<table>
<tr><td rowspan="8">Identification</td><td>Subject</td><td colspan="3">PETE 303 Physics of Oil and Gas Reservoir 6 ECTS credits</td></tr>
<tr><td>Department</td><td colspan="3">Petroleum Engineering</td></tr>
<tr><td>Program</td><td colspan="3">Undergraduate</td></tr>
<tr><td>Term</td><td colspan="3">Fall, 2023</td></tr>
<tr><td>Instructor</td><td colspan="3">Grigorii Penkov</td></tr>
<tr><td>E-mail:</td><td colspan="3">gpenkov@khazar.org</td></tr>
<tr><td>Phone:</td><td colspan="3">+994 12 421 10 93 (ext. 243)</td></tr>
<tr><td>Classroom/hours</td><td colspan="3">TBC</td></tr>
<tr><td></td><td>Office hours</td><td colspan="3">Monday 10:00-17:00</td></tr>
<tr><td>Prerequisites</td><td colspan="4">Consent of instructor</td></tr>
<tr><td>Language</td><td colspan="4">English</td></tr>
<tr><td>Compulsory/Elective</td><td colspan="4">Required</td></tr>
<tr><td>Required textbooks and course materials</td><td colspan="4">1. Hu, X., Hu, S., Jin, F., & Huang, S. (Eds.). Physics of petroleum reservoirs. Springer Geophysics, 2017.
2. Reservoir engineering: Heriot-Watt University, Department of Petroleum Engineering, Edinburgh, UK 2004, 814 p.</td></tr>
<tr><td>Course outline</td><td colspan="4">Compressibility of reservoir rocks, porosity and permeability of reservoir rocks, fluid saturation of reservoir rocks, classification of crude oils and natural gases.</td></tr>
<tr><td>Course objectives</td><td colspan="4">Basic Objective of the Course:
▪ Understand the basic concepts and terminology associated with oil and gas reservoirs, including types of reservoirs, reservoir rock properties, and fluid properties.
Specific Objectives of the Course:
▪ Study the behavior of hydrocarbon fluids (oil and gas) in reservoir conditions, including phase behavior, properties, and equations of state.
▪ Learn about the geophysical and geological properties of reservoir rocks, including porosity, permeability, capillary pressure, and rock mechanics.
▪ Explore the fundamentals of fluid flow in porous media, including Darcy's law, fluid mobility, and multiphase flow in reservoirs.</td></tr>
<tr><td>Learning outcomes</td><td colspan="4">• Demonstrate basics of porosity, permeability, relative permeability, arithmetic and geometric average of permeability total porosity, effective porosity, and primary and secondary porosity. Determining pore volume methods, bulk volume, and compressibility factors of reservoir rock.
• To learn Darcy equation derivation in different conditions such as steady state, pseudo steady state and unsteady state. Analyzing different equations of state such as ideal gas law and etc.
• To learn horizontal and vertical flow, single phase flow of incompressible.
• To learn about the Klinkenberg effect, calculate the effect of fractures and channels, turbulence flow near the well bore, and describe methods for determining values of absolute permeability.
• To learn reservoir rock and fluid properties, pore pressure concepts. Calculations of pressure gradients will be another outcome of this course.</td></tr>
<tr><td rowspan="3">Teaching methods</td><td colspan="3">Lecture</td><td>X</td></tr>
<tr><td colspan="3">Experiential exercise</td><td>X</td></tr>
<tr><td colspan="3">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></td><td>30</td></tr>
<tr><td>Class Participation</td><td></td><td>5</td></tr>
<tr><td>Assignment and quizzes</td><td></td><td>25</td></tr>
<tr><td>Final Exam</td><td></td><td>40</td></tr>
<tr><td>Total</td><td></td><td>100</td></tr>
</table>

Policy	**Class assignments** will be provided during class. The contents will be based on the calculation of formation properties etc. **Quizzes** will cover the materials covered in previous classes. There will be 2 quizzes during the semester. **Project** will mainly include case studies. Research skills and the techniques learnt during class assignments and practical exercises will be the tools to complete the projects**.** A midterm exam is an exam given near the middle of an academic grading term or near the middle of any given quarter or semester. The purpose of the examination is that students have a better idea of whether they're advancing well in the course. The student receives 5 bonus points at the end of the semester if they attend all classes and follow all course policies and procedures. Assessment of the participant's activity in lectures, practical classes and in the learning process in general. A quiz is a quick assessment of student knowledge to test a students' level of comprehension briefly regarding course material, providing teachers with insights into student progress and any existing knowledge gaps. A project is a collaborative activity of students relating to scientific research. The reasons for including projects in the subject course is to show prospective students and research activity on the subject. 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 given to students at the end of a course of study.
	▪ **Preparation for class** 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. ▪ **Withdrawal (pass/fail)** 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. ▪ **Cheating/plagiarism** 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. ▪ **Professional behavior guidelines** 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. ▪ **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.

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook/Assignments
1	Week 1	Introduction to the course and reservoir rock	1-2
2	Week 2	Grain-size distribution of rocks	1-2
3	Week 3	Reservoir pressures and temperatures	1-2
4	Week 4	Compressibility of reservoir rocks	1-2
5	Week 5	Porosity of reservoir rocks	1-2
7	Week 6	Fluid saturation of reservoir rocks	1-2
8	Week 7	Permeability of reservoir rocks **Quiz 1**	1-2
9	Week 8	**Mid-Term Exam**	
10	Week 9	Permeability of reservoir rocks. Part 2	1-2
11	Week 10	Classification of crude oils and natural gases	1-2
12	Week 11	Gas reservoir	1-2
13	Week 12	Oil reservoir	1-2
14	Week 13	Properties of natural gas	1-2
15	Week 14	Properties of crude oil **Quiz 2**	1-2
16	Week 15	Overall revision and preparation for exam	
	TBA	**Final Exam**	

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