

Identification	Subject	CHE-411 Chemical Process Design and Simulation - 6 ECTS		
	Department	Chemistry and Chemical Engineering		
	Program	Undergraduate		
	Term	Fall 2026		
	Instructor	Mail Babashov		
	E-mail:	mail.babashov@khazar.org		
	Phone			
	Classroom/hours			
	Office hours	Monday to Friday 09:30-17:30		
Prerequisites				
Language		English		
Compulsory/ Elective		Compulsory		
Required textbooks and course materials		Main: - AspenTech Customer Education Training Manual, <i>EHY101 Aspen HYSYS®: Process Modeling</i> [1] Extra: - AspenTech Customer Education Training Manual, <i>EHY202 Aspen HYSYS®: Advanced Process Modeling Topics</i> [2] J. Haydary, Chemical Process Design and Simulation, <i>Aspen Plus and Aspen HYSYS Applications</i>, 2019 JohnWiley & Sons, Inc. [3] - AspenTech, Aspen HYSYS Unit Operations, <i>Reference Guide</i>, 3028 [4] D. C. Y. Foo, <i>Chemical Engineering Process Simulation</i>, 2023 Elsevier Inc [5] - AspenTech, <i>Aspen HYSYS Petroleum Refining Unit Operations and Reactor Models</i>, 2016 [6]		
Website of course		This course is based on traditional face-to-face classes.		
Teaching methods	Lecture		X	
	Group discussion		X	
	Practical tasks		X	
Evaluation	Methods	Date/deadlines		Percentage (%)
	Activity / In-Class Tasks			25
	Midterm Exam	TBC		30
	Homework	Weekly		15
	Final Exam	TBC		30
	Total			100
Course outline		This course introduces the fundamentals and applications of process design and simulation in chemical engineering. It emphasizes the development, analysis, and optimization of chemical processes through systematic design methodologies and modern simulation tools. Students will learn to apply engineering principles, thermodynamics, and transport phenomena to design process units and integrated systems, while gaining hands-on experience with simulation software to evaluate performance, efficiency, and safety in real-world industrial operations.		

Course objectives	The course covers the fundamentals of process design, including the application of material and energy balances, thermodynamic and transport principles, and the development of process flowsheets. It introduces the design and analysis of unit operations, as well as methods for process optimization and integration. The course also provides practical experience with process simulation tools and their applications in the design, evaluation, and improvement of chemical and industrial processes.
Learning outcomes	By the end of this course, students will be able to: • Develop process flow diagrams and identify key unit operations for chemical processes. • Perform material and energy balance calculations to support process design decisions. • Apply thermodynamic and transport principles in the design and evaluation of chemical processes. • Use process simulation software to model, analyze, and optimize chemical process systems. • Assess process performance in terms of efficiency, economics, and safety considerations.
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 as a whole. • Presentation/Group work Students frequently must explain difficult chemical ideas to their classmates when they work in groups or make presentations. As they must break it down into simpler terms and respond to inquiries from their classmates, teaching others can help students get a deeper knowledge of the content. • Activity The students should participate in the seminars, conferences, and other events related to their courses to build new connections between academic and non-academic institutions. • 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%. If the student fails, the course. • 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 Student with an illness may miss a quiz or presentation. This might be because the student needs 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 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	Get Started. Installation of Aspen HYSYS and first Introduction to it	[1] pg. 23-30
2	Build a Propane Refrigeration Loop. Model a Refrigerated Gas Plant	[1], pg. 30-104
3	Perform Oil Characterization & HP Separation	[1], pg. 143-188
4	Model a Two Stage Compression Process	[1], pg. 201-224
5-6	Rate a Heat Exchanger, Troubleshoot Simulations	[1], pg. 225-270
7	Midterm Exam	
8-9	Build a Gas Gathering System, Construct a Pre-Heat Train Model	[1], pg. 272-338
10-11	Model a NGL Fractionation Process, Define and Analyze an Atmospheric Crude Column	[1], pg. 339-398
12-13	Model a TEG-based Gas Dehydration Process, Define and Analyze a Vacuum Tower with Heat Integration	[1], pg. 399-461
14-15	Model an Acid Gas Cleaning Process, Build a Multi-flowsheet Liquid Natural Gas (LNG) Plant Model	[1], pg. 462-521
Final Exam		