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| **Identification** | | | **Subject** | PETE 509 – Advanced Petroleum Production Technology | | |
| **Department** | Petroleum Engineering | | |
| **Program** | Graduate | | |
| **Term** | Spring, 2017 | | |
| **Instructor** | Shahriyar Alkhasli | | |
| **E-mail:** | [shahriyar.alkhasli@khazar.org](mailto:shahriyar.alkhasli@khazar.org) | | |
| **Phone:** | +994552926053 | | |
| **Classroom/hours** | Thursday 18:40 | | |
|  | | | **Office hours** | by appointment | | |
| **Prerequisites** | | |  | | | |
| **Language** | | | English | | | |
| **Compulsory/Elective** | | | Required | | | |
| **Required textbooks and course materials** | | | ***Core textbooks:***  ***Well Performance,*** 2nd Ed., Michael. Golan and Curtis.H. Whitson  ***Multiphase Flow in Wells***, James P. Brill and Hemanta Mukherjee  ***Production Technology,*** Heriot Watt university manual  ***Supplementary material:***  Class Lecture Handouts and Additional Reading Materials | | | |
| **Course outline** | | | The course is designed for graduate students. Hence, understanding of basic concepts is assumed a priori. Some similar topics will be covered but with the deep analysis in order to guide students for the future research directions. Advanced project involving wide range of computation will be provided during the semester and will be related to fluid flow in the whole system. Homework assignments are crucial for the course and designed to encourage individual study. | | | |
| **Course objectives** | | | The objectives are to improve analytical thinking and develop numerical computational skills regarding production system. This includes subsurface and surface dynamics, fluid properties, optimization problems and flow assurance consideration. Strong mathematical background is required for solution of PDEs. **Project assignment** will also master ability to work in a team under instructor’s supervision on advanced topics and will be based on computation fluid properties, inflow and outflow models analysis and flow patterns modeling using programming languages available. The objective of the project is to master computational skills of complicated and state-of-the-art problems of the industry.  **Quizzes** will be provided during the classes and are based on the topic covered previously. Four quizzes will be provided during semester. | | | |
| **Learning outcomes** | | | **By the end of the course the students should be able:**   * Apply worldwide experience to certain well performance problems * Apply fundamental sciences in well performance management * Deliver scientific ideas to production system * Analyze current research directions locally and worldwide * Design an advanced production system and apply various optimization techniques * Model a completion design for various types of reservoir and compute perforation parameters * Describe the options with constrains and advantages for producing from multiple production zones * Understand reservoir and well integrity specifics in details * Calculate parameters related to artificial lift systems * Perform high order computations using programming languages * Solve analytical equations using various techniques * Identify the crucial near wellbore area susceptible to formation damage. * Calculate the cost of formation damage (in terms of lost production). * Provide guidelines for minimizing formation damage during workover operations. * Explain the potential negative impacts of “matrix stimulation” and identify * migration strategies * Critically describe the Hydraulic Fracture Treatment Design Procedure * Identify Flow assurance problems and propose the ways to predict it using simulations | | | |
| **Teaching methods** | | | **Lecture** | | | X |
| **Group discussion** | | | X |
| **Experiential exercise** | | |  |
| **Simulation** | | |  |
| **Case analysis** | | | X |
| **Course papers** | | | X |
| **Others** | | |  |
| **Evaluation** | | | **Methods** | | **Date/deadlines** | **Percentage (%)** |
| **Midterm Exam** | |  | 30 |
| **Case studies** | |  |  |
| **Class Participation** | |  | 5 |
| **Assignment and quizzes** | |  | 10 |
| **Project** | |  | 20 |
| **Presentation/Group Discussion** | |  |  |
| **Final Exam** | |  | 35 |
| **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.   * **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. | | | |
| **Tentative Schedule** | | | | | | |
| **Week** | **Date/Day**  **(tentative)** | **Topics** | | | | **Textbook/Assignments** |
| 1 | 16 Feb | Introduction to the course and Petroleum Engineering. Modern Problems. | | | | Hydrocarbon Exploration and Production. |
| 2 | 23 Feb | Concepts in Production System. | | | | Well Performance, Ch. 1;  Production Technology |
| 3 | 2 Mar | Fluid Mechanics Review and Application to Production Engineering. | | | | Multiphase flow in well; |
| 4 | 9 Mar | Black Oil and Compositional Models Simulation. | | | | Lecture Notes |
| 5 | 16 Mar | Reservoir and Tubing Performance. | | | | Production Technology Ch.3,12. |
| 6 | 23 Mar | **Novruz Holiday** | | | |  |
| 7 | 30 Mar | Advanced Nodal Analysis. | | | | Production Technology Ch.12. |
| 8 | 6 Apr | Advanced Artificial Lift Technologies. | | | | Production Technology Ch.4. |
| 9 | 13 Apr | **Midterm exam** | | | |  |
| 10 | 20 Apr | Gas lift fundamentals. | | | | Production Technology Ch.5. |
| 10 | 27 Apr | Formation Damage. Matrix Acidizing | | | | Production Technology Ch.7,8. |
| 11 | 4 May | Hydraulic Fracturing | | | | Production Technology Ch.9. |
| 12 | 11 May | Sand Control | | | | Production Technology Ch.10. |
| 13 | 18 May | Flow Assurance. Field Development. | | | | Lecture Notes;  Production Technology, Ch.11 |
| 14 | 25 May | Course Summary, Presentation of Projects | | | |  |
|  | TBA | **Final Exam** | | | | TBA |

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