Identification	**Subject**	CHEM 401 – Process Design and Simulation – 6 ECTS
	Department	Chemistry and Chemical Engineering
	Program	Undergraduate
	Term	Fall 2024
	Instructor	Azar Tapdigzade
	E-mail:	tapdigzadeazar@gmail.com
	Phone	+994 516320176 +994 772553340
	Classroom/hours	11 Mehseti str. (Neftchilar campus) 407N/ 18:40 - 21:00
	Office hours	
Prerequisites	• Engineering Mathematics • General information on Separation, Reaction, Heat transfer and fluid dynamics • Heat and material balances calculation • Business awareness, safety and sustainability	
Language	English	
Compulsory/Elective	Compulsory	
Course outline	This design project consists of a preliminary study for a proposed processing plant, and includes selection of process route and technology, choice of an appropriate location, consideration of economic aspects, and gathering of relevant physical, thermodynamic and kinetic data. Students work in small groups under the direction of an academic supervisor.	
Required textbooks and course materials	Main textbooks (References): • Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016 • AspenTech Customer Education Training Manual, course number EHY101_V9.0_rev1	
Course objectives	• Understand Production scheme from the raw material to final product • Have an overview about the different process unit equipment • Know how to analyze economic side of the industry • Know how to apply safety rules to plant operations	
Learning outcomes	By the end of this topic, you should be able to: • Experience in developing Process Flow Diagram, Utility Flow Diagram, Mass and Energy Balance, Preliminary Equipment Sizing and Process Control • Learning analyzing market requirements and economically assessing the needs	

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<tr><td></td><td colspan="3">• Learning about Process Safety and Sustainability</td></tr>
<tr><td rowspan="4">Teaching methods</td><td colspan="2">Lecture</td><td>X</td></tr>
<tr><td colspan="2">Simulation software</td><td>X</td></tr>
<tr><td colspan="2">Group works & discussions</td><td>X</td></tr>
<tr><td colspan="2">Problem-based learning (Real industry examples)</td><td>X</td></tr>
<tr><td rowspan="5">Evaluation</td><td>Methods</td><td>Date/deadlines</td><td>Percentage (%)</td></tr>
<tr><td>Assignment</td><td>Week 10th</td><td>20</td></tr>
<tr><td>Project Report</td><td>Week 14th</td><td>30</td></tr>
<tr><td>Final Exam</td><td></td><td>50</td></tr>
<tr><td>Total</td><td></td><td>100</td></tr>
<tr><td>Policy</td><td colspan="3">
• Preparation for class
The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and work relevant problems and cases from the end of the chapter and sample exam questions.

• Project
Students as group (4-5 students in each group) will work on Process Flow Diagram preparation, Process Description, Mass and Heat Balance, Market/SWOT analysis, Economics, Safety, Environment, Sustainability and Planning and etc. based on selected topics such as Methanol Production, PhenolFormaldehyde production and etc. Second part of the report will comprise design/sizing of process equipment (reactor, distillation column, fired-heater and etc.) or utility equipment such as pump, compressor, heat exchanger and etc. Each lesson groups have to present their weekly progress, what they have done individually and as a group within a week against their initially provided planning schedule and team leader has to organize weekly meeting with members for discussions, and minutes of meeting has to be sent to instructor`s email. Students will be assessed based on their activity, leading skills, draft and final reports` quality which makes 30% of total mark.

• Simulation
Students will be trained to be able to work on Aspen Hysys simulation software. Software will be introduced to students and each lesson, they will be given problem to simulate and solve on Hysys with the help of instructor. Students will get 20% of total mark from simulations (assignment). Using Hysys in project report to achieve mass/heat balance and proper equipment sizing is optional but will give extra points to student.
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	• **Withdrawal (pass/fail)** This course strictly follows grading policy of the School of Engineering and Applied Science. Thus, a student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year. • **Cheating/plagiarism** Plagiarism and Cheating of any kind on an examination, quiz, or project will lead to assignment cancellation. In this case, the student will automatically get zero (0), without any considerations. • **Professional behavior guidelines** The students shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited. • **Ethics** Students should not arrive in late to class. All electronic devices must be silenced and stowed during class.

	Tentative Schedule	
Weeks	**Topics**	**Textbook/Assignments**
1	Research into possible design processes	Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016.
1	Selection of design	N/A
2	Critical path plan	N/A
2	Submission of individual reports	N/A
3	Individuals get on with their tasks	N/A
3	Simulation Software introduction	Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016 AspenTech Customer Education Training Manual, course number EHY101_V9.0_rev1
4	Getting Started with Hysys	Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016 AspenTech Customer Education Training Manual, course number EHY101_V9.0_rev1
5	Getting Started with Hysys (Simulation Environment)	Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016 AspenTech Customer Education Training Manual, course number EHY101_V9.0_rev1
6	Getting Started with Hysys (Adding Unit Operations)	Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016 AspenTech Customer Education Training Manual, course number EHY101_V9.0_rev1
7	Using HYSYS for Physical Properties & Phase Conditions	Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016 AspenTech Customer Education Training Manual, course number EHY101_V9.0_rev1

8	Deciding and working on individual section inside teams	**(Draft group report submission)**
9	Merging individual sections into a group report and refine it	N/A
10	Starting simulations with Hysys	**Assignment (Hysys)**
10	Individually, submit a page summarizing a journal article	N/A
11	Submit evidence of group planning: records of meetings, skills portfolio, etc.	N/A
12	Calculations and final report preparations	N/A
13	Operation Simulations at Hysys	Heriot-Watt University, Process Design, Edinburgh EH14 4AS, 2016 AspenTech Customer Education Training Manual, course number EHY101_V9.0_rev1
14	Final Report Submission	**(Final report submission)**
15	Final Presentation	N/A