Faculty of Engineering & Technology

Fundamentals of Petroleum Reservoir Simulation

Information :

Course Code :	PET 510	**Level** :	Undergraduate	**Course Hours :**	3.00- Hours

Department :	Department of Petroleum Engineering

Instructor Information :

Title	Name	Office hours
Professor	Adel Mohamed Salem Ragab	9
Teaching Assistant	Taha Abdelhamid Abdelmaqsoud Abdelhamid Yehia	

Area Of Study :

The main aim is to give the student the theoretical basis and practical fundamentals for numerical and analytical simulation of fluid flow in petroleum reservoirs.

Description :

An introduction to petroleum reservoir simulation. Fundamentals of finite difference approximation of the partial differential equations of flow through porous media. Discussion of various simulation schemes, data handling, boundary conditions. Use of a dry gas and black oil simulators.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Understand how derivatives can be approximate by finite differences, and what errors are involved.
2 -	Understand the fully implicit and IMPES solution strategies for solving flow equations.
3 -	Recognize the usage of finite difference techniques in solving differential equations.
4 -	Define what streamline simulation techniques are, and when they are most valuable.

b.Intellectual Skills: :

1 -	Use numerical reservoir methods to solve complex fluid flow problems.
2 -	Use the proper methods to be used in enhanced oil recovery (EOR)
3 -	Use appropriate mathematical and computer-based methods for modeling
4 -	Solve problems analytically and numerically.

c.Professional and Practical Skills: :

1 -	Simulate mass conservation equations for single phase and multi-phase flows in porous media.
2 -	Develop some experience with history matching a reservoir simulation model.
3 -	Solve petroleum engineering problems by using mathematics and physics knowledge.
4 -	Carry out a simple reservoir simulation study using a black-oil model.

d.General and Transferable Skills: :

1 -	Collaborate effectively within multidisciplinary teams.

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2 -	Effectively manage tasks, time, and resources
3 -	Use internet to research the fundamental concepts of Dynamic Reservoir Simulation,
4 -	Use internet to search for a simple reservoir simulation model (including data gathering, data QC),

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction to Reservoir Simulation	5	3	2
Formulation of Fluid Flow Equations	10	6	4
Finite Difference Formulations	10	6	4
Numerical Methods	5	3	2
Applications of Finite Difference Techniques	5	3	2
Applications Using A Simulator	10	6	4
Numerical Methods in Reservoir Simulation	5	3	2
Reservoir Discretization	10	6	4
Treatment of Boundary Conditions and Well Representation in Simulators	10	6	4

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments	10.00		
Final exam	40.00		
In Class Quizzes	5.00		
Mid-Term exams	40.00		
Participations	5.00		

Recommended books :

Jamal Hussein Abou-Kassem, Syed Mohammad Farouq Ali, M. Rafiq Islam. 2006. Petroleum
Reservoir Simulation: A Basic Approach, Gulf Publishing Company.
M. R. Carlson. 2003. Practical Reservoir Simulation, PennWell Books.
T. Ertekin, J.H. Abou-Kassem, and G.R. King, 2001. Applied Reservoir Simulation, SPE
Textbook Series.
Herriot Watt. 2000. Reservoir Simulation textbook.