

<b>Identification</b>	<b>Subject</b>	Introduction to Chemical Engineering– 6 ECTS credits
	<b>Department</b>	Chemistry and Chemical Engineering
	<b>Program</b>	Undergraduate
	<b>Term</b>	Fall, 2019
	<b>Instructor</b>	Dr. Rasoul Moradi
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	<b>Phone:</b>	(+994 55) 769-56-63
	<b>Hours /Class</b>	Tuesday 13:40-15:10 /411O, Friday 15:20-16:50 /301NB
	<b>Office hours</b>	Monday, Wednesday, 17:00 – 18:00
<b>Prerequisites</b>	Physics2 and Chemistry2	
<b>Language</b>	English	
<b>Compulsory/Elective</b>	Compulsory	
<b>Required textbooks and course materials</b>	<p><b>Recommended References:</b></p> <p>1. Chemical Engineering: An Introduction (Cambridge Series in Chemical Engineering) Morton M. Denn2011.</p> <p><b>Supplementary material:</b> Class Lecture Handouts and Additional Reading Materials</p>	
<b>Course outline</b>	<p>This course provides an introduction to the scope and nature of the chemical and petroleum industries, the role of professional engineers within these industries, and key technical concepts underpinning chemical and petroleum engineering. Students will develop an understanding of the history and economic importance of these industries and the career pathways available to them. Key concepts in process analysis and resource utilization will be introduced, and the technological properties and chemistry of major industrial chemicals and petroleum products will be studied. It introduces simple concepts of petroleum geology, with an initial study of reservoirs.</p> <p>to petroleum</p>	
<b>Course objectives</b>	<p>The aims of this module are: To provide students with an understanding of the history and economic significance of the chemical and petroleum industries, and career pathways available to professional engineers in these industries. To introduce key technological concepts in the analysis of chemical and petroleum processes and resource utilization. To provide students with a basic knowledge of the chemistry and technological properties of key groups of industrial chemicals and petroleum products to convey first principles in science, engineering. To provide students with the fundamentals of material and energy balances as applied to chemical engineering to enable the analysis of a chemical process. Develop efficient methods of and life-long skills for problem solving through exercise problems and thought experiments. Offer practice in defining problems, collecting data, analyzing data. Help you decide if you have chosen the right field</p>	
<b>Learning outcomes</b>	<p>Understand the scope, history and economic importance of the industries within which chemical engineers operate, and the professional roles and contribution of chemical and petroleum engineers. The importance of ethics and sustainability will be introduced. Represent processing requirements in the form of process flow diagrams, material balances and energy balances. Understand and competently perform mass and energy balances by hand and using a computer package. Understand key technological concepts concerning chemical and petroleum processing including yield, rate, productivity, and measures of efficiency of utilization of resources. Have</p>	

	a basic knowledge of the chemistry and technological properties of key groups of industrial chemicals and petroleum products. Explain in simple terms the principles underlying the formation of hydrocarbons		
<b>Teaching methods</b>	<b>Lecture</b>		x
	<b>Group discussion</b>		x
	<b>Experiential exercise</b>		
	<b>Lab</b>		x
	<b>Case analysis</b>		x
	<b>Course paper</b>		
	<b>Others</b>		
<b>Evaluation</b>	<b>Methods</b>	<b>Date/deadlines</b>	<b>Percentage (%)</b>
	<b>Midterm Exam</b>		30
	<b>Case studies</b>		
	<b>Class Participation</b>		
	<b>Quizzes&amp; H. W</b>		
	<b>Project</b>		20
	<b>Laboratory</b>		10
	<b>Final Exam</b>		40
	<b>Others</b>		
<b>Total</b>		100	
<b>Policy</b>	<ul style="list-style-type: none"> <li>▪ <b>Ethics</b> Use of any electronic devices is prohibited in the classroom. All devices should be turned off before entering class. This is a university policy and violators will be reprimanded accordingly.</li> <li>▪ <b>Preparation for class</b> 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.</li> <li>• <b>Withdrawal (pass/fail)</b> This course strictly follows grading policy of the School of Engineering. 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.</li> <li>▪ <b>Cheating/plagiarism</b> Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations.</li> <li>▪ <b>Professional behavior guidelines</b> 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.</li> </ul>		
<b>Tentative Schedule</b>			

<b>Week</b>	<b>Topics</b>	<b>Textbook/Assignments</b>
1,2	<b>Introduction</b> An introduction to the chemical and petroleum industries considering their scope, history, and economics, and current major trends and issues. This section will also investigate the roles of graduate	Ref. 1
3,4	<b>Fundamental aspects of process and resource utilization</b> Including: process flow sheeting; mass and energy balances; concepts of yield, rate and productivity; measures of efficiency and resource recovery; concepts of environmental impact and life cycle analysis; and economic analysis	Ref. 1 Quiz 1, 2
5-8	<b>Fundamental aspects of industrial chemistry</b> Relevant to chemical and petroleum engineers. This will introduce the technological properties and chemistry of: low MW hydrocarbons (C1 – C6 alkanes/ alkenes/ benzene), high MW hydrocarbons, and key gaseous species such as H <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , NH <sub>3</sub> , and Cl	Ref. 1, Quiz 3, 4
9	<b>Midterm Exam</b>	
10-12	<b>Basic chemical thermodynamics.</b> States of matter and the ideal gas equation. Vapour-liquid equilibrium, modelling using for example the Antoine equation and Raoult's law. Bubble and dew point conditions. Application to a simple separation process, for example single-stage flash distillation	Ref. 1 Quiz 5,6
13	<b>Introduction to petroleum science,</b> Technology and economics Formation and occurrence of fossil fuel resources.	Ref. 1  Quiz 7
14-15	<b>Introduction to Renewable Energy Resources</b>	
15	<b>Project Presentation</b>	
16	<b>Final Exam</b>	