

<b>Identification</b>	<b>Subject</b>	CHE 350 Material and energy balance 6 ECTS		
	<b>Department</b>	Chemistry and Chemical Engineering		
	<b>Program</b>	Undergraduate		
	<b>Term</b>	Spring 2024		
	<b>Instructor</b>	Valida Fataliyeva		
	<b>E-mail:</b>	valide_eliyeva@outlook.com		
	<b>Classroom/hours</b>			
	<b>Office hours</b>			
<b>Prerequisites</b>	Introduction to Chemical Engineering			
<b>Language</b>	English			
<b>Compulsory/Elective</b>	Compulsory			
<b>Required textbooks and course materials</b>	<u>Recommended References:</u> Richard M. Felder and Ronald W. Rousseau, Lisa G. Bullard, Elementary Principles of Chemical Processes, Fourth Edition, John Wiley & Sons, INC. (2016) [1] <u>Supplementary material:</u> 1. David M. Himmelblau, Basic Principles and Calculations in Chemical Engineering, Prentice Hall of India Private Limited [2] 2. Class Lecture Handouts and Additional Reading Materials			
<b>Website of course</b>	This course is based on traditional face-to-face classes.			
<b>Teaching methods</b>	<b>Lecture</b>	<b>X</b>		
	<b>Group discussion</b>	<b>X</b>		
	<b>Practical tasks</b>	<b>X</b>		
<b>Evaluation</b>	<b>Methods</b>	<b>Date/deadlines</b>	<b>Percentage (%)</b>	
	<b>Activity</b>	Each lesson	5	
	<b>Quiz</b>	3 times during semestr	15	
	<b>Presentation</b>	Last week of semester	10	
	<b>Participation</b>	Each lesson	5	
	<b>Midterm Exam</b>	Mid of the semestr	30	
	<b>Final Exam</b>	End of semestr	35	
	<b>Total</b>		100	
<b>Description</b>	The core ideas and concepts surrounding the conservation of mass and energy in chemical and industrial processes are covered in a course on material and energy balance. Students acquire the skills necessary to methodically examine and analyze the movement of materials and energy inside a system. Topics covered in the course include process stoichiometry, thermodynamics, mass and energy balance equations, and using these concepts to solve problems in engineering. It is crucial for guaranteeing efficiency, reducing harmful impacts			

	on the environment, and understanding how to enhance a variety of industrial operations.
<b>Course objectives</b>	<ul style="list-style-type: none"> <li>• Gain an in-depth knowledge of the fundamental concepts of chemical and process engineering material and energy balances.</li> <li>• Utilize the principles of mass and energy conservation to address issues associated with chemical systems and processes.</li> <li>• Acquire the knowledge of applying material and energy balance principles to analyze and model complicated systems.</li> <li>• Gain analytical and problem-solving abilities to tackle material and energy balance issues that arise in industrial and chemical processes.</li> </ul>
<b>Learning outcomes</b>	<ul style="list-style-type: none"> <li>• Create mass balance equations for various systems and unit operations.</li> <li>• Apply energy balance equations to analyze and quantify energy transfer in chemical processes.</li> <li>• Analyze chemical reactions and their impact on material and energy balances in reactive systems.</li> <li>• Perform basic chemical engineering calculations, including( but not limited to) unit conversions, mass/mole conversions,...</li> <li>• Draw and label a process flow diagram from a written description of a process.</li> <li>• Perform a degree-of-freedom analysis.</li> <li>• Develop critical thinking skills to analyze and solve unfamiliar material and energy balance problems.</li> </ul>
<b>Policy</b>	<ul style="list-style-type: none"> <li>• <b>Activity</b> Class activities play a crucial role in the overall learning experience and contribute to the development of students in various ways. Activity means responding to the teacher's questions, actively participating in solving problems, constantly exchanging ideas with the teacher during lectures, and so on. Activity is taken into account for each lesson and is evaluated with 5 points at the end of the semestr.</li> <li>• <b>Parcipation</b> 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. Parcipation is valued at 5 points and 3 absences are worth 1 point.</li> <li>• <b>Quiz</b> A consistent method of measuring 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.  The quizzes could be thought of as "preperation" for the exams. Quizzes will be held 3 times during the semester and will give a total of 15 points. Each quiz will take place during class and consist of approximately 5 points conceptual multiple-choice, true/false, and short answer questions. You are allowed to use a calculator during quizzes, however books and notes are not permitted.</li> <li>• <b>Presentation</b></li> </ul>

Presentation consists of students researching a topic and presenting it in the form of a power point presentation. The maximum score for the presentation is 10 points.

- **Midterm Exam**

Midterm exam is important components of the academic assessment process, and it serves several crucial purposes in a student's educational journey. Midterm is held in the middle of the semester and is evaluated with a total of 30 points. The time limit of midterm exam is 90 minutes. The format of the questions will vary, but expect a range of "easy", "medium" and "challenging" parts, with the point values for each question/part clearly labeled. During the exam, you are permitted to use a calculator (any model, provided that it has no communication ability; you also may not share calculators).

- **Final Exam**

Final Exam is held at the end of the semester and is evaluated with a total of 35 points. The time limit of midterm exam is 90 minutes. The format of the questions will vary, but expect a range of "easy", "medium" and "challenging" parts, with the point values for each question/part clearly labeled. During the exam, you are permitted to use a calculator (any model, provided that it has no communication ability; you also may not share calculators).

- **Withdrawal (pass/fail)**

The School of Engineering and Applied Science's grading guidelines are carefully adhered to throughout this course. In order to pass, a student must typically receive a mark of at least 60%.

- **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.

- **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 shouldn't be late. During class, all electronic devices must be put away and turned off.

	<b>Tentative Schedule (Can be changed)</b>	
<b>Weeks</b>	<b>Topics</b>	<b>Reference books</b>

1	Course introduction, engineering calculations, processes	[1] Ch.2-3
2	Material balance calculations	[1] Ch. 4.1-4.3
3	Material balances on multiple-unit processes	[1] Ch. 4.4–4.5
4	Quiz 1 (During Class Time)	<b>Ch. 2-4.5</b>
5	Reactive processes	[1] Ch. 4.6
6	Single-phase systems	[1] Ch. 5
7	<b>Mid Exam</b>	
8	Multiphase systems	[1] Ch. 6.1-6.3
9	Phase Equilibrium	[1] Ch. 6.4-6.8
10	Energy Balance Procedures	[1] Ch. 7
11	Quiz 2 (During Class Time)	<b>Ch. 4.6-7</b>
12	Nonreactive energy balances	[1] Ch. 8.1-8.3
13	Phase-Change Operations	[1] Ch. 8.4-8.5
14	Reactive energy balances	[1] Ch. 9
15	Quiz 3 (During Class Time) Review & catch-up	<b>Ch. 8-9</b>
<b>Final Exam</b>		