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| **Identification** | **Course** |  **PETE 509- Petroleum Geoscience- 4 credits** |
| **Department** | Petroleum Engineering |
| **Program** | Graduate |
| **Instructor** | Assoc. Prof. Gasham Zeynalov |
| **E-mail:** | gzeynalov@khazar.org  |
| **Phone:** | (+994 12) 421-79-16 (ext. 243 ) |
| **Class hours** | in appointed time |
|  | **Office hours** | Wednesday, 14.00-15.00 |
| **Prerequisites** | Consent of instructor |
| **Language**  | English |
| **Compulsory/Elective** | Required |
| **Required textbooks and course materials** | 1. Jon Gluyas and Richard Swarbrick, ***Petroleum Geoscience***, Blackwell Publishing, 2009
2. Richard C. Selley and Steve Sonnenberg, 2015, ***Elements of Petroleum Geology***, 3rdedition, Academic Press of Elsevier, 507 pages
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| **Course objectives**  | This course is a major subject of a Petroleum Engineering. General Objectives of the Course: to meet curriculum requirements of the MSc Petroleum Engineering program at Khazar UniversitySpecific 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 in appraisal* to obtain knowledge in petroleum in place, reservoir models and hydrocarbon reserves and well planning, reservoir management and reserves revisions and field rehabilitation in development and production

**Assignment and two quizzes:** First quiz will be based on course materials which had been taught by between 1-7 weeks. Second quiz will be based on course materials which had been taught by between 9-14 weeks. **Practical exercises** will be dedicated to evaluation of poroperm properties, sedimentary structure and textural properties of reservoir rocks, net to cross mapping, interpretation of seismic data etc. |
| **Learning outcomes** | 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
* Play and Play fairway
* Sedimentary basins and sedimentation processes in in different types of basin
* Reservoir description from seismic data
* Petroleum in place and reserves
* to integrate geological sounds with Petroleum Engineering subjects
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| **Teaching methods** | Lecture  | x |
| Group discussion | x |
| Experimental exercises | x |
| Case studies  | x |
| Simulation | x |
| **Grades**  |  |  |
| Evaluation Methods  | Percentage (%) |
| Midterm Exam | 30 |
| Participation | 5 |
| Assignment and two quizzes | 15 |
| Practical exercises | 10 |
| Final Exam | 40 |
| Total  | 100 |
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| **Academic integrity** | Students are responsible for the honest completion and representation of their projects, for the appropriate citation of sources, and for respect of others academic endeavors. Plagiarism and other forms of academic misconduct are serious offenses with severe penalties.  |
| **Tentative Schedule** |
| **Week** | **Dates** | **Topics** | **Textbook/Assignments** |
| 1 | 16.09.2016 | Introduction to the Petroleum Geoscience Importance Petroleum Geoscience in the Petroleum EngineeringGeological exploration at different scales | Chapt. 1(1) |
| 2 | 23.09.2016 | Frontier Exploration:Direct Petroleum Indicators: petroleum leakage and seepage:Identification of petroleum in seismic data  | chapt.3.3(1) |
| 3 | 30.09.2016 | Sedimentary basins: extensional, intracratonic, rift, foreland basins and passive margins Basin History: Subsidence, sediment supply, burial history, thermal history, uplift, pressure history and integrated basin modeling | chapt.3.4,3.5(1), 8(2) |
| 4 | 07.10.2016 | Principles of Stratigraphy and The Geological Time Scale, Chronostratigraphy, Biostratigraphy, Lithostratigraphy, Seismic Stratigraphy. Chemostratigraphy and magnetosratigraphy methodsRock Unit relationship and Sea-LevelUnconformities in sedimentation processInterpretation of stratigraphic unconformities on outcrops and field geologic cross-sections  | Chapt.3.6(1) |
| 5 | 14.10.2015 |  Source Rock: Origin of petroleum from living organisms, Kerogen and its types, Maturation of Source rock: kerogen to oil to gas | Chapt3.7 (1). Chapter 1(3) |
| 6 | 21.10.2015 | Exploration and exploitation:Seal, Reservoir and its intrinsic properties: net to gross, porosity, permeability and hydrocarbon saturationReservoir Lithologies | Chapt. 4.2,4.3(1). 7(2) |
| 7 | 28.10.2015 | Sandstone depositional systems: Alluvial fans, Aeolian dunes, lakes, fluvial systems, deltas, shallow marine systems, submarine fansQuiz 1 | Chapter 4.3 (1), 6(2) |
| 8 | 04.11.2015 | **Mid –term exam** |  |
| 9 | 11.11.2015 | Carbonate depositional systems: Shelfal and ramp carbonates, reefs, deep-water carbonates, karstFractured reservoirs | Chapter 4.3 (1) 3(2) |
| 10 | 18.11.2015 | Migration: Primary, secondary and tertiary migrationsThe Trap: Trap types, migration and trap formation, Structural traps, stratigraphic traps, hydrodynamic traps | Chapt.4.4,4.5 (1), 5,7(2) |
| 11 | 25.11.2015 | Petroleum Play and Fairway: play, play fairway,Lead and Prospect: Lead, prospect and prospect evaluation, prospect inventory, well prognosis Risk and uncertainty | Chapt.4.6, 4.7(1), 5(2) |
| 12 | 02.12.2015 | Appraisal:The trap envelope: depth conversionMapping surfaces and faultsSpill pointsFluid distribution and contacts: fluid contacts and transition zoneIntra-field variations in petroleum compositionIntra-field variation in water composition | Chapt.5.1,5.2(1), 6(2) |
| 13 | 09.12.2015 | Reservoir property distribution: lithofacies and lithotypes, reservoir body geometry, reservoir correlationReservoir quality: More intrinsic reservoir properties, controls on reservoir quality, compaction and cementation in sandstones, compaction and cementation in limestones | Chapter 5.5,5.6 (1), 6(2) |
| 14 | 16.12.2015 | Reservoir description from seismic data: lithology description, porosity determination, lateral variations and reservoir heterogeneity, reservoir correlation, identification of fluid types and contactsPetroleum in Place and reservoir models: petroleum in place, geologic models, reservoir models, reserves | Chapt.5.7,5.8(1), 6(2) |
| 15 | 23.12.2015 | Development and ProductionWell planning and execution: facilities location and well numbers, well geometries, well types, drilling hazards, well completion and stimulation, formation damage, well logging and testingReservoir management: reservoir description from production data, reservoir visualization, Time-lapse seismic, managing decline and abandonmentQuiz 2 | Chapt.6.2,6.3(1), 6.9(2) |
|  | TBA | **Final Exam** |  |