

Identification	Subject	CHE 215 Introduction to Chemical Engineering		
	Department	Chemistry and Chemical Engineering		
	Program	Undergraduate		
	Term	Fall 2026		
	Instructor	Karim Ahmadov		
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	Classroom/hours			
	Office hours			
Prerequisites				
Language	English			
Compulsory/Elective	Compulsory			
Required textbooks and course materials	▪ Himmelblau, D. M., & Riggs, J. B. (2022). Basic Principles and Calculations in Chemical Engineering (9th ed.). Pearson.[1] ▪ Towler, G., & Sinnott, R. (2021). Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design (3rd ed.). Elsevier.[2] ▪ Felder, R. M., Rousseau, R. W., & Bullard, L. G. (2020). Elementary Principles of Chemical Processes. John Wiley & Sons. [3] ▪ Fogler, H. S. (2024). Elements of Chemical Reaction Engineering (6th ed.). Pearson.[4] ▪ Geankoplis, C. J., Hersel, A. A., & Lepek, D. H. (2018). Transport Processes and Separation Process Principles (5th ed.). Pearson.[5] ▪ Crowl, D. A., & Louvar, J. F. (2019). Chemical Process Safety: Fundamentals with Applications (4th ed.). Pearson.[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		5	
	Quiz	4 th and 11 th week	20	
	Midterm Exam	TBA	25	
	Case study	13 th week	10	
	Final Exam	TBA	40	
	Total		100	

Course outline	This course introduces the fundamental principles of Chemical Engineering, including engineering calculations, material and energy balances, stoichiometry, combustion, thermodynamics, chemical reactions, process equipment, distillation, and process safety. Students will develop problem-solving and technical communication skills while exploring applications in chemical, petrochemical, and energy industries.
Course objectives	The course aims to provide students with a broad understanding of the scope, role, and professional responsibilities of chemical engineers in industries such as oil and gas, petrochemicals, energy, pharmaceuticals, and environmental engineering. Students will develop fundamental skills in engineering units, dimensional analysis, unit conversions, stoichiometry, and material and energy balance calculations for both reactive and non-reactive processes. The course also introduces combustion reactions, fuel utilization, and the environmental aspects of industrial energy systems. Students will become familiar with major equipment used in chemical plants, including pumps, compressors, heat exchangers, reactors, pressure vessels, and distillation columns, as well as the basic principles of chemical reactions, reactor operations, and separation processes. In addition, they will learn to interpret process flow diagrams (PFDs) and piping and instrumentation diagrams (P&IDs) and gain an understanding of key chemical engineering tools, processes, and concepts. Particular attention is given to process safety, environmental protection, sustainability, and ethical engineering practices. The course also supports the development of problem-solving, teamwork, communication, and presentation skills, while helping students relate fundamental chemical engineering principles to real-world industrial applications and current challenges in the chemical, energy, and petrochemical sectors.
Learning outcomes	Upon successful completion of this course, students will be able to: • Describe the role of chemical engineers and the major sectors of the chemical process industry. • Apply engineering units, dimensional analysis, and unit conversion methods to solve engineering problems. • Perform material balance calculations for non-reactive and reactive chemical processes. • Apply stoichiometric principles to analyze chemical reactions and industrial process operations. • Perform basic energy balance calculations for chemical engineering systems. • Explain the principles of combustion reactions and determine fuel, air, and product requirements for industrial combustion processes. • Demonstrate an understanding of fundamental thermodynamic concepts and their application to chemical processes. • Explain the behavior of gases using the kinetic theory of gases and basic thermodynamic relationships. • Identify major rotating and static equipment used in chemical plants and describe their functions and operating principles. • Describe the fundamentals of chemical reactors, reaction systems, and common industrial chemical processes. • Explain the basic principles of distillation and other separation processes used in the chemical industry. • Interpret simple Process Flow Diagrams (PFDs) and recognize the purpose of Piping and Instrumentation Diagrams (P&IDs).

	• Recognize the importance of process safety, environmental protection, and sustainability in chemical engineering practice. • Prepare and present technical coursework on chemical engineering topics using appropriate engineering terminology and communication skills. • Apply fundamental chemical engineering concepts to analyze and solve introductory engineering problems encountered in industry.
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. •Case Study/Report Students will be presented with an opportunity to work on a real-life case in an oil and gas plant. They have to use their critical analysis and engineering knowledge to understand the case and try to solve it by applying what they learnt during this course. They must present a report to explain their reasoning. •Activity The students should participate in all the classes. However, class activity will mainly depend on the level of interaction of the student during the lectures. •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 questions, and each question will be marked with 10 points. 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%. 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 A 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.
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Tentative Schedule		
Weeks	Topics	Reference books
1	Engineering Units and Dimensions	[1] pp. 16-33
2	Engineering Chemistry	[5] pp. 59-80
3	Material Balances and Stoichiometry	[5] pp. 105-125
4	Energy Balances	[5] pp. 239-270
5	Introduction to the Principles of Chemistry	[4] pp. 500-534
6	Midterm exam	
7	Combustion Reactions and Industrial Fuels	[1] pp. 333-350
8	Introduction to Thermodynamics	[3] pp. 580-620
9	Rotating and Static Equipment in Chemical Plants	[2] pp. 619-635
10	Kinetic Theory of Gases	[2] pp. 502-526
11	Chemical Reactions and Reactors	[4] pp. 528-535
12	Distillation Fundamentals	[2] pp. 635-653
13	Course Work Discussion and Student Presentations	[5] pp. 343-360
14-15	Process Safety, PFDs and P&IDs	[2] pp. 782-790