

**Faculty of Engineering & Technology**

**Fundamental Digital Applications in Petroleum Engineering**

**Information :**

**Course Code :** PET 508

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Department of Petroleum Engineering

**Area Of Study :**

The Main Goals of this course are:

- Understand the basic theory behind the finite element method
- Use the finite element method for the solution of practical engineering problems
- Use the Visual Basic in PVT models.
- Understand the concept of digitizing.
- Use the Matlab in the numerical methods.

**Description :**

This course includes applications of Windows-based Visual Basic solutions to engineering problems including selected topics in fluid flow, PVT behavior, matrices in engineering solutions, translating curves to computer solutions, predictor-corrector material balance solutions, and graphical display of results.

**Course outcomes :**

**a. Knowledge and Understanding: :**

1 -	Outline the approximation in engineering problems
2 -	Explain the concept of analytical, numerical methods
3 -	Explain the underlying mathematics behind finite element analysis software solvers
4 -	Outline the finite element study to investigate a real-world engineering problem
5 -	Explain the underlying basis of physical laws relevant to the course topics, discussing their applications and appreciating their relation to the topics to the topics of other courses taken
6 -	Describe qualitatively and quantitatively process, relationships and techniques relevant to the topics included in the course outline.

**b. Intellectual Skills: :**

1 -	Demonstrate different numerical methods to solve large petroleum problems
2 -	Write MATLAB program using different numerical methods
3 -	Solve the different problems using MATLAB
4 -	Apply the Visual Basics in building the PVT Models

**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 -	Use MATLAB program to solve different problems related to petroleum engineering and present the results within multidisciplinary team.
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**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction to FEA; Discretization; FE Terminology	8	6	2
A General FE Problem Solving Approach; Modelling Assumptions;	5	3	2
Validation; Sources of Error in FE; Computational Resources;	5	3	2
Introduction to Visual Basics	10	6	4
Building PVT model using the visual basics	7	3	4
Newton Raphson method; Bisection method Secant method; False Position method; introduction to MATLAB; Mathematical functions	10	6	4
Basic plotting; Matrix generation; Introduction to programming in MATLAB;	8	6	2
Control flow and operators in MATLAB;	10	6	4
Numerical methods in MATLAB	5	3	2
Field problems	7	3	4

**Teaching And Learning Methodologies :**

Interactive Lecturing
Discussion
Problem-based Learning
Research
Experiential Learning

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Assignment	10.00		
Final Exam	40.00		
Lab. Exam	5.00		
Mid- Exam	25.00		
Participation	10.00		
Quizzes	10.00		