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| **Identification** | **Subject** | CHE215 Introduction to Chemical Engineering, 6 ECTS | |
| | **Department** | Chemistry and Chemical Engineering | |
| | **Program** | Undergraduate | |
| | **Term** | Fall 2025 | |
| | **Instructor** | Ahmad Galandarli | |
| | **E-mail:** | ahmadgalandarliuk@gmail.com | |
| | **Phone** | | |
| | **Classroom/hours** | TBC | |
| | **Office hours** | | |
| **Prerequisites** | • General Chemistry knowledge<br>• Calculus | | |
| **Language** | English | | |
| **Compulsory/ Elective** | Compulsory | | |
| **Required textbooks and course materials** | **Main:**<br>• Introduction to Chemical Engineering by C. M. van 't Land (1st Edition, September 2023) [1]<br>**Extra**:<br>• Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design by G. Towler & R. Sinnott [2]<br>• Introduction to Chemical Engineering Thermodynamics by J.M. Smith, H.C. Van Ness, M.M. Abbott & M.T. Swihart [3]<br>• Chemical Engineering: An Introduction by Morton Denn [4]<br>• Unit Operations of Chemical Engineering by W.L. McCabe, J.C. Smith & P. Harriott [5]<br>• Transport Phenomena by R.B. Bird, W.E. Stewart & E.N. Lightfoot [6]<br>• Coulson & Richardson's Chemical Engineering: Vol. 1A Fluid Flow – Fundamentals and Applications [7]<br>• Perry's Chemical Engineers' Handbook edited by D.W. Green & M.Z. Southard [8] | | |
| **Website of course** | This course is based on traditional face-to-face classes. | | |
| **Teaching methods** | **Lecture** | | **X** |
| | **Group discussion** | | **X** |
| | **Practical tasks** | | **X** |

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| **Evaluation** | **Methods** | **Date/deadlines** | **Percentage (%)** |
| | **Activity** | | 5 |
| | **Quiz** | 2nd week of each month | 15 |
| | **Midterm Exam** | TBC | 30 |
| | **Presentation/Group work** | 1st week of November | 10 |
| | **Final Exam** | TBC | 40 |

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| | **Total** | | 100 |
| **Course outline** | The Introduction to Chemical Engineering course provides students with a foundational understanding of the principles, methods, and applications that define the chemical engineering profession. The course introduces key topics such as material and energy balances, transport phenomena, mixing and stirring, chemical reactor fundamentals, and separation processes including distillation, extraction, and membrane systems. Emphasizing both theoretical concepts and their practical application, it develops students' ability to analyze and solve engineering problems within industrial and environmental contexts. By combining fundamental science with engineering practice, the course equips students with the critical skills required to model, evaluate, and design basic chemical processes. This subject is essential for students pursuing careers in chemical and process industries, as it lays the groundwork for advanced studies in reaction engineering, thermodynamics, and process design. | | |

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| **Course objectives** | • Fundamental knowledge of chemical engineering principles and basic concepts<br>• Material and energy balances for chemical processes<br>• Introduction to transport phenomena: mass, momentum, and heat transfer<br>• Principles of mixing and agitation in chemical systems<br>• Reaction engineering fundamentals and chemical reactor analysis<br>• Separation processes: distillation, absorption, extraction, membranes, drying, and crystallization<br>• Introduction to process modeling and flow diagrams<br>• Application of chemical engineering methods to industrial and environmental problems |
| **Learning outcomes** | **By the end of the course the students should be able:**<br>• To build fundamental knowledge in chemical engineering principles and processes<br>• To apply material and energy balances to analyze simple chemical systems<br>• To understand the basics of transport phenomena (momentum, heat, and mass transfer)<br>• To describe the role of mixing and agitation in chemical processes<br>• To analyze the performance of basic chemical reactors using reaction rate data<br>• To understand the principles of common separation processes (distillation, absorption, extraction, membranes, drying, crystallization)<br>• To interpret and construct simple process flow diagrams<br>• To apply chemical engineering concepts to solve introductory industrial and environmental problems |
| **Policy** | • **Participation**<br>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.<br>• **Presentation/Group work**<br>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. |

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| | • **Activity**<br>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.<br>• **Quiz**<br>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 to 10 questions and each question will be marked according to its difficulty. There will be two quizzes.<br>• **Withdrawal (pass/fail)**<br>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.<br>• **Cheating/plagiarism**<br>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.<br>• **Illness**<br>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.<br>• **Professional behavior guidelines**<br>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.<br>• **Ethics**<br>In class, students must not be late. During class, mobile phones must be put away and turned off. |

| Tentative Schedule | | |
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| **Weeks** | **Topics** | **Reference books** |
| 1 | Fundamentals of Mass and Energy Balances | [1] p. 1-23 |
| 2 | Laminar and Turbulent Flows and Flow Phenomena | [1] p. 24-67 |
| 3 | Heat Conduction and Transfer | [1] p. 68-105 |
| 5 | Diffusion and Mass Transfer | [1] p. 106-135 |
| 6 | Mixing and Stirring | [1] p. 136-217 |
| 7 | **Midterm exam** | |
| 8 | Chemical Reactions and Reactors | [1] p. 218-280 |
| 9 | Distillation Fundamentals | [1] p. 281-325 |
| 10 | Liquid Extraction | [1] p. 326-371 |
| 11 | Absorption of Gases | [1] p. 372-385 |
| 12-13 | Membranes | [1] p. 386-449 |
| 14 | Crystallization, Solid-Liquid Separation and Drying | [1] p. 450-517 |
| 15 | Review | |
| **Final Exam** | | |