جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Advanced Well Testing - ERPE 361

Division	Physical Science and Engineering Division
Course Number	ERPE 361
Course Title	Advanced Well Testing
Academic Semester	Fall
Academic Year	2018/2019
Semester Start Date	08/26/2018
Semester End Date	12/11/2018
Class Schedule (Days & Time)	09:00 AM - 10:30 AM | Mon Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
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Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	Oil and gas production rates from a well often undergo a declining behavior over time. Well productivity is a complex process that is a function of the hydrocarbon reservoir subsurface properties related to the fluids in places and the hosting environment. It is also related to the wellbore flow conditions from the reservoir to the surface. Well testing is an important technology that is frequently used in the industry. This technology consists of flow diagnostics (rates and pressure) to evaluate a well productivity or injectivity performance such as skin factor, non-Darcy effect, and storativity. It is also used to acquire insights about the reservoir properties such as connectivity, heterogeneity including fractures, flow regime, and drainage area. This course covers the fundamentals of well testing and discusses real field applications. The course includes : 1) fundamentals of flow in porous media; 2) introduction to decline-curve analysis; 3) Buildup-test analysis of slightly compressible fluids; 4) Analysis of oil and gas well flow and buildups tests; 5) Well-test in hydraulically fractured wells; 6) Well-test in naturally fractured reservoirs; 7) Interference and pulse testing; 8) well testing in unconventional reservoirs.
Course Description from Program Guide	Oil and gas production rates from a well often undergo a declining behavior over time. Well productivity is a complex process that is a function of the hydrocarbon reservoir subsurface properties related to the fluids in places and the hosting environment. It is also related to the wellbore flow conditions from the reservoir to the surface. Well testing is an important technology that is frequently used in the industry. This technology consists of flow diagnostics (rates and pressure) to evaluate a well productivity or injectivity performance such as skin factor, non-Darcy effect, and storativity. It is also used to acquire insights about the reservoir properties such as connectivity, heterogeneity including fractures, flow regime, and drainage area. This course covers the fundamentals of well testing and discusses real field applications. The course includes : 1) fundamentals of flow in porous media; 2) introduction to decline-curve analysis; 3) Buildup-test analysis of slightly compressible fluids; 4) Analysis of oil and gas well flow and buildups tests; 5)Well-test in hydraulically fractured wells; 6) Well-test in naturally fractured reservoirs; 7) Interference and pulse testing; 8) well testing in unconventional reservoirs Note: students are expected to have at least basic familiarity with: Multi- phase flow in porous media, reservoir engineering, and programming in Matlab or Python

Goals and Objectives	After completing this course, students will be able to : - Understand the well testing technology and its significance - Understand the concept of decline curve analysis - Know about the pressure and rate transient analyses - Understand the capability of well testing in identifying well flow issues and reservoir properties - Understand how this technology can be used to identify flow regimes including fractured reservoirs - Get familiarized with a reservoir simulator
Required Knowledge	Students are expected to have at least basic familiarity with: single and multi-phase flow in porous media, reservoir engineering, and programming in Matlab or Python.
Reference Texts	- Course material - Lee, Rollins, and Spivey, Pressure Transient Testing, SPE, 2003 - T. Ertekin, J. Abou-Kassem and G. King; Basic Applied Reservoir Simulation, SPE 2001.
Method of evaluation	**10.00**% - Active participation **20.00**% - Midterm exam **20.00**% - Homework /Assignments **30.00**% - Group Project(s) **20.00**% - Final exam
Nature of the assignments	- Model coding in Matlab or Python - Written assignments - Paper presentation - Group project with a presentation
Course Policies	- For absense and late assignments, discuss with instructor beforehand
Additional Information	

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Mon 08/27/2018	Introduction to well testing
1	Thu 08/30/2018	Fundamentals of fluid flow in porous media
2	Mon 09/03/2018	Decline curve analysis
2	Thu 09/06/2018	Decline curve analysis
3	Mon 09/10/2018	Diffusivity equation: derivation
3	Thu 09/13/2018	Diffusivity equation: derivation
4	Mon 09/17/2018	Diffusivity equation: solution
4	Thu 09/20/2018	Diffusivity equation: solution
5	Mon 09/24/2018	Flow tests: overview
5	Thu 09/27/2018	Flow tests: analysis
6	Mon 10/01/2018	Limitations of real applications
6	Thu 10/04/2018	Limitations of real applications
7	Mon 10/08/2018	Buildup tests: dimensionless variables
7	Thu 10/11/2018	Buildup tests: dimensionless variables
8	Mon 10/15/2018	Midterm Exam
8	Thu 10/18/2018	Computer lab (reservoir simulation)
9	Mon 10/22/2018	Computer lab (reservoir simulation)
9	Thu 10/25/2018	Computer lab (reservoir simulation)
10	Mon 10/29/2018	Pressure buildup test: phase redistribution
10	Thu 11/01/2018	Pressure buildup test: phase redistribution
11	Mon 11/05/2018	Well testing in hydraulicly fractured wells
11	Thu 11/08/2018	Well testing in hydraulicly fractured wells
12	Mon 11/12/2018	Well testing in naturally fractured reservoirs
12	Thu 11/15/2018	Well testing in naturally fractured reservoirs
13	Mon 11/19/2018	Injection-well testing
13	Thu 11/22/2018	Injection-well testing
14	Mon 11/26/2018	Interference and pulse testing
14	Thu 11/29/2018	Interference and pulse testing
15	Mon 12/03/2018	Well testing in unconventional reservoirs
15	Thu 12/06/2018	Well testing in unconventional reservoirs
16	Mon 12/10/2018	Final Exam

Note

The instructor reserves the right to make changes to this syllabus as necessary.