Identification	**Subject**	CHEM 410 Alternative Fuel Technology 6 ECTS
	Department	Chemistry and Chemical Engineering
	Program	Undergraduate
	Term	Fall 2024
	Instructor	Madina Nabiyeva
	E-mail:	nabiyevamadina@gmail.com, mnabiyeva@khazar.org
	Phone	Neftchilar Campus
	Classroom/hours	407 N
	Office hours	Monday to Friday 09:30-17:30
Prerequisites		
Language	English	
Compulsory/Elective	Elective	
Required textbooks and course materials	1) "Renewable energy in the 21st century" Md Kashif Gohar Deshmukh, Mohd Sameeroddin, Daud Abdul, Mohammed Abdul Sattar 2023 2) Lennon, Breffní & Dunphy, Niall & Sanvincente, Esti & Hillman, Joanne & Morrissey, John. Energy Management Approaches for Sustainable Communities. 2018 3) "Handbook of Alternative Fuel Technologies". Edited By Sunggyu Lee, James G. Speight, Sudarshan K. Loyalka 2018 edition 4) "Water for Energy and Fuel Production" Yatish T. Shah 2017 5) "Carbon-Neutral Fuels and Energy Carriers" Nazim Z. Muradov, T. Veziroğlu 2016 (routhledge preview) 6) "Biofuels and Bioenergy. Processes and Technologies" Sunggyu Lee, Y.T. Shah 2013 (preview)	
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	2nd week of each month	15
	Midterm Exam	TBC	30
	Presentation/Group work		10
	Final Exam	TBC	40
	Total		100

Course outline	The global energy scenario is undergoing an unprecedented transition. In the wake of enormous challenges—such as increased population, higher energy demands, increasing greenhouse gas emissions, depleting fossil fuel reserves, volatile energy prices, geopolitical concerns, and energy insecurity issues—the energy sector is experiencing a transition in terms of energy resources and their utilization. The course provides an overview of the unfolding transition in terms of overall dimensions, drivers, trends, barriers, policies, and geopolitics, and then discusses transition in terms of particular resources or technologies, such as renewable energy systems, solar energy, hydropower, hydrogen and fuel cells, electric vehicles, energy storage systems, batteries, digitalization, smart grids, blockchain, and machine learning.

Course objectives	• General Objective of the Course: To meet curriculum requirements of the School of Engineering and Applied Sciences (SEAS). • Develop professional fundamentals. Understand energy infrastructure, latest renewable energy and low-carbon fuel technologies • Prepare for an alternative-fueled economy. Assess alternative fuel systems' societal, economic, environmental, ethical, and legal impacts. • To encourage students participation and interaction in scientific perspective.
Learning outcomes	By the end of the course the students should be able: • To have a broad comprehension of sustainability, alternative fuels and their production technologies. • Abled to do an environmental assessment of alternative fuels, with all the advantages and disadvantages associated with each fuel.
Policy	• **Participation** For a variety of reasons, participation in a classroom context is essential. It isessential to the learning process, promotes teamwork, and aids in the generalsuccess of both the individual students and the class as a whole. • **Presentation/Group work** Students frequently must do research about several alternative energy sources while work in groups and make presentations. They must deeply learn all the pros and cons of renewable and non-renewable energy, as well as their production. • **Activity** The students should participate in the seminars, conferences, debates and other events related to their courses to build new connections between academic and non-academic institutions. By 10 December 2025, a one-page report on the students' activities will be required. • **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 frommore explanation. Each quiz will consist of 5 questions, and each question will be marked with 1 point. There will be three 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 markof 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 scoreof zero (zero) without any further consideration. • **Illness** 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 withoutpermission 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.

Tentative Schedule		
Weeks	**Topics**	**Reference books**
1	Sustainability and Energy in 21st Century.	[1] full paper [2] p. 18-24
2	World Energy Consumption. Effect of Human Activities on Carbon Cycle and Climate	[3] p.1-3 [5] p.15-41
3	Carbon-Free and Low-Carbon Alternatives to Fossil Energy	[3] p.17-22 [5] p.54-72
4	Gasification of Coal	[3] p.25-44
5	Clean Liquid Fuels from Coal	[3] p.82-120
6	Liquid Fuels from Natural Gas	[3] p.153-169
7	**Midterm exam**	
8	Water for Energy and Fuel Production	[4] p.6-15, 205-224
9	Power and Energy Directly from Water	[4] p.361-380
10	Energy From Biomass Conversion	[3] p.377-390 [6] p.147-196
11	Energy Generation from Waste	[3] p.395-415 [6] p.205-242
	Geothermal Energy	[3] p.422-440
13	Nuclear Energy	[3] p.443-488
14	Fuell Cells	[3] p.494-520
15	Biofuels and Bioenergy	[6] p.8-47
Final Exam		