

Identification	Subject	CHE 310 Separation Processes, 6 ECTS		
	Department	Chemistry and Chemical Engineering		
	Program	Undergraduate		
	Term	Fall 2026		
	Instructor	Ruslan Hajiyeu		
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	Phone			
	Classroom/hours	TBC		
	Office hours			
Prerequisites				
Language	English			
Compulsory/Elective	Compulsory			
Required textbooks and course materials	[1] Seader, J.D., Henley, E.J., Roper, D.K. Separation Process Principles: With Applications Using Process Simulators, 4th Ed., Wiley, 2020. [2] Ray, A.K. (Ed.) Coulson and Richardson’s Chemical Engineering, Volume 2B: Separation Processes, Elsevier, 2022.			
Website of course	This course is based on traditional face-to-face classes.			
Teaching methods	Lecture	X		
	Group discussion	X		
	Workshops	X		
Evaluation	Methods	Date/deadlines		Percentage (%)
	Midterm exam	TBC		30
	Assignment	TBC		20
	Quiz	2nd week of each month		10
	Final exam	TBC		40
	Total			100
Course outline	This course introduces the principles and applications of separation processes in chemical engineering. It emphasizes the fundamental concepts of mass transfer, equilibrium, and equipment design applied to distillation, extraction, and absorption. Students will gain the ability to analyze separation units, design basic equipment configurations, and apply both theoretical and graphical methods to solve practical problems.			
Course objectives	The course aims to provide students with a comprehensive understanding of the fundamental principles of separation processes used in chemical and process engineering. Students will study phase equilibria and mass transfer concepts and learn how these principles are applied in the design and operation of separation units. The course covers major separation techniques, including distillation, liquid-liquid extraction, and absorption, with emphasis on their industrial applications. Students will also develop knowledge of separation equipment design, including columns, trays, and packing systems. In addition, the course introduces process analysis and simulation tools for modeling, evaluating, and optimizing separation units. By the end of the course, students will be able to analyze separation problems, select appropriate separation methods, and apply engineering principles to the design and operation of industrial separation processes.			

Learning outcomes	By the end of this course, students will be able to: • Understand the concepts of vapour–liquid equilibrium and apply them to separation operations. • Analyze binary distillation systems, including single-stage, multi-stage, and batch distillation. • Apply the McCabe–Thiele method and reflux calculations for distillation column design. • Evaluate equipment design aspects such as plates, packing, condensers, and reboilers. • Understand the principles of liquid–liquid extraction, including partition coefficients, graphical methods, and stage calculations. • Apply mass transfer fundamentals (diffusion, film theory, overall mass transfer coefficients) to real systems. • Perform calculations related to absorption processes, including NTU/HTU methods, solvent flow requirements, and temperature effects. • Select appropriate separation methods and equipment based on feed characteristics and process requirements.
Policy	• Participation For a variety of reasons, participation in a classroom context is essential. It is essential to the learning process, promotes teamwork, and aids in the general success of both the individual students and the class. • Quiz A consistent method of gauging your understanding of the content covered in class is through quizzes. They assist you and your teacher in evaluating your comprehension of important ideas and identifying any areas that can benefit from more explanation. Each quiz will consist of 5-8 questions, and each question will be marked according to its difficulty. There will be two quizzes. • Withdrawal (pass/fail) The School Science and Engineering grading guidelines are carefully adhered to throughout this course. To pass, a student must typically receive a mark of at least 60%. • Assignment Students will work in groups of 2–3. Each group will be given a Process Flow Diagram (PFD). Using this, they must design and size either a distillation column or an absorption column. The work should include basic calculations for column dimensions, number of stages, and operating conditions. • Activity Students are expected to actively participate in all course related activities, including lectures, case studies, and problem-solving sessions. Active participation is considered an essential part of the learning process, as the course relies on discussion, analysis of practical examples, and the application of theoretical concepts to engineering problems. • Cheating/plagiarism Any form of plagiarism or cheating on a test, quiz, or project will result in the cancellation of the assignment. In this scenario, the student will receive a score of zero (zero) without any further consideration. • Illness Students with an illness may miss a quiz or presentation. This might be because students need to go to the hospital, recover at home, or attend regular medical appointments. In this case, the student must inform the instructor in advance about the illness and must present a document from their doctor. After considering the situation, the instructor may set a new date for the quiz or project presentation. Only one opportunity will be given to the student. The students who don't inform the instructor in advance will not be given a chance to retake the quiz or give a presentation.

	• Professional behavior guidelines During class hours, students are expected to conduct themselves in a way that fosters a positive academic and professional atmosphere. Discussions without permission, side conversations and unethical conduct are absolutely forbidden. • Ethics In class, students must not be late. During class, mobile phones must be put away and turned off.
Use of Artificial Intelligence Tools	The use of Generative Artificial Intelligence (GAI) tools within this course is permitted solely for educational, research, and individual learning purposes and must remain consistent with the University's principles of academic integrity. GAI tools may be used as supplementary resources to support learning and research; however, all submitted work must reflect the student's own understanding, critical thinking, and academic contribution. Any use of GAI must be appropriately disclosed in the relevant assignment, project, presentation, or other academic material. Students are fully responsible for evaluating and verifying the accuracy, reliability, and appropriateness of all AI-generated content included in their work.

Tentative Schedule		
Weeks	Topics	Reference books
1	Introduction to Separation Processes & Thermodynamics of Phase Equilibria	[1], pg. 1–20
2	Vapor–Liquid Equilibrium & Flash Calculations	[1], pg. 87–110
3	Binary Distillation Principles	[1], pg. 111–145
4	McCabe–Thiele Method & Reflux Calculations	[2], pg. 65–90
5	Distillation Column Design (Trays, Packing)	[2], pg. 91–120
6	Advanced Distillation (Multicomponent, Azeotropic)	[1], pg. 211–250
7	Midterm Exam	
8	Liquid–Liquid Extraction Fundamentals	[2], pg. 257–290
9	Extraction Equipment & Stage Calculations	[2], pg. 291–330
10	Mass Transfer Fundamentals (Diffusion, Film Theory)	[1], pg. 46–75
11	Mass Transfer Coefficients & Applications	[1], pg. 76–110
12	Absorption Principles (NTU/HTU Methods)	[2], pg. 185–210
13	Absorption Equipment Design & Solvent Selection	[1], pg. 341–370
14	Membrane Separation & Adsorption	[1], pg. 371–400
15	In-Class Activities, Group Presentations, Review	
	Final Exam	