

Faculty of Engineering & Technology

Finite Element Analysis with Applications in Petroleum Engineering

Information :

Course Code :	PE 407	Level	:	Undergraduate	Course Hours :	4.00- Hours

Department : Department of Petroleum Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	Salah Ahmed Ebrahem Badr	4
Lecturer	Salah Ahmed Ebrahem Badr	4
Assistant Lecturer	YOUSSEF ELSAYED ABDELHAFEZ KANDIEL	
Teaching Assistant	Mohamed Osama Mohamed Abbas	
Teaching Assistant	AHMED NAGUIB ABDELAZIZ ABDELAZIZ GHONIM	
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Area Of Study :

The Main Goals of this course are:

ÁUnderstand the theory behind the finite element method for the solution of practical engineering problems. ÁUnderstand the concept of numerical methods, Newton Raphson, Bisection, Secant, False position and Gaussian Elimination methods.

Ápply numerical methods using software tools in MATLAB.

Description :

This course introduces finite element analysis (FEA) methods and applications of subsurface engineering. The course is intended to provide a fundamental understanding of FEA software and experience in creating meshes for petroleum reservoirs or other subsurface features.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Explain the concept of approximation in the analysis of engineering problems
2 -	Demonstrate the concept of analytical and numerical methods
3 -	Explain the underlying mathematics behind finite element analysis software solvers
4 -	Illustrate a finite element to investigate a real world engineering problem.
5 -	Explain the underlying basis of physical laws relevant to the finite elements analysis
6 -	Describe qualitatively and quantitatively process, relationships and techniques relevant to finite elements.
b.Intellectu	al Skills: :
1 -	Apply different numerical methods to solve large petroleum problems.
2 -	Write matlab program using different numerical methods.
3 -	Identify the most common problems encountered in finite element analysis



4 -	Solve the different problems using matlab.		
5 -	Identify the most common problems encountered in finite element analysis		
c.Professional and Practical Skills: :			
1 -	Apply the Finite Element Method to practical situations , with specific emphasis on its application to petroleum engineering problems		
2 -	Use computer program to solve the problems using the concept of numerical methods		
d.General and Transferable Skills: :			
1 -	Communicate effectively.		

Course Topic And Contents :

Торіс	No. of hours	Lecture	Tutorial / Practical
Introduction to FEA; Discretisation; FE Terminology.	6	4	2
A General FE Problem Solving Approach; Modelling Assumptions;	6	4	2
Validation; Sources of Error in FE; Computational Resources;	6	4	2
Introduction to numerical methods	6	4	2
Newton Raphson method; Bisection method	6	4	2
Secant method; False Position method; introduction to MATLAB; Mathematical functions	12	8	4
Basic plotting; Matrix generation; Introduction to programming in MATLAB;	12	8	4
Control flow and operators in MATLAB;	12	8	4
Numerical methods in MATLAB	12	8	4
Field problems	12	8	4

Course Assessment :					
Methods of assessment	Relative weight %	Week No	Assess What		
1st Midterm	25.00				
2nd Midterm	25.00				
Final Exam	40.00				
Performance	10.00				