Identification	**Subject**	PETE509, Fundamentals of Petroleum Geoscience, 6 ECTS
	Department	Petroleum Engineering
	Program	Graduate
	Term	Spring 2026
	Instructor	Fuad Aliyev
	E-mail:	fuad.aliyev@khazar.org
	Classroom/hours	11 Mehseti str. (Neftchilar campus), Wednesdey 18:40- 21:00
Language	English	
Compulsory/Elective	Elective	
Required textbooks and course materials	• *Knut Bjørlykke, 2010. Petroleum Geoscience: From Sedimentary Environments to Rock Physics, Springer, 518 pages [1]* • *Petroleum Geoscience: Author Dr. Jon G. Gluyas, Richard E. Swarbrick, 2014, 376 pages [2]* • *Hu, X., Hu, S., Jin, F., & Huang, S. (Eds.). Physics of petroleum reservoirs. Springer Geophysics, 2017, 516 page [3]* • *Reservoir engineering: Heriot-Watt University, Department of Petroleum Engineering, Edinburgh, UK 2004, 814 p. [4]*	
Course outline	This course is designed for master's students and provides an advanced understanding of the fundamental and applied aspects of petroleum geoscience. It covers the principles of petroleum systems and energy resources, the fundamentals of geology relevant to hydrocarbon exploration, and the key elements of petroleum systems including source, reservoir, seal, and traps. Students will develop expertise in sedimentology and stratigraphy as applied to petroleum system analysis, as well as in geophysical methods for hydrocarbon exploration, including seismic and well logging techniques. The course also emphasizes petroleum geochemistry, focusing on hydrocarbon generation, migration, and oil–source rock correlation.	
Course objectives	Specific Objectives of the Course: - to study origin and distribution and properties of petroleum and petroleum bearing rocks and petroleum play key elements - to obtain knowledge in different geological-geophysical methods in hydrocarbon exploration and concepts of clastic and carbonate depositional environments in petroleum exploration - to perform knowledge in leads and prospects, risks and uncertainty in exploration and fluid distribution and contacts, reservoir property distribution and reservoir description from seismic data to obtain knowledge in sours rocks and petroleum migration, - to study production geology and unconventional hydrocarbon resources	

<table>
<tr><td>Learning outcomes</td><td colspan="3">By the end of the course the students should be able to learn:
- importance of Petroleum Geoscience in Petroleum Engineering
- Source rock, reservoir, migration path, trap and seal elements in hydrocarbon exploration
- Geomechanics and deformation of sedimentary rocks
- Sedimentary basins and sedimentation processes in in different types of basins
- Reservoir description from seismic data
- Production geology and unconventional resources
- to integrate geological sounds with Petroleum Engineering subjects</td></tr>
<tr><td rowspan="4">Teaching methods</td><td colspan="2">Lecture</td><td>x</td></tr>
<tr><td colspan="2">Group discussion</td><td>x</td></tr>
<tr><td colspan="2">Practical exercise</td><td>x</td></tr>
<tr><td colspan="2">Case analysis</td><td>x</td></tr>
<tr><td rowspan="6">Evaluation</td><td>Methods</td><td>Date/deadlines</td><td>Percentage (%)</td></tr>
<tr><td>Midterm Exam</td><td>TBA</td><td>30</td></tr>
<tr><td>Assignment and quizzes</td><td></td><td>10</td></tr>
<tr><td>Presentation/Group Discussion</td><td>TBA</td><td>20</td></tr>
<tr><td>Final Exam</td><td>TBA</td><td>40</td></tr>
<tr><td>Total</td><td></td><td>100</td></tr>
<tr><td>Policy</td><td colspan="3">Midterm exam will be carried out in the week announced by the university. Time allocated will be announced close to the midterm. A midterm examination is a test administered approximately midway through an academic grading term, be it a quarter or semester. Its primary objective is to provide students with a clearer assessment of their progress within the course, enabling them to gauge their performance and understanding up to that point.

Students who actively participate throughout the semester and complete all class assignments and quizzes will be awarded 10 bonus points at the end of the course.

Presentation/Group Discussion will be conducted close to the end of semester. Date and time will be announced during the semester. A presentation/group discussion is a collaborative activity of students relating to research about geology. The reasons for including a presentation/group discussion in the subject course is to evaluate the students' individual presentation skills and ability to work in groups.

A final examination is an exanimation administered at the end of an academic term, with a set of questions or exercises evaluating the skill or knowledge of students. Final exam date and time will be defined by the University. A final examination is an evaluative assessment presented to students at the conclusion of an academic term or course of study.

• Preparation for class</td></tr>
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	The structure of this course makes individual study and preparation of students outside the class very 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 student's understanding of the lecture. After the lecture student should study his notes, work relevant problems and cases from the end of the chapter. • **Class assignment** Class assignments will be provided during class. The contents will be based on the calculation of formation properties etc. • **Class quizzers** Quizzes will cover the materials studied in previous classes. There will be 2 quizzes during the semester. • **Withdrawal (pass/fail)** This course strictly follows grading policy of the School of Science and Engineering. Student is normally expected to achieve a mark of at least 65% to pass. In case of failure, he/she will be required to retake the course the followingterm or year. • **Cheating/plagiarism** Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation and invalidation of student's results. • **Professional behaviour guidelines** Students shall behave in professional way to create favourable academic environment during the class hours for themselves and their colleagues. Unauthorized discussions and unethical behaviour are strictly prohibited. • **Expected behavior** Includes attending all class activities; meeting deadlines; observing common courtesies to fellow students, teachers, and staff; being honest; making a diligent effort to learn; and does not engage in any disruptive irresponsible manner. Legitimate collaboration is encouraged but academic collusion or dishonesty will not be tolerated. • **Class attendance** Attendance is required! Please be in class on time. Attendance will be taken at the beginning of each class period. In case you are not present when the attendance sheet is passed on, you will be marked absent. If you are late by more than 10 minutes you will not be allowed into the classroom not to cause distraction. You will receive a Dean's warning if you miss more than 3 classes and shall be dismissed from the course if you miss more than 5 classes.

	• **Class discussion** Feel free to voice your opinions and ask questions anytime during a class period. Practice your right and freedom to learn. Remember you are here to learn and we are here to teach and that teaching and learning are forever intertwined. You can help me teach you as much as I can help you learn. Be an active participant in the learning process!

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook/Assignments
1		Introduction to the Petroleum Geoscience, Importance Petroleum Geoscience in the Petroleum Engineering, Geological exploration at different scales	*[1] Chapter 1*
2		Introduction to Sedimentology, Sediment Transport and Sedimentary Environments, Sediment texture and grain size distribution	*[1] Chapter 2*
3		Sedimentary geochemistry, how sedimentary are produced, Distribution of Clay Minerals and other Authigenic Minerals as a Function of Erosion and Weathering, Geochemical Processes in the Ocean, Clastic Sedimentation in the Oceans	*[1] Chapter 3*
4		Sandstone And Sandstone Reservoirs, Prediction of Reservoir Quality, Meteoric Water Flow and Mineral Dissolution, Sandstone Reservoirs Buried to Intermediate and Deeply Depth	*[1] Chapter 4*
5		Carbonate Sediments, Geochemistry of carbonate minerals, Carbonate Environments, Carbonate Reservoir Rocks	*[1] Chapter 5*
6		Stratigraphy: Lithostratigraphy, Biostratigraphy, Time Stratigraphy, Radiometric Dating Methods	*[1] Chapter 7, 8*
7		Heat Transport in Sedimentary Basins, Subsurface Water and Fluid Flow in Sedimentary Basins	*[1] Chapter 9, 10*
8		**Mid-term Exam**	
9		The Structure and Hydrocarbon Traps of Sedimentary Basins	*[1] Chapter 12*
10		Compaction of Sedimentary Rocks Including Shales, Sandstones and Carbonates	*[1] Chapter 13*
11		Source Rocks and Petroleum Geochemistry, Modelling of Petroleum Generation	*[1] Chapter 14*

12		Rock-Eval Analyses, Composition of Petroleum, Petroleum Migration, Loss of Petroleum During Migration	[1] Chapter 15
13		Seismic Exploration, Seismic interpretation	*[1] Chapter 16*
14		Explorational Rock Physics – The Link Between Geological Processes and Geophysical Observables	[1] Chapter 17
15		**Presentation/Group Discussion**	
16	**TBA**	**Final Exam**	

This syllabus is a guide for the course and any modifications to it will be announced in advance.