

Identification	Subject	Petroleum Geology - GEOL 310 – 6 ECTS
	Department	Petroleum Engineering
	Program (Undergraduate, Graduate)	Undergraduate
	Term	Fall, 2026
	Instructor	Prof. Dr. Nazan YALÇIN ERİK
	Email:	nyalcin@gmail.com
	Classroom/hours	Online; one 90-minute synchronous session per week Office / Consultation Hours: Fridays, 17:00–18:00. Students may request an online consultation via Zoom during this hour. The instructor can also be contacted via email at any time.
Prerequisites	GEOL 203 – General Geology	
Language	English	
Compulsory/Elective	Compulsory	
Textbooks and course materials	Primary material: The instructor's own lecture notes and slide presentations for each session, together with interpretation worksheets prepared by the instructor (distributed weekly via the LMS). Background references (students are not required to purchase these): [1] Selley, R. C. & Sonnenberg, S. A., Elements of Petroleum Geology, 4th ed., Academic Press, 2022. [2] Asquith, G. & Krygowski, D., Basic Well Log Analysis, 2nd ed., AAPG Methods in Exploration No. 16, American Association of Petroleum Geologists, 2004. [3] Tearpock, D. J. & Bischke, R. E., Applied Subsurface Geological Mapping, Prentice Hall, 1991. [4] Magoon, L. B. & Dow, W. G. (eds.), The Petroleum System – From Source to Trap, AAPG Memoir 60, 1994, Chapter 1: "The Petroleum System" (pp. 3–24). [5] Society of Petroleum Engineers (SPE), Petroleum Resources Management System (PRMS), revised June 2018. [6] Tissot, B. P. & Welte, D. H., Petroleum Formation and Occurrence, 2nd ed., Springer-Verlag, 1984 (used specifically for source-rock geochemistry, kerogen classification and thermal maturity in Week 4). Recommended electronic resources: AAPG Search and Discovery (searchanddiscovery.com) — open-access technical articles on petroleum systems and basin analysis. SPE OnePetro (onepetro.org) — SPE/AAPG/SEG technical papers on reservoir and exploration geology. Schlumberger Oilfield Glossary (glossary.oilfield.slb.com) — reference definitions for technical terminology.	
Course description	This introductory course situates petroleum within energy resources and the global energy system and explains the role of geology in petroleum exploration and engineering. It covers sedimentary-basin development and stratigraphy; depositional systems and facies; source rocks, petroleum generation and fluid properties; reservoirs, migration, traps and seals; petroleum-system timing; basic subsurface-data interpretation; and introductory petroleum volumetrics and uncertainty. Selected examples from major oil and gas fields worldwide, including the Caspian region, are used throughout the course.	
Course objectives	Explain petroleum's place in the global energy system and the role of geology in petroleum exploration and engineering.	

	• Introduce the geological and geochemical controls on source-rock formation, petroleum generation, expulsion, migration and accumulation, and relate petroleum-fluid properties to subsurface occurrence and movement. • Relate depositional, stratigraphic, diagenetic and structural controls to reservoir occurrence and quality. • Develop introductory competence in interpreting core descriptions, wireline logs, structure maps, cross-sections and seismic data. • Introduce deterministic and probabilistic volumetric estimation while distinguishing subsurface uncertainty from geological chance of success. • Develop the ability to integrate geological evidence into a simple play or prospect evaluation and communicate assumptions, risks and uncertainty clearly.		
Learning Outcomes	• Explain petroleum-system elements, processes, timing, the critical moment and preservation. • Evaluate introductory source-rock data using organic richness, kerogen type and thermal maturity. • Describe the geologically relevant composition, physical properties, phase occurrence and alteration of crude oil and natural gas. • Relate sedimentary facies, stratigraphic architecture and diagenetic processes to reservoir distribution and quality. • Classify structural, stratigraphic and combination traps and identify principal charge, timing and containment risks. • Interpret basic core, well-log, structure-map, cross-section and seismic data. • Estimate hydrocarbons initially in place using basic volumetric inputs and distinguish volumetric uncertainty from geological chance of success. • Integrate geological evidence into a simple play or prospect evaluation and communicate conclusions and limitations in a scientifically defensible manner.		
Teaching methods	Interactive lecture		☒
	Case analysis		☒
	Group discussion		☒
	Practical exercises (worksheets and datasets)		☒
Evaluation Criteria	Methods	Date/deadlines	Percentage (%)
	Midterm Exam	Week 8 (exact date TBA)	30
	Group Project and Presentation	Week 15	15
	Activity / Participation	Throughout the semester	10
	Attendance	Throughout the semester	5
	Final Exam	TBA (Registrar's exam schedule)	40
	Total		100
Class Policy	All University and Department rules and regulations applicable to courses also apply to this course. Regular attendance, active participation and respectful interaction are expected during synchronous online classes. Attendance is recorded weekly; students whose attendance falls below the minimum threshold set by Khazar University's attendance regulations may be barred from sitting the final examination [instructor/department to confirm the exact percentage threshold]. All practical and preparation assignments must be submitted via the LMS by 23:59 on the date announced in the weekly schedule at the start of the semester. Late submissions are penalized in accordance with University late-submission policy; make-up examinations are governed by University policy and require prior notice and supporting documentation.		

	Students affected by a documented medical condition or emergency must inform the instructor as soon as possible and provide supporting documentation when required. Students are responsible for assigned readings and for regularly checking the LMS and email for materials, deadlines and announcements. Plagiarism, cheating and unauthorized collaboration are prohibited and are handled in accordance with Khazar University's academic-integrity regulations. Sources and any permitted use of generative artificial-intelligence (GAI) tools must be acknowledged in accordance with the rules set out below. Use of Generative Artificial Intelligence (GAI) in This Course Approach adopted for this course: Partial Permission. In line with Khazar University's Rules for the Use of Generative Artificial Intelligence (GAI), the use of GAI tools (e.g., ChatGPT, Copilot, Claude, Gemini) in this course is permitted only for the specific, limited purposes listed below. In all other cases, the use of GAI is prohibited. GAI may be used only for: Organizing and structuring the student's own notes or a logical outline for a practical assignment or the group project (the resulting structure must still be developed and written by the student). Checking grammar, spelling and sentence-level writing style in draft reports and the project write-up. The geological content, analysis, interpretation and conclusions must remain the student's own. Generating additional self-study practice questions or explanations of general geological/petroleum-engineering concepts already covered in class, for exam preparation. Checking the syntax of simple spreadsheet formulas used for volumetric calculations (the underlying inputs, assumptions and interpretation of results must be the student's own work). GAI may NOT be used for: Generating the geological interpretation, analysis, or conclusions of any practical assignment, worksheet, or the group project. Completing quizzes, the midterm exam, or the final exam, or any in-class assessment task, in any form. Producing the substantial content of the group project report or presentation on the student's behalf. Analyzing or interpreting the instructor-provided South Caspian Basin datasets and worksheets — these must be uploaded only to the course LMS and never submitted to any external GAI platform, in line with the University's data-security and confidentiality rules. Disclosure requirement: Where GAI is used for any of the permitted purposes above, the student must add a short disclosure statement at the end of the relevant assignment (tool name and version, and exactly how it was used), together with a reference-list entry, following Khazar University's Citation and Disclosure Rules. Overall, GAI-generated text in any written submission must not exceed 25% of the document, and the student remains fully responsible for the accuracy, originality and academic integrity of the final submission. Non-compliance: Undisclosed or unauthorized use of GAI or presenting GAI-generated content as one's own work, is treated as an academic-integrity violation. Depending on severity, consequences may include an oral or written warning, a requirement to resubmit the assignment, or a grade reduction (including a zero) for the assignment, in accordance with Khazar University's academic-integrity regulations. Note 1: The exact calendar dates in the schedule above ("TBA") will be confirmed and distributed at the start of the semester once the official academic calendar is published;
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		Note 2: Numbers in square brackets in the weekly schedule refer to the numbered Background References above; page ranges correspond to the cited editions. If a different edition or printing is used, pagination must be verified before distribution.	
Tentative Schedule			
Week	Date/Day (tentative)	Topics	Textbook/Assignments
1	TBA	Introduction: Energy resources and the global energy system; petroleum's role in the global energy mix; overview of petroleum exploration and development	[1, pp. 1–14]
2	TBA	Sedimentary basins, tectonic setting and stratigraphic framework	[1, pp. 419–472]
3	TBA	Sedimentary rocks, depositional systems and facies: fluvial, deltaic, shallow-marine and carbonate settings	[1, pp. 275–359]
4	TBA	Source rocks and petroleum generation: TOC, kerogen, Rock-Eval concepts, thermal maturity and burial history	[1, pp. 207–273]; [6, pp. 131–198]
5	TBA	Properties and subsurface occurrence of crude oil and natural gas: composition, density and API gravity, viscosity, gas gravity, phase behavior and alteration	[1, pp. 15–42]
6	TBA	Reservoir geology: porosity, permeability, saturation, heterogeneity and diagenesis	[1, pp. 275–359]
7	TBA	Expulsion, primary and secondary migration, charge and accumulation; Structural, stratigraphic and combination traps; seal capacity, spill points, timing and preservation	[1, pp. 207–273, 361–418]; [4, pp. 3–24]
8	TBA	Midterm Exam	Midterm Exam
9	TBA	Petroleum-system synthesis: timing, critical moment and preservation; known, hypothetical and speculative systems; play, lead, prospect and geological risk	[4, pp. 3–24]
10	TBA	Core and basic well-log interpretation: lithology, facies and reservoir identification	[2, pp. 1–20, 37–76, 77–101, 115–135, 137–149]
11	TBA	Well correlation and subsurface mapping: correlation panels, cross-sections, structure and thickness maps	[3, pp. 37–93, 134–194, 280–399, 488–545]
12	TBA	Introductory seismic interpretation: horizon and fault interpretation; integration of seismic and well data	[1, pp. 43–166]
13	TBA	Basic petroleum volumetrics and uncertainty; selected examples from major oil and gas fields worldwide.	[5, pp. 6–16, 25–30]
14	TBA	Integration workshop: synthesizing petroleum-system elements, geological risk and volumetrics into a play/prospect evaluation (group project work session)	Review: [1, pp. 1–14, 15–42, 43–166, 207–273, 275–359, 361–418, 419–472]; [2, pp. 1–20, 37–76, 77–101, 115–135, 137–149]; [3, pp. 37–93, 134–194, 280–399, 488–545]
15	TBA	Student Project Presentations and Course Synthesis	Review of course materials
	TBA	Final Exam	Final Exam