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| **Identification** | **Subject**  | PETE 531- Formation Evaluation– 4 credits  |
| **Department** | Petroleum Engineering |
| **Program** | Graduate  |
| **Term** | Fall, 2016 |
| **Instructor** | Izat Shahsenov and Elshan Rzayev (assistant)  |
| **E-mail:** | izat.quantum@mail.ru |
| **Phone:** | (+994 55) 4077622 |
| **Classroom/hours** | 11 Mehseti str. (Neftchilar campus), Friday 21.00-22:00 |
|  | **Office hours** | Friday, 18:30 – 21:00  |
| **Prerequisites** | Petroleum Geology, basics of geosciences, drilling |
| **Language**  | English |
| **Compulsory/Elective** | Elective |
| **Required textbooks and course materials** | ***Core textbook:***1. *Gary Mavko, Tapan Mukerji, Jack Dvorkin, 2009,*  ***The Rock Physics Handbook***

***Supplementary books:*** 1. *Djebbar Tiab, Erle C. Donaldson), 2010.* ***Petrophysics***
2. *Toby Darlin, Linacre House, Jordan Hill, 2005,****Well logging and Formation Evaluation***
3. [***www.ipims.com***](http://www.ipims.com)
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| **Course outline** | This course is designed for the master students. Course addresses principles 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

**Project description**: many projects will be assigned to the class that will require calculations and interpretation of the well data (logs, pressures, core etc) along with other data using the methods studies during the lectures. **Quizzes** will be assigned every two weeks. |
| **Learning outcomes** | **By the end of the course the students should be able:*** Quick look interpretation of logs
* Understand the math and physics behind each measurement technique and rock physics models
* Analytical thinking
* Critical reasoning
* Team building
* Leadership
* Presentation
* Other…
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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** |  | 25 |
| **Case studies** |  |  |
| **Class Participation** |  | 5 |
| **Assignment and quizzes** |  | 15 |
| **Projects** |  | 15 |
| **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 an assignment and quizzes. * **Withdrawal (pass/fail)**

This course strictly follows grading policy of the School of Engineering and Applied Science. Thus, a student is normally expected to achieve a mark of at least 65% 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 | 17.09.16 | Introduction to Formation Evaluation and well loggingTerminology and application | [www.ipims.com](http://www.ipims.com)  |
| 2 | 24.09.2016 | Borehole environment. Gamma Ray Log (tool physics, application and limitations) | [www.ipims.com](http://www.ipims.com)  |
| 3 | 01.10.2016 | SP and Caliper Logs (tool physics, application and limitations) | [www.ipims.com](http://www.ipims.com)  |
| 4 | 08.10.2016 | Resistivity logs (tool physics, application and limitations) | [www.ipims.com](http://www.ipims.com)  |
| 5 | 15.10.2016 | Density and Neutron logs (tool physics, application and limitations) | [www.ipims.com](http://www.ipims.com)  |
| 6 | 22.10.2016 | Formation Pressure Testers (tool physics, application and limitations) | [www.ipims.com](http://www.ipims.com)  |
| 7 | 29.10.2016 | Acoustic Logs (tool physics, application and limitations) | [www.ipims.com](http://www.ipims.com)  |
| 8 | 05.11.2016 | NMR log (tool physics, application and limitations)Quiz 1 | [www.ipims.com](http://www.ipims.com)  |
| 9 | 12.11.2016 | **Mid-term Exam**  |  |
| 10 | 19.11.2016 | Introduction to Rock Physics. The concept of Matrices Basics of First Order Differential Equations | Ch.8Ch.9 |
| 11 | 26.11.2016 | Some concepts of Probability theory | Ch.10 |
| 12 | 03.12.2016 | Basics of stress theory, Wave propagation | Ch.11, Ch.12 |
| 13 | 10.12.2016 | Effective Pressure Concept. Poroelasticity theory | Ch.13 |
| 14 | 17.12.2016 | Rock Physics models. Ruess and Voigt Biot’s Model, equation of wave propagation | Ch.14ç Ch.15 |
| 15 | 25.12.2016 | Gassman’s equation, fluid substitutionQuiz 2 | Ch.16 |
| 16 | TBA | **Final Exam** |  |

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