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| **Identification** | **Subject**  | PETE 311- Reservoir Petrophysics– 3 credits  |
| **Department** | Petroleum Engineering |
| **Program** | Undergraduate |
| **Term** | Spring, 2017 |
| **Instructor** | Elshan Aliyev  |
| **E-mail:** | aliyev.elshan@hotmail.com |
| **Phone:** | (+994 55) 655 8504 |
| **Classroom/hours** | 11 Mehseti str.(Neftchilar campus),Tuesday 18:40- 21:20 |
|  | **Office hours** | Friday, 15:00 - 17:00 |
| **Prerequisites** | Petroleum Geology, basics of geosciences, drilling |
| **Language**  | English |
| **Compulsory/Elective** | Elective |
| **Required textbooks and course materials** | ***Coretextbook:***1. *Gary Mavko, TapanMukerji, Jack Dvorkin, 2009,* ***The Rock Physics Handbook***

***Supplementary books:*** 1. *DjebbarTiab, Erle C. Donaldson), 2010.* ***Petrophysics***
2. *Toby Darlin, Linacre House, Jordan Hill, 2005,****Well logging and Formation Evaluation***
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| **Course website** |  |
| **Course outline** | This course is designed for the bachelor and master students. Course addressesprinciples and operation of gamma ray, self potential, caliper, resistivity (micro and focused), density neutron, sonic, cement bond and variable density; diameter of well logging tools. Interpretation of well log and their cross plotting techniques. Determination of formation properties such as porosity, hydrocarbon saturation, lithology, zone thickness, shaliness, etc. Correlation of gas bearing formations and determination of predictable reserves. Guidelines to select proper logs in given field conditions. Additionally, basics of mathematics and physics will be taught in order to understand the tool physics and the rock physics models |
| **Course objectives**  | *Generic Objective of the Course:** To equip students with the core concepts, methods and techniques of well logging and interpretation.
* To prepare students for the industry environment

*Specific Objectives of the Course:** To support the students academically, to improve their chance of realizing their potential
* To give basic knowledge in math and physics required to understand petrophysical models
* To encourage students participation and interaction and fostering atmosphere of tolerance and respect
* To develop an understanding of the theory and practice of managerial analysis, and strategic decision making
* To develop an understanding of the theory in Well logging
* To furnish of students with the “Interpretation charts”
* To build background for the students further Well logging interpretation
* To introduce the key concepts of rock physics

**Homework assignments** will be provided for each class. The contents will be based on log interpretation**,**  fluid substitution, **c**alculation of reserves, elastic properties and seismic attributes from log data. **Quizzes** will cover the materials covered in previous classes. There will be 2 quizzes during semester. **Projects** will mainly include case studies. Research skills and the techniques that learnt during homework assignments will be the tools to complete the projects**.**  |
| **Learning outcomes** | **By the end of the course the students should be able:*** Perform quick look interpretation of logs
* Perform log interpretation of real case studies
* Calculate field reserves
* Use well-to-well correlation of logs to identify geological signatures of formations
* Understand the math and physics behind each measurement technique and rock physics models
* Evaluate elastic properties from log data and apply to drilling and reservoir stimulation
* Identify seismic sweet-spots using soft data
* Identify rock facies using velocity transforms
* Build Rock Physics models for sandstone formations
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| **Teaching methods** | **Lecture**  | x |
| **Group discussion** | x |
| **Practical exercises** | x |
| **Simulation** |  |
| **Case analysis** | x |
| **Course paper** |  |
| **Others** |  |
| **Evaluation**  | **Methods** | **Date/deadlines** | **Percentage (%)** |
| **Midterm Exam** |  | 30 |
| **Case studies** |  |  |
| **Class Participation** |  | 5 |
| **Assignments** |  | 10 |
| **Quizzes** |  | 5 |
| **Projects** |  | 10 |
| **Presentation/Group Discussion** |  |  |
| **Final Exam** |  | 40 |
| **Others** |  |  |
| **Total**  |  | 100 |
| **Policy** | * **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. After the lecture, you should study your notes and work relevant problems and cases from the end of the chapter and sample exam questions.Throughout the semester we will also have assignments and quizzes.* **Withdrawal (pass/fail)**

This course strictly follows grading policy of theSchool of Engineering and Applied Science. Thus, 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. |
| **Tentative Schedule** |
| **Week** | **Date/Day****(tentative)** | **Topics** | **Textbook/Assignments**  |
| 1 | 14.02.2017 | Introduction to Petrophysics and well loggingTerminology and application | Ch.1 |
| 2 | 21.02.2017 | Borehole environment. Gamma Ray Log (tool physics, application and limitations) | Ch.2 |
| 3 | 28.02.2017 | SP and Caliper Logs (tool physics, application and limitations) | Ch.3 |
| 4 | 07.03.2017 | Resistivity logs (tool physics, application and limitations) | Ch.4 |
| 5 | 14.03.2017 | Density and Neutron logs (tool physics, application and limitations)Formation Pressure Testers (tool physics, application and limitations) | Ch.5 |
| 6 | 21.03.2017 | Novruz Holiday |  |
| 7 | 28.03.2017 | Acoustic Logs (tool physics, application and limitations) | Ch.6 |
|  | 04.04.2017 | NMR log (tool physics, application and limitations)Quiz 1 | Ch.7 |
| 8 | 11.04.2017 | **Mid-term Exam** |  |
| 9 | 18.04.2017 | Introduction to Rock Physics | Ch.8 |
| 10 | 25.04.2017 | Continuum Mechanics Concepts | Ch.9 |
| 11 | 02.05.2017 | Elastic Properties of Rocks | Ch.10 |
| 12 | 09.05.2017 | Holiday |  |
| 13 | 16.05.2017 | Effective Pressure Concept. Poroelasticity theory | Ch.11 |
| 14 | 23.05.2017 | Rock Physics models | Ch.12 |
| 15 | 30.05.2017 | Gassman’s equation, fluid substitutionSeismic AttributesQuiz 2 | Ch.13 Ch.14 |
|  | TBA | **Final Exam** |  |

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