarization, MEUF, UF module configurations, Design of UF modules, UF processing schemes and applications	From Sirkar , From Mulde
Week 7	عطلة عيد الفطر	
Week 8	Microfiltration principles, Types, Cross-flow and dead-end microfiltrations, Theory, Applications, Design	From Matsuura , From Mulde
Weeks 9, 10	Gas permeation separation through polymeric membranes. Gaseous diffusion separation. Role of defects. Separation of vapors. Dual sorption. Permeator arrangements. Design of permeators. Cascades/separations schemes. Applications.	From Sirkar , From Mulde

Week 11	Pervaporation. Mechanism. Azeotrope separation. Applications	From Sirka
Week 12	Second Exam + Review	
Week 13	Microporous/porous membrane based solvent extraction, gas absorption/stripping, and membrane distillation and membrane adsorption.	From Sirka , From Mulde
Week 14	Membrane reactors. Types. Analysis of equilibrium shift. Reactors. Reduction of product inhibition in bioreactors. Cell culture devices.	From Sirka
Week 15	Review	

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Describe what are membranes, how are they made, and where are they used. [1SO1] [1L7S2]	20%	
List the different structures of membranes and their different applications. [1SO1] [1L7S2]	20%	
Explain the different driving mechanisms of membrane separations. [1SO2] [1L7K1]	20%	
Calculate the requirements needed to design a membrane separation facility with a focus on water treatment. [20SO2] [1L7S1]	20%	
Identify the challenges and advancements in membrane technologies in recent years. [1SO7] [1L7S2]	20%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
40	40					20

Relationship to NQF Outcomes (Out of 100%)		
L7K1	L7S1	L7S2
20	20	60

Evaluation	
Assessment Tool	Weight
First Exam	25%
Second Exam	25%
Final Exam	40%
Online Activities	10%

Policy	
Attendance	Course will be delivered online. Sync sessions follow university attendance policies. Async sessions are based on student schedule.
Online Activities	The course will involve online activities that require student participation. Details of such activities will be communicated throughout the course. Students must check the eLearning page for any timed activities that needs to be delivered within a given due date.
Grade Distribution	Grade will be distributed as follows: Two mid-term exams 20% each Online Activities 10% Final Exam 40%
Exams	All exams will be closed book/closed note.
Makeup Exams	If a student misses an exam, he or she must consult with the instructor as soon as possible within one week of the exam date to determine the proper action to be taken. Makeup exams can be arranged if the student provides a convincing excuse for his or her absence. The excuse must be acceptable with proper proof according to the university policies.
Academic Conduct	<p>For the successful completion of this course, each student needs to solve the homework by himself/herself with no external assistance (except from the instructor). Therefore, attempts to cheat while doing the homework assignments will affect your performance negatively. In addition, any student caught cheating will be penalized for this behavior. The penalty will range from canceling the assignment/quiz grade to canceling all grades for that part of the course (i.e. getting zero in all assignments or quizzes) to other penalties according to the university policy. Cheating in the exams will be dealt with according to the university policies (and you do not want that to happen).</p> <p>What is considered cheating? In general, any action that results in the solution being given to you in one way or another is cheating. That is, if you submitted an assignment for which you were not the one who completely solved the whole of the assignment, then you are cheating. For example, using a previously solved homework, a key solution from a previous homework, or a manual solution are all considered cheating. In addition, asking your classmate for the solution or for how to solve the problem, working in groups and copying the solution from each other, or asking other professors all also other forms of cheating.</p>
JUST Policies	Jordan University of Science and Technology (JUST) is committed to the highest standards of academic excellence, integrity, and honesty. Students are advised to familiarize themselves with the JUST rules and regulations regarding cheating, attendance, and general behavior (https://www.just.edu.jo/aboutjust/RegulationsTemp/41%D9%86%D8%B8%D8%A7%D9%85%D8%AA%D8%A3%D8%AF%D9%8A%D8%A8%D8%A7%D9%84%D8%B7%D9%84%D8%A8%D8%A9/1.pdf)

Date Printed: 2024-06-09