

Identification	Subject	CHE 480 Refinery and Petrochemical products 4 ECTS
	Department	Chemistry and Chemical Engineering
	Program (Undergraduate, Graduate)	Undergraduate
	Term	Fall 2026
	Instructor	Gullu Aliyeva
	Email:	gull.askar@mail.ru
	Classroom/hours	
Prerequisites	Organic chemistry, Inorganic chemistry	
Language	English	
Compulsory/Elective	Elective	
Textbooks and course materials	1. The Refinery of the Future (2nd Edition, 2020) by James G. Speight, 647 pages 2. Handbook of Petrochemical Processes, James G. Speight, 2019, 578 pages 3. Chemistry of Petrochemical Processes, Sqmi Matar, Lewis F. Hatch, 293 pages 4. Fundamentals of Petroleum and Petrochemical Engineering, Uttam Ray Chaudhuri, 2016, p. 406	
Course description	This course is based on traditional face-to-face classes.	
Course objectives	The course is designed to provide students with a comprehensive understanding of the composition, properties, processing, and industrial utilization of crude oil and petroleum-derived products. It introduces the classification and physicochemical properties of crude oils and explains how these characteristics influence refining processes and product quality. Students study the main hydrocarbons, including paraffinic, olefinic, and aromatic hydrocarbons, as well as the composition and applications of liquid petroleum fractions and residues. Special attention is given to the chemistry and industrial importance of benzene, toluene, xylenes, and their derivatives. The course also covers automotive fuels, including motor gasoline and high-speed diesel, with emphasis on important quality parameters such as octane and cetane characteristics. Students become familiar with the principles and chemistry of major refinery processes, including thermal processes, catalytic cracking, catalytic reforming, and hydrocatalytic processes, and learn how these technologies modify hydrocarbon structures and improve product quality. In addition, the course introduces biorefinery concepts, renewable feedstocks, and the	

	application of petrochemical and organic chemical processes in pharmaceutical production. Overall, the course aims to develop students' ability to relate hydrocarbon structure and reactivity to industrial petrochemical processes, evaluate petroleum products and conversion pathways, and understand modern trends in cleaner fuels, sustainable processing, and environmentally responsible chemical production.		
Learning Outcomes	After successfully completing this course, students will be able to describe the composition, classification, and physicochemical properties of crude oils and explain their influence on petroleum processing and product quality. They will be able to identify the main hydrocarbon intermediates, including paraffinic, olefinic, and aromatic hydrocarbons, and relate their chemical structures to their industrial applications. Students will understand the composition and significance of liquid petroleum fractions and residues and will be able to explain the chemistry and production of important aromatic derivatives based on benzene, toluene, and xylenes. They will also be able to evaluate the basic properties of automotive fuels, including gasoline and diesel, and interpret important fuel-quality parameters such as octane number and cetane number. In addition, students will be able to explain the principles and reaction chemistry of major refinery processes, including thermal conversion, catalytic cracking, catalytic reforming, and hydrocatalytic processes. They will be able to analyze how catalysts and operating conditions affect hydrocarbon conversion and product distribution. Students will also gain an understanding of biorefinery concepts, renewable feedstocks, and the role of petrochemical and organic synthesis in pharmaceutical production. By the end of the course, they will be able to connect theoretical petrochemical concepts with industrial applications, compare conventional and sustainable processing routes, and apply basic analytical and problem-solving skills to petrochemical processes and products.		
Teaching methods	Case analysis		x
	Group discussion		x
	Lecture		x
	Simulation		x
Evaluation Criteria	Methods	Date/deadlines	Percentage (%)
	Midterm Exam	TBA	30
	Quizzes	Each month	15
	Practical Assignments	3 rd week of December	10
	Activity	Each lesson	5
	Attendance	X	X
	Final Exam	TBA	40
	Total		100
Class Policy	Participation/Activeness Actively participating in class discussions, asking questions, and		

	contributing to group activities can enhance your understanding of complex concepts. It allows you to clarify certain doubts, exchange ideas, and learn from both peers and the instructor. Quiz A quiz is a form of assessment that helps instructors measure students' understanding of key concepts and topics. They are designed to assess whether students have grasped the material presented during lectures or practical sessions. Quizzes are conducted in written form. Open-ended questions are graded from 1 to 5 points depending on their level of difficulty. The quiz is evaluated out of a total of 15 points. Presentation Students studying the subject of Inorganic Chemistry demonstrate their knowledge and skills on various topics through presentations. Engaging in group work and presentations during class helps students develop skills that can be directly transferred to their future careers. Students research a given topic and deliver a 10–15-minute presentation based on the information they have gathered. After the presentation, questions are asked on the topic. If both the presentation and responses to the questions are strong, the student is awarded the maximum score of 10 points. Course Completion A student is considered to have completed the course if they score 60% or more. Otherwise, the student must retake the course. Violations In cases of rule violations during midterm or final exams (such as attempts to cheat or other unlawful behavior), the student's exam will be invalidated. Classroom Behavior Students must do everything possible to maintain an appropriate academic environment during class. Unauthorized talking, unnecessary movements, and other unethical behaviors are strictly prohibited. Students should participate actively in class, ask questions when needed, and not remain disengaged from discussions.
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.

Tentative Schedule			
Week	Date/Day (tentative)	Topics	Textbook/Assignments
1	16.09.2026	Crude oils. Properties of crude oils.	[3] p.12-23
2	23.09.2026	Hydrocarbon Intermediates. Paraffinic hydrocarbons.	[3] p.29-31 [2] p.211-252
3	30.09.2026	Liquid Petroleum fractions and Residue	[2] p.254-262, p.264-266 [3] p. 42-47
4	7.10.2026	Liquid Petroleum fractions and Residue	[2] p.254-262, p.264-266 [3] p. 42-47
5	14.10.2026	Hydrocarbon Intermediates. Olefinic hydrocarbons.	[3] p. 32-34
6	21.10.2026	Chemicals from Aromatics hydrocarbons	[2] p.331-357
7	28.10.2026	Chemicals based on Benzene, Toluene, Xylenes	[3] p.262-280
		Midterm exam	
8	4.11.2026	Automotive fuels. Motor Spirit. High Speed Diesel	[4] p.33-36 p. 36-39
9	11.11.2026	Refinery processes. Thermal processes.	[1] p.48-59
10	18.11.2026	Catalytic cracking and its chemistry	[1] p. 60-63
11	25.11.2026	Catalytic Reforming	[1] p. 66-73
12	2.12.2026	Hydrocatalytic processes	[1] p. 63-66
13	9.12.2026	Biorefinery	[1] p. 515-544
14	16.12.2026	Pharmaceuticals	[2] p.470-485
15	23.12.2026	Pharmaceuticals	[2] p.470-485
		Final exam	