<table>
<tr><td rowspan="8">Identification</td><td>Subject</td><td colspan="3">CHE411 Chemical Process Design and Simulation, 6 ECTS</td></tr>
<tr><td>Department</td><td colspan="3">Chemistry and Chemical Engineering</td></tr>
<tr><td>Program</td><td colspan="3">Undergraduate</td></tr>
<tr><td>Term</td><td colspan="3">Fall 2025</td></tr>
<tr><td>Instructor</td><td colspan="3">Mail Babashov</td></tr>
<tr><td>E-mail:</td><td colspan="3">mail.babashov@khazar.org</td></tr>
<tr><td>Phone</td><td colspan="3"></td></tr>
<tr><td>Classroom/hours</td><td colspan="3">18:40-21:00</td></tr>
<tr><td></td><td>Office hours</td><td colspan="3">Monday to Friday
09:30-17:30</td></tr>
<tr><td>Prerequisites</td><td colspan="4"></td></tr>
<tr><td>Language</td><td colspan="4">English</td></tr>
<tr><td>Compulsory/ Elective</td><td colspan="4">Compulsory</td></tr>
<tr><td>Required textbooks and course materials</td><td colspan="4">Main:
AspenTech Customer Education Training Manual, EHY101 Aspen HYSYS®: Process Modeling [1]
Extra:
AspenTech Customer Education Training Manual, EHY202 Aspen HYSYS®: Advanced Process Modeling Topics [2]
J. Haydary, Chemical Process Design and Simulation, Aspen Plus and Aspen HYSYS Applications, 2019 JohnWiley & Sons, Inc. [3]
AspenTech, Aspen HYSYS Unit Operations, Reference Guide, 3028 [4]
D. C. Y. Foo, Chemical Engineering Process Simulation, 2023 Elsevier Inc [5]
AspenTech, Aspen HYSYS Petroleum Refining Unit Operations and Reactor Models, 2016 [6]</td></tr>
<tr><td>Website of course</td><td colspan="4">This course is based on traditional face-to-face classes.</td></tr>
<tr><td rowspan="3">Teaching methods</td><td colspan="2">Lecture</td><td colspan="2">X</td></tr>
<tr><td colspan="2">Group discussion</td><td colspan="2">X</td></tr>
<tr><td colspan="2">Practical tasks</td><td colspan="2">X</td></tr>
<tr><td rowspan="6">Evaluation</td><td>Methods</td><td>Date/deadlines</td><td colspan="2">Percentage (%)</td></tr>
<tr><td>Activity / In-Class Tasks</td><td></td><td colspan="2">25</td></tr>
<tr><td>Midterm Exam</td><td>TBC</td><td colspan="2">30</td></tr>
<tr><td>Homework</td><td>Weekly</td><td colspan="2">15</td></tr>
<tr><td>Final Exam</td><td>TBC</td><td colspan="2">30</td></tr>
<tr><td>Total</td><td></td><td colspan="2">100</td></tr>
<tr><td>Course outline</td><td colspan="4">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.</td></tr>
</table>

Course objectives	• Fundamentals of Process Design • Material and Energy Balances • Thermodynamic and Transport Principles • Process Flowsheet Development • Design of Unit Operations • Process Optimization and Integration • Process Simulation Tools and Applications
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	• **Precipitation** 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 otherscan 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 markof 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.

Tentative Schedule		
Weeks	**Topics**	**Reference books**
1	Get Started. Installation of Aspen HYSYS and first Introduction to it	
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		