Ministry of Higher Education and Scientific Research
University of Misan
College of Engineering
Department of Petroleum Engineering
Committee of Quality Assurance and Academic Accreditation

Academic Program and Course Description Guide for the Bachelor's Program in Petroleum Engineering According to the Courses System for the Third and Fourth Stages

2024-2025

Academic Program Description Form

University Name: Misan University

Faculty/Institute: College of Engineering

Scientific Department: Petroleum Engineering Department

Academic or Professional Program Name: Bachelor's Petroleum Engineering

Final Certificate Name: Bachelor

Academic System: Courses System (third and fourth stages)

Description Preparation Date: 1/6/2024

File Completion Date: 1/7/2025

Signature:

Head of Department Name:

Assist. Prof. Dr. Jabbar Raheem Rashed

Date: 7/9/2025

Signature:

Scientific Associate Name:

Assist. Prof. Dr. Hassnin Abbas Hassan

Date: 8/9/2025

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Prof. Dr. Abbas Oda Dawood

Date: 9/9/2025

Signature:

Approval of the Dean

Prof. Dr. Abbas Oda Dawood

9/9/2025

الاستاذ الدكتور

عباس عودة داود

1. Program Vision

Petroleum engineering department is willing to be internationally remarkable school in petroleum industry related programs.

2. Program Mission

The department strives to prepare very well scientifically equipped engineers having significant leader spirit and positive attitude.

3. Program Objectives

1- Ability to apply the knowledge of science mathematics and engineering.
2- Ability to work in multi-disciplinary team work.
3- Ability to determine the problems and find the solution.
4- Ability to communicate effectively.
5- Knowing the ethical and practical responsibility.
6- Ability to utilize modern technology and engineering tools.
7- Ability to analyze data and implement the experiments.

4. Program Accreditation

Does the program have program accreditation? And from which agency?
NO

5. Other external influences

Is there a sponsor for the program?
College of engineering /University of Misan

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements				
College Requirements				
Department Requirements	**28**	**76**	**100%**	**Basic**

Summer Training	**---**	**---**	**----**	**3th stage**
Other				

* This can include notes whether the course is basic or optional.

Year/semester	Course Code	Course Name	Class lecture CL(hr/w)	Lab. (hr/w)
3/1	**PE300**	***Engineering Mathematics***	***4***	
3/1	**PE301**	***Applied Engineering Mathematics***	***4***	
3/1	**PE302**	***Petroleum Reservoir Engineering I***	***4***	**2**
3/2	**PE303**	***Petroleum Reservoir Engineering II***	***4***	**2**
3/1	**PE304**	***Petroleum Drilling Engineering I***	***4***	**2**
3/2	**PE305**	***Petroleum Drilling Engineering II***	***4***	**2**
3/1	**PE306**	***Petroleum Production Engineering I***	***4***	
3/2	**PE307**	***Petroleum Production Engineering II***	***4***	
3/1	**PE308**	***Petroleum Engineering Economics I***	**3**	
3/2	**PE309**	***Petroleum Engineering Economics II***	**3**	
3/1	**PE310**	***Well Logging***	***4***	
3/2	**PE311**	***Mechanical Earth Modeling***	***3***	
3/2	**PE312**	***Engineering Statistics***	***3***	
3/2	**PE313**	***Geophysics***	***3***	
4/1	**PE400**	***Applied Numerical Methods***	***3***	**2**
4/1	**PE401**	***Reservoir Simulation***	***3***	**2**
4/1	**PE402**	***Applied Reservoir Engineering***	***4***	
4/2	**PE403**	***Reservoir Characterization***	***4***	
4/1	**PE404**	***Directional Drilling Engineering***	***4***	
4/2	**PE405**	***Drilling Optimization***	***4***	
4/1	**PE406**	***Well Test***	***4***	
4/2	**PE407**	***Multiphase Flow in Porous Media***	***4***	
4/1	**PE408**	***Secondary Oil Recovery***	***4***	
4/2	**PE409**	***Enhanced Oil Recovery***	***4***	
4/1	**PE410**	***Natural Gas Engineering***	***3***	
4/2	**PE411**	***Optimization***	***3***	
4/2	**PE412**	***Integrated Reservoir Management***	***4***	
4/2	**PE413**	***Engineering Ethics***	***3***	

7. Expected learning outcomes of the program	
Knowledge	
Learning Outcomes 1	Ability to apply the knowledge of science mathematics and engineering.

Skills	
Learning Outcomes 2	Ability to determine the problems and find the solution
Learning Outcomes 3	Ability to communicate effectively.
Ethics	
Learning Outcomes 4	Knowing the ethical and practical responsibility.
Learning Outcomes 5	Ability to utilize modern technology and engineering tools.

8. Teaching and Learning Strategies

Visual, laboratory, and electronic tools, as well as any means that contribute to delivering ideas and content accurately.

9. Evaluation methods

Daily quizzes, seminars, reports, and homework assignments.

10.Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor		1			1	
Assist Prof.	3	2			5	
Lecture	2	4			6	
Assist. Lec.	8	8			12	4

Professional Development

Mentoring new faculty members

New college members are guided through various aspects before becoming actively involved in the educational process and being assigned theoretical courses. They are also introduced to all academic and administrative components of the department through several measures, including: highlighting the important role of university professors in guiding Petroleum Engineering students toward their future careers; emphasizing the significance of the professor's character and academic competence and their direct impact on students in all aspects; and stressing the importance of attention to even minor details and consulting senior and more experienced faculty members before making important decisions.

Professional development of faculty members

Participation in a teaching methods course, engagement with senior college members who have extensive academic experience, involvement in laboratory work, and subsequently, the preparation of a simple seminar on a specific topic.

11. **Acceptance Criterion**
"Multiple admission channels (Central Admission, Special Government Education, Families of Martyrs, …)"

12. **The most important sources of information about the program**
"International, Arab, and Iraqi universities, as well as the current college members.

13. Program Development Plan
"Continuous review of the program implementation plan and the provision of feedback throughout the academic year."

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Eng. Economics / PE316	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\25	**Scientific Committee Approval Date** .8

9. **Module Objectives**

Basic petroleum and Gas concepts & Oil Economic concepts and conversion standards and .transactions - its composition Oil formation theories Types of oil The economic functions of oil
To achieve the required understanding by students of economic concepts associated with the oil industry.

10. Module Learning Outcomes

A This material of study will be increasing the level of knowledge and skills to evaluate the required aspects of economics as part of petroleum and gas industries. The study of analysis the economics tools will helps determine level of investments and risks related with oil-fields. Accuracy and integration of information with practical reality will be one of the most important outputs that reflect the current and future economic outlook in the oil industry or the optimal use of this industry in other supporting industries. Accuracy in presenting examples and the standard of economic analysis and evaluation will be a major part of this study stage.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. Using pdf and ppt format during the course of study will be main tools within different level of exercises and solved problem.

General and qualifying transferable skills (other skills related to employability and personal development).

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. Using pdf and ppt format during the course of study will be main tools within different level of exercises and solved problem.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Overview petroleum and gas Functions of petroleum economics. Importance of petroleum Economics & Characteristics of the oil industry
Week 2	Economic aspects for Oil and gas reserve. organization of petroleum exporting and importing countries
Week 3	International supply and demand of petroleum. classification of petroleum,
Week 4	petroleum pricing, alternative energy, international strategy of energy, Alternative energy, international strategy of energy,
Week 5	Time value of money , Quiz
Week 6	Types of interest rates , Mid Exam
Week 7	Investments Evaluations, NET PRESENT VALUE, NPV, IRR, MIRR etc. & Hurdle and minimum acceptable rates of return profitability Index
Week 8	NPV, IRR, MIRR etc. & Hurdle and minimum acceptable rates of return profitability Index, Distinguishing cash flow from income and profit
Week 9	Sources of revenue and cost & lifecycle costing, Cost classifications & relationship between costs and revenue
Week 10	Break Even Analysis, risk analysis production decline curves,
Week 11	Decision models, game theory, Risk adjustments when valuing petroleum reserve Categories, Sensitivity analysis of engineering projects.
Week 12	Sensitivity analysis of engineering projects, Applications of Sensitivity analysis of engineering projects, Quiz
Week 13	methods of engineering decisions, depreciation methods, depreciation methods
Week 14	taxation, inflation, Bidding process and re-awarded contracts and Future production of oil and gas wells, Bidding process and re-awarded contracts and Future production of oil and gas wells
Week 15	Paybacks methods
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of economic concepts in oil and gas	Yes
Recommended Texts		Yes
Websites	https://www.coursera.org/browse/Economic_petrlomue	

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University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Eng. Statistics / PE312	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\25	**Scientific Committee Approval Date** .8
9. **Module Objectives**	

10. Module Learning Outcomes

1. Understand the fundamental concepts of statistics, including measures of central tendency, dispersion, probability, and distributions.
2. Apply statistical techniques to analyze and interpret data relevant to petroleum engineering, such as reservoir properties, production rates, and well performance.
3. Evaluate and select appropriate statistical methods for solving engineering problems in the petroleum industry.
4. Use statistical software tools effectively to analyze large datasets and perform statistical calculations.
5. Apply hypothesis testing techniques to make decisions and draw conclusions about petroleum engineering processes and data.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course is a "must have" for anyone working with the subsurface within the petroleum industry. Well logging provides data to answer fundamental questions regarding petrophysical, geological and mechanical properties required to evaluate, develop and produce a field. The course covers
The fundamental rock properties and petrophysical concepts and equations. The following well logging measurements are discussed:
SP log, gamma ray log, Caliper log, conventional resistivity log, induction log; lateral log, macro resistivity log, acoustic/sonic log, density log, photoelectric absorption, neutron porosity, nuclear magnetic resonance, TDT log, CBL log and quick method in (HC) detection.
Further topics include the measurement environment, geometrical considerations in a borehole, environmental corrections, and the link between the measured parameters and the rock's porosity, permeability, fluid/gas saturation, lithology and clay content.
Through exercises and projects the students will learn how to interpret well log data. During group work the students learn to cooperate and to take responsibility for their part of the assignments given. By working with real data from the field, they learn to understand that real data can be uncertain and that one has to use common sense and understanding in order to find good answers to the interpretation problems.

General and qualifying transferable skills (other skills related to employability and personal development).

1. Actively participate in class: Attend all lectures and actively engage in discussions. Ask questions, seek clarification, and participate in class activities. This will help you understand the concepts better and reinforce your learning.
2. Review prerequisite knowledge: Make sure you have a solid understanding of the prerequisite mathematical concepts, such as calculus and probability theory. If you find any gaps in your knowledge, review the necessary topics before diving into Engineering Statistics.
3. Establish a study schedule: Create a study schedule that allocates dedicated time for studying Engineering Statistics. Break down the topics into manageable chunks and allocate sufficient time for practice problems and review.

Practice regularly: Engineering Statistics is best learned through practice. Solve a wide range of problems to reinforce your understanding of concepts and

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Oil and gas reserve, organization of petroleum exporting and importing
Week 2	countries,
Week 3	International supply and demand of petroleum,
Week 4	Classification of petroleum, petroleum pricing, alternative energy,
Week 5	international strategy of energy,
Week 6	Time value of money, types of interest rates, rate of return,
Week 7	Methods of engineering decisions, depreciation, depletion, amortization,
Week 8	taxation, inflation, and quiz.
Week 9	Sensitivity analysis of engineering projects,
Week 10	Mid exam
Week 11	Risk analysis production decline curves,
Week 12	Evaluation of future production of oil and gas wells.
Week 13	Exam preparation and review
Week 14	Preparatory week before the final Exam
Week 15	Oil and gas reserve, organization of petroleum exporting and importing

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Curriculum and textbook	Yes
Recommended Texts	• Engineering Mathematics", by John Bird, 5th edition, Elsevier Ltd., 2007 • Advanced Engineering Mathematics", by Peter V.	Yes

	O'Neil, 7th Edition, Cengage Learning, 2012	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Production Engineering I / PE306	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\22	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The aim of the production engineering module in the third grade of the petroleum engineering department is to provide students with a comprehensive understanding of the principles and practices involved in the production of oil and gas. The module focuses on developing students' knowledge and skills related to the design, optimization, and management of oil and gas production systems.

Well Completion and Stimulation: Students will gain knowledge of well completion techniques and stimulation methods. This includes understanding different types of well completions, hydraulic fracturing, and acidizing.

Field Development Planning: Students will gain an understanding of field development planning processes. They will learn how to evaluate reservoir potential, estimate recoverable reserves, and design production strategies for optimal field development.

10. Module Learning Outcomes

Understand the fundamental principles of production engineering: Students should be able to demonstrate a comprehensive understanding of the basic principles and concepts of production engineering, including reservoir characteristics, fluid flow, well completion, and artificial lift methods.

Analyze and interpret production data: Students should be able to collect and analyze production data from oil and gas wells, interpret the results, and identify potential production issues or opportunities for optimization.

Design well completions: Students should be able to design and optimize well completions, considering factors such as reservoir characteristics, wellbore stability, and production objectives. They should also be able to evaluate different completion techniques and select the most appropriate ones for specific reservoir conditions.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
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Indicative Contents

Introduction to Production Engineering: Overview of production engineering in the petroleum industry, its importance, and its role in maximizing hydrocarbon recovery.

Reservoir Fluid Properties: Understanding the behavior of reservoir fluids, including oil, gas, and water, their physical properties, phase behavior, and their impact on production.

Well Performance: Analyzing the performance of oil and gas wells, studying inflow and outflow performance relationships, wellbore flow, and pressure behavior.

Well Completion: Techniques and technologies for completing and optimizing oil and gas wells, including completion design, perforation strategies, and well stimulation.

Artificial Lift Systems: Introduction to artificial lift methods, such as rod pumping, gas lift, and electric submersible pumps (ESP), and their application in enhancing production from oil and gas wells.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Type of well – total production system and its component
Week 2	Types of completion single, dual, triple zones(advantage and disadvantage of each of the completion)
Week 3	Gathering line on the surface, and Types of storage tanks, requirement and definition.
Week 4	
Week 5	Separator definition, Separator types and classification, Separator and the separation mechanism, the effect on separation mechanism
Week 6	Separator sizing and calculation of each phase area.
Week 7	Conning definition and different methods to calculate the critical flow
Week 8	Choke performance, type of chokes, importance of choke for production practice.
Week 9	Different methods to calculate the choke performance(Gilbert and Ros).
Week 10	Introduction to well stimulation, types of well stimulation.
Week 11	Hydraulic fracture and its calculation (dimension of hydraulic fracture)
Week 12	Drill Stem Test: introduction to well test, requirement to well test.
Week 13	Calculation of permeability (k), skin factor(S), initial pressure(Pi) and pressure drop due to skin.
Week 14	Practice to calculate different parameters from DST
Week 15	Final Project and Exam Preparation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Engineering Analysis I / PE300	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\24	**Scientific Committee Approval Date** .8

9. **Module Objectives**

This module is intended to expose the students to understand the basic ideas of differential equations (DE) combined with its definition, types, orders, and degrees. It provides a comprehensive understanding of solving differential equations with 1st order and nth order using different approaches. This module is a fundamental module that provides students with the mathematical skills and knowledge necessary for solving engineering problems in the petroleum industry. It covers a range of mathematical concepts and techniques applicable to various engineering disciplines, including petroleum engineering. Engineering Analysis Module (I) provides students with a solid foundation in mathematical principles and problem-solving techniques necessary for understanding and analyzing complex engineering problems in petroleum engineering.

10. Module Learning Outcomes

At the end of this module, students will be able to:

1- Understand the fundamentals of differential equations.
2- Classify the differential equations based on its type, order, and degree. This will help to identify the best method for solving the differential equations.
3- Solve the 1st order of DE using different methods including separable, exact, homogenous, linear, Bernoulli, and Ricatti's methods.
4- Apply of 1st DE for solving different physical problems including Cooling Problems, Falling Bodies, Growth and Decay, and Dilution Problems.
5- Solve the nth order of LDE with constant coefficients using two methods: Undetermined Coefficients and Variation of Parameters. Then, applying that on Spring-Mass System.

Solve the 2nd DE with variable coefficient using different methods such as Power-series method, Tayler, Frobenius, and Bessel's function methods.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The Module of Engineering Analysis I is an important course to understand the fundamentals of differential of differential equations and how it can be solved. It covers various aspects and applications of differential equations. It can help students to learn how to translate the physical problems into differential equations which can be then solved based on the initial and boundary conditions of this DE. This model will also deeply help the students to understand the numerical methods which can be used for simulating the reservoir

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the discussion in class and quick quizzes. This will be achieved through classes, interactive tutorials and by considering a simple type of strategy involving some examples related to petroleum industry that have been solved and understood using differential equations.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Ordinary Differential Equations: Review of Fundamental Concepts
Week 2, 3	1ST Order Linear Differential Equations: Types and Solutions
Week 4,5	Application of 1st Order Linear Differential Equations
Week 6,7	Solution of nth order of LDE using Undetermined Coefficients
Week 8	Solution of Nth order of LDE using Variation of Parameters
Week 9	Solution of Linear Differential Equations with Variable Coefficients/ Cauchy-Euler Method
Week 10,11	Solution of 2nd Order DE with variable coefficients using Power-Series Method
Week 12	Solution of 2nd Order DE with variable coefficients using Tayler-Series Method
Week 13, 14	Solution of 2nd Order DE with variable coefficients using Frobenius Method/ Three Cases
Week 15	Preparation and Help Session for the Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Curriculum and textbook	Yes
Recommended Texts	• Engineering Mathematics", by John Bird, 5th edition, Elsevier Ltd., 2007 • Advanced Engineering Mathematics", by Peter V. O'Neil, 7th Edition, Cengage Learning, 2012	Yes
Websites		None

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Well logging / PE314	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\18	**Scientific Committee Approval Date** .8

9. **Module Objectives**

1. To develop problem solving skills and understanding of well logging through the application of techniques.
2. gives insights into the role of borehole measurements in the search for and evaluation of hydrocarbon reservoirs
3. The module covers a number of measurement methods, and how these are used to determine important rock parameters such as porosity, permeability, water saturation and the rock types along the borehole.
4. This module deals with the fundamental petrophysical concepts and equations. How does the composition of the rock influence the measurements we do and important petrophysical parameters like porosity, permeability and saturation.
5. This is the most important log measurements used in boreholes: Resistivity, natural gamma radiation, neutron porosity, density, photoelectric absorption, acoustic measurements, formation pressures, nuclear magnetic resonance and more.
6. The measurement environment in a borehole and environmental corrections of the data.
7. Find how the measured properties can be used to determine the porosity, permeability, water/hydrocarbon saturation, shale content and rock type.

10. Module Learning Outcomes

8. Know the logging operations and data acquisition for logging while drilling and open hole logging.
9. Know the physics of various logging tools.
10. Describe different rock properties such as porosity, permeability and saturation based on basic definition.
11. Interpret individual and combination of wire-line log data for lithology and fluids
12. Interpret different wire-line log data by cross-plotting
13. Estimate hydrocarbon volume in the reservoir based on reservoir properties
14. Know the main applications and limitations of the different measurements
15. Perform a quick qualitative interpretation to determine possible interest zones
16. The students are expected to understand and to make simple interpretations of the more common log measurements that are made in a borehole. They should be able to determine the main lithologies and estimates of porosity, saturation and permeability, and which fluid types, water, oil or gas, are present in the formations.
17. As a General competence: During group work the students learn to cooperate and to take responsibility for their part of the assignments given. By working with real data from the field, they learn to understand that real data can be uncertain and that one has to use common sense and understanding in order to find good answers to the interpretation problems.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course is a "must have" for anyone working with the subsurface within the petroleum industry. Well logging provides data to answer fundamental questions regarding petrophysical, geological and mechanical properties required to evaluate, develop and produce a field. The course covers
The fundamental rock properties and petrophysical concepts and equations. The following well logging measurements are discussed:
SP log, gamma ray log, Caliper log, conventional resistivity log, induction log; lateral log, macro resistivity log, acoustic/sonic log, density log, photoelectric absorption, neutron porosity, nuclear magnetic resonance, TDT log, CBL log and quick method in (HC) detection.
Further topics include the measurement environment, geometrical considerations in a

borehole, environmental corrections, and the link between the measured parameters and the rock's porosity, permeability, fluid/gas saturation, lithology and clay content. Through exercises and projects the students will learn how to interpret well log data. During group work the students learn to cooperate and to take responsibility for their part of the assignments given. By working with real data from the field, they learn to understand that real data can be uncertain and that one has to use common sense and understanding in order to find good answers to the interpretation problems.

General and qualifying transferable skills (other skills related to employability and personal development).

Teaching/Learning Strategies include:
Direct Instruction in classroom, 4 hrs per week. -1
Classroom Discussions -2
Group Design Projects -3
4- Seminars
Methods of assessment for students.
Compulsory exercises -1
Quarterly exams. -2
Discussions and assignments for project. -3
*The overall assessment for this course is as follows:
Annual pursuit of 30 points from the total mark, which includes assignments, oral examinations and quarterly in addition to presentations.
*70 marks for the final exam

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Introduction
Week 2	Basic rock properties, petrophysics
Week 3	Sp log
Week 4	GR log
Week 5	Caliper log
Week 6	conventional resistivity log, induction log; lateral log, macro resistivity log
Week 7	Porosity log: sonic log, density log, neutron log
Week 8	nuclear magnetic resonance
Week 9	CBL log
Week 10	Porosity applications for lithology and mineralogy indications
Week 11	Porosity determination in “clean” formations –for liquid and lithology
Week 12	Improved mineralogy Identification with cross plots
Week 13	Shaly formation interpretation, and Shaly sand saturation versus Archie equation
Week 14	Well log analysis - Overview of permeability and calculations for sedimentary rocks
Week 15	Quick-Look methods for determining the presence of hydrocarbons
Week 16	Introduction

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Theory, Measurement, and Interpretation of Well Logs " Bassiouni , McGraw-Hill Education	Yes
Recommended Texts	1-Basic well log analysis 2- Open Hole Wireline Logging 3- Wireline Logging operations	Yes
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Reservoir Engineering I / PE302	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\20	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The aim is to provide students with a comprehensive understanding of the properties and behavior of reservoir rocks. This includes studying rock properties such as porosity, permeability, saturation, wettability, capillary pressure, and relative permeability. By gaining a deep understanding of these properties, students will be able to analyze and predict the behavior of fluids within the reservoir, which is essential for making informed decisions about the extraction of oil and gas.

10. Module Learning Outcomes

Overall, the course's learning outcomes equip students with the necessary knowledge, skills, and tools to analyze, characterize, and optimize reservoir performance based on rock properties. They will be well-prepared to tackle real-world reservoir engineering challenges and contribute to the efficient and sustainable extraction of hydrocarbon resources.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The Module of Engineering Analysis I is an important course to understand the fundamentals of differential of differential equations and how it can be solved. It covers various aspects and applications of differential equations. It can help students to learn how to translate the physical problems into differential equations which can be then solved based on the initial and boundary conditions of this DE. This model will also deeply help the students to understand the numerical methods which can be used for simulating the reservoir

General and qualifying transferable skills (other skills related to employability and personal development).

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to reservoir engineering. • Introduction about reservoir rocks and reservoir fluids. • Introduction core analysis and how to obtain representative core material.
Week 2, 3	Porosity • Types and classification of porosity • Parameters that influence porosity • Laboratory measurement of porosity • Averaging of Porosity
Week 4,5	Absolute Permeability • Darcy's Law • Heterogeneity, An Isotropy, And Permeability Tensor • Averaging Of Permeabilities
Week 6,7	Absolute Permeability • Laboratory Measurement of Absolute Permeability • Factors Affecting Absolute Permeability
Week 8	Fluid Saturation • Distribution of fluid saturation in a petroleum reservoir • Reservoir Rock Samples Used for Fluid Saturation Determination. • Assessing the validity of fluid saturation data measured on the plug-end trim for the core plug sample.
Week 9	Fluid Saturation • Special types of fluid saturations. • Saturation averaging. • Factors affecting fluid saturation determination. • Skin factor derivation.
Week 10,11	Wettability • Introduction • Interfacial and surface tension. • Wettability • Fundamental concepts of wettability • Discussion on practical aspects of wettability
Week 12	Wettability • measurement of reservoir rock wettability • Factors affecting wettability. • Relationship between wettability and irreducible water saturation and residual oil saturation • Quiz about absolute Saturation
Week 13, 14	Capillary pressure • Introduction • Excess Pressure Inside Curved Surface

	• The basic mathematical expression of capillary pressure • The rise of liquid in capillaries and the plateau equation • Quiz about wettability
Week 15	Capillary pressure • Dependence of capillary pressure on rock and fluid properties • Capillary pressure and saturation history • Laboratory measurement of capillary pressure. • Converting laboratory capillary pressure data to reservoir conditions • Characteristics of capillary pressure curves

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Helium porosimeter
Week 2	Lab 2: Vacuum Saturation
Week 3	Lab 3: Permeability measurement using Gas.
Week 4	Lab 4: Retort Distillation and Dean-Stark Extraction
Week 5	Lab 5: Mercury Injection Method and Centrifuge Method
Week 6	Lab 6: CONTACT ANGLE MEASUREMENT and Amott Test or USBM Method
Week 7	Lab 7: relative permeability steady state technique and unsteady state technique

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Abhijit Y. Dandekar 2013 "Petroleum Reservoir Rock and Fluid Properties" Tarik Ahmed 2019 "Reservoir Engineering Handbook, 5th edition" Tom Blasingame lectures and lecture note	Yes
Recommended Texts	Professor Tom Blasingame Lectures and contributions (Directory Listing (tamu.edu) Advanced Mathematics for Engineers and Scientists, M.R. Spiegel, Schaum's Series (1971). [The 1st edition, the 1971 text.]	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Drilling Engineering I / PE304	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 90	**(Totally) No. of hours** .7
2024\9\20	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Drilling Engineering Module is designed to provide students with an in-depth understanding of the principles and techniques involved in drilling oil wells. The module covers various aspects of drilling wells, including drilling fluids, including mixing and analysis of rheological properties; drilling hydraulics, drill bit selection, casing design; well cementing; pore pressure and geomechanical considerations in drilling; introduction to directional drilling and deviated wells.

10. Module Learning Outcomes

The purpose of the course is to learn the how to conduct fundamental tasks in well design and drilling operations. The lab specifically deals with the preparation, analysis and properties of fluids used in the drilling of oil and gas wells. Specific course objectives are:

1. Learn the basic components used in drilling and the rig system.
2. Develop casing program, design casing based on pore pressure and fracture gradient and cementing program and understand requirements to protect fresh water. Select casing strings based on burst, collapse, tension.
3. Understand basic methods to select, rig size, BOP ratings, drilling bit, bottom hole assemblies.
4. Maintain well control by calculating mud weight necessary to maintain well control and understand how mud additives can be used to prevent kick and improve hole cleaning.
5. Be introduced to technologies and tools for directional drilling.
6. Know basic fishing tool types and applications.

In addition, the lab are to instruct students on: (1) the primary functions of oilfield drilling fluids; (2) the procedures to measure drilling fluids and cement properties; (3) the common additives used to obtain the desirable properties under various well conditions; (4) the main factors controlling mud selection; and (5) training students on report writing skills.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The Module of Engineering Analysis I is an important course to understand the fundamentals of differential of differential equations and how it can be solved. It covers various aspects and applications of differential equations. It can help students to learn how to translate the physical problems into differential equations which can be then solved based on the initial and boundary conditions of this DE. This model will also deeply help the students to understand the numerical methods which can be used for simulating the reservoir

General and qualifying transferable skills (other skills related to employability and personal development).

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Overview of the Drilling Process, Rigs and Rig systems.
Week 2	Wellbore Elements and Volumes
Week 3	Hydrostatic pressures in the wellbore and subsurface Quiz -
Week 4	Drilling Fluids, I
Week 5	Drilling Fluids, II Quiz
Week 6	Safe Mudweight window - Pore Pressure
Week 7	Safe Mudweight window - Fracture gradients Quiz
Week 8	Casing design, I
Week 9	Casing design, II Quiz
Week 10	Cements
Week 11	Cementing Procedures Quiz
Week 12	Casing design, collapse, burst, tensile, I
Week 13	Casing design, II Quiz
Week 14	Roller Cone and Drag drilling bits
Week 15	PDC drilling bits Quiz
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Well schematics with I-Handbook™, Lab safety

Week 2	Lab 2: Basic drilling fluid properties
Week 3	Lab 3: Sand content
Week 4	Lab 4: Fluid Loss A
Week 5	Lab 5: Fluid Loss B
Week 6	Lab 6: Weighted mud
Week 7	Lab 7: Rig systems

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Applied Drilling Engineering, Textbook Vol. 2 Authors: A.T. Bourgoyne Jr., K.K. Millheim, M.E. Chenevert	Yes
Recommended Texts	Fundamentals of Drilling Engineering. SPE Textbook Series, Vol 12, Authors: R.F. Mitchell and S.Z Miska	Yes
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Eng. Economics II / PE309	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\26	**Scientific Committee Approval Date** .8

9. **Module Objectives**

Basic petroleum and Gas concepts & Oil Economic concepts and conversion standards and transactions - its composition Oil formation theories Types of oil The economic functions of oil. To achieve the required understanding by students of economic concepts associated with the oil industry.

10. Module Learning Outcomes

A This material of study will be increasing the level of knowledge and skills to evaluate the required aspects of economics as part of petroleum and gas industries. The study of analysis the economics tools will helps determine level of investments and risks related with oil-fields. Accuracy and integration of information with practical reality will be one of the most important outputs that reflect the current and future economic outlook in the oil industry or the optimal use of this industry in other supporting industries. Accuracy in presenting examples and the standard of economic analysis and evaluation will be a major part of this study stage.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. Using pdf and ppt format during the course of study will be main tools within different level of exercises and solved problem.

General and qualifying transferable skills (other skills related to employability and personal development).

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. Using pdf and ppt format during the course of study will be main tools within different level of exercises and solved problem.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Overview petroleum and gas Functions of petroleum economics. Importance of petroleum Economics & Characteristics of the oil industry
Week 2	Economic aspects for Oil and gas reserve. organization of petroleum exporting and importing countries
Week 3	International supply and demand of petroleum. classification of petroleum,
Week 4	petroleum pricing, alternative energy, international strategy of energy, Alternative energy, international strategy of energy,
Week 5	Time value of money , Quiz
Week 6	Types of interest rates , Mid Exam
Week 7	Investments Evaluations, NET PRESENT VALUE, NPV, IRR, MIRR etc. & Hurdle and minimum acceptable rates of return profitability Index
Week 8	NPV, IRR, MIRR etc. & Hurdle and minimum acceptable rates of return profitability Index, Distinguishing cash flow from income and profit
Week 9	Sources of revenue and cost & lifecycle costing, Cost classifications & relationship between costs and revenue
Week 10	Break Even Analysis, risk analysis production decline curves,
Week 11	Decision models, game theory, Risk adjustments when valuing petroleum reserve Categories, Sensitivity analysis of engineering projects.
Week 12	Sensitivity analysis of engineering projects, Applications of Sensitivity analysis of engineering projects, Quiz
Week 13	methods of engineering decisions, depreciation methods, depreciation methods
Week 14	taxation, inflation, Bidding process and re-awarded contracts and Future production of oil and gas wells, Bidding process and re-awarded contracts and Future production of oil and gas wells
Week 15	Paybacks methods
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of economic concepts in oil and gas	Yes
Recommended Texts		Yes
Websites	https://www.coursera.org/browse/Economic_petrlomue	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Engineering Analysis II / PE301	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\24	**Scientific Committee Approval Date** .8

9. **Module Objectives**

This module provides students with a solid foundation in mathematical principles and problem-solving techniques necessary for understanding and analyzing complex engineering problems in petroleum engineering. It is intended to expose the students to understand the basic ideas of differential equations (DE) combined with its solutions using Bessel's function, Gamma function, and Laplace Transforms. This module is also aimed to understand how to solve the differential equations using numerical methods. By understanding the fundamentals of numerical methods, the results of numerical methods in solving the DE can be compared with the analytical solution which represents the exact solution. Partial differential equations with its properties and how the initial value problems can be analyzed and solved will be covered in this module. This module is a fundamental module that provides students with the mathematical skills and knowledge necessary for solving engineering problems in the petroleum industry. It covers a range of mathematical concepts and techniques applicable to various engineering disciplines, including petroleum engineering. As overall as, scientists and engineers must know how to model the world in terms of differential equations.

10. Module Learning Outcomes

At the end of this module, students will be able to:

1- Solve the 2nd DE with variable coefficients using different functions and methods such as Bessel's function, and Gamma function.
2- Understand the importance of Laplace Transforms in solving the DEs.
3- Understand the definition of Laplace Transforms, transform of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms. Inverse Laplace Transforms will also be applied to reach the solution of differential equations.
4- Understand the basic functioning of numerical methods including Basic and Modified Euler methods and compare that with the analytical exact solution.

Understand the basic of partial differential equations and how it can be used to solve the initial-value problems.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The Module of Engineering Analysis II is Solve the 2nd DE with variable coefficients using different functions and methods such as Bessel's function, and Gamma function. Understand the importance of Laplace Transforms in solving the DEs. Understand the definition of Laplace Transforms, transform of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms. Inverse Laplace Transforms will also be applied to reach the solution of differential equations. Understand the basic functioning of numerical methods including Basic and Modified Euler methods and compare that with the analytical exact solution. Understand the basic of partial differential equations and how it can be used to solve the initial-value problems.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the discussion in class and quick quizzes. This will be achieved through classes, interactive tutorials and by considering a simple type of strategy involving some of examples related to petroleum industry that have been solved and understood using differential equations.

* Lectures are conducted by face-to-face education in the classroom, two hours per week,

and students' technical reports.
* Conducting dialogues and discussions with the request.

Methods of assessment for students.
* Quarterly exams.
* Discussions and assignments.
*The overall assessment for this course is as follows:
Annual pursuit of 30 points from the total mark, which includes quizzes, assignments in addition to presentation.
*70 marks for the final exam

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Ordinary Differential Equations and Partial Differential Equations.
Week 2, 3	Introduction to the Laplace Transforms
Week 4,5	Understanding the transformation of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms.
Week 6,7	Learn students how to apply the Inverse Laplace Transforms characteristics by which the differential equation can be solved.
Week 8	Understand the definition of Laplace Transforms, transform of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms. Inverse Laplace Transforms will also be applied to reach the solution of differential equations.
Week 9	Applications of numerical methods to solve the differential equations and perform a comparison between the numerical methods and exact solutions.
Week 10,11	Fourier Series
Week 12	Fourier Sine and cosine series.
Week 13, 14	Solution of the Diffusion equation.
Week 15	Solution of the wave equation.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• Curriculum and textbook	Yes

Recommended Texts	• Engineering Mathematics", by John Bird, 5th edition, Elsevier Ltd., 2007 • Advanced Engineering Mathematics", by Peter V. O'Neil, 7th Edition, Cengage Learning, 2012	Yes
Websites		None

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Geophysics / PE313	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\18	**Scientific Committee Approval Date** .8
9. **Module Objectives**	
Teaching the principle of geophysical exploration	

10. Module Learning Outcomes

Teaching the students, the main physical principles the used in petroleum exploration. And the equipment and techniques which developed for this purpose.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

Geophysical maps, Geo sections.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

* Lectures are conducted by face-to-face education in the classroom, two hours per week, and students' technical reports.
* Conducting dialogues and discussions with the request.

Methods of assessment for students.

* Quarterly exams.
* Discussions and assignments.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Define geophysics. What are the main physical properties of the rocks?
Week 2	The main physical laws used in geophysical exploration; Snell, Newton, and wave propagation.

Week 3	Gravity Method
Week 4	Application and Problems about gravity method.
Week 5	Analysis the gravity geophysical maps for petroleum traps.
Week 6	Magnetic Method.
Week 7	Application and examples of magnetic method.
Week 8	Examples of basement rock analysis by magnetic surveying.
Week 9	The main equipment and methods
Week 10	Refraction Methods
Week 11	Examples and problems about refraction interpretation
Week 12	Analysis the distribution of subsurface structures using refraction waves
Week 13	Reflection Method, the 2D, 3D and 4D seismic surveying
Week 14	Examples of reflection sections Interpretation
Week 15	Project Discussions

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Geophysics for Petroleum Engineers,** Fred	Yes

	Aminzadeh, Shivaji N. Dasgupta	
Recommended Texts	On significant application of geophysical methods, Mansour Al Garni, 2018	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Reservoir Eng. II / PE303	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 90	**(Totally) No. of hours** .7
2024\9\22	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The aim of the reservoir engineering course is to provide students with a comprehensive understanding of key concepts in petroleum reservoir engineering. This course focuses on fluid properties, phase behavior, PVT (Pressure-Volume-Temperature) sampling, compositional analysis of reservoir fluids, PVT analysis, and properties of formation waters. By the end of the course, students will have a solid foundation in these areas, enabling them to accurately characterize reservoirs, predict fluid behavior, and make informed decisions for efficient reservoir management.

10. Module Learning Outcomes

Students should have a comprehensive understanding of the behavior and characteristics of fluids in petroleum reservoirs. They should be able to apply this knowledge to analyze and interpret PVT data, conduct compositional analysis of reservoir fluids, and make predictions about reservoir performance. Additionally, students should understand the principles of vapor-liquid equilibria and their application in reservoir engineering, as well as the impact of formation waters on reservoir performance. This knowledge will equip them with the skills necessary to make informed decisions about the development and management of oil and gas fields.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The aim of the reservoir engineering course is to provide students with a comprehensive understanding of key concepts in petroleum reservoir engineering. This course focuses on fluid properties, phase behavior, PVT (Pressure-Volume-Temperature) sampling, compositional analysis of reservoir fluids, PVT analysis, and properties of formation waters. By the end of the course, students will have a solid foundation in these areas, enabling them to accurately characterize reservoirs, predict fluid behavior, and make informed decisions for efficient reservoir management.

General and qualifying transferable skills (other skills related to employability and personal development).

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

* Lectures are conducted by face-to-face education in the classroom, two hours per week, and students' technical reports.
* Conducting dialogues and discussions with the request.

Methods of assessment for students.

* Quarterly exams.
* Discussions and assignments.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Petroleum Reservoir Fluids • Introduction • Chemistry of petroleum • Solid components of petroleum • Classification of reservoir gases and oils • Five reservoir fluids • Other hydrocarbon fluids of interest • Formation waters
Week 2, 3	Introduction to Phase Behavior • Introduction • Definition of terms used in phase behavior. • Phase behavior of a pure component • Phase behavior of two-component • Phase behavior of multicomponent mixtures • Construction of phase envelopes
Week 4,5	Phase Behavior of Petroleum Reservoir Fluids • Introduction • Preamble to the phase behavior of petroleum reservoir fluids • Brief description of the plus fraction • Classification and identification of fluid type • Black oils • Volatile oils • Gas condensates • Wet gases • Dry gases • Behavior of petroleum reservoir fluids in the two-phase region • Saturated hydrocarbon reservoirs • Production trends of five reservoir fluids
Week 6,7	PVT sampling • Introduction • Practical considerations of fluid sampling • Methods of fluid sampling • Evaluating the representativity of fluid samples: quality checks • Factors affecting sample representativity
Week 8	Compositional Analysis of Petroleum Reservoir Fluids • Introduction • Strategy of compositional analysis • Characteristics of reservoir fluid composition • Gas chromatography • True boiling-point distillation • Characterization of pseudo fractions and residue

Week 9	PVT Analysis and Reservoir Fluid Properties • Introduction • Properties of gases and liquid • Properties of Ideal gas • Properties of real gas • Properties of mixture of gases
Week 10,11	PVT Analysis and Reservoir Fluid Properties • Properties of black oil and volatile oil
Week 12	PVT Analysis and Reservoir Fluid Properties • PVT Laboratory tests • PVT Equipment • Constant Composition Expansion • Differential Liberation • Constant Volume Depletion • Separator Tests
Week 13, 14	PVT Analysis and Reservoir Fluid Properties • Adjustment of Black Oil Laboratory Data • Other sources of obtaining the properties of petroleum reservoir fluids
Week 15	Vapor–Liquid Equilibria • INTRODUCTION • IDEAL MIXTURES • EMPIRICAL CORRELATIONS FOR CALCULATING EQUILIBRIUM RATIOS FOR REAL SOLUTIONS

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Lab 1: Construction of Phase Envelopes
Week 2	Lab 2: Gas Chromatography
Week 3	Lab 3: True Boiling-Point Distillation
Week 4	Lab 4: Constant Composition Expansion
Week 5	Lab 5: Differential Liberation
Week 6	Lab 6: Constant Volume Depletion
Week 7	Lab 7: Separator Tests

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Abhijit Y. Dandekar 2013 “Petroleum Reservoir Rock and Fluid Properties” Tarik Ahmed 2019 “Reservoir Engineering Handbook, 5th edition” Tom Blasingame lectures and lecture note	Yes
Recommended Texts	Professor Tom Blasingame Lectures and contributions (Directory Listing (tamu.edu) Advanced Mathematics for Engineers and Scientists, M.R. Spiegel, Schaum's Series (1971). [The 1st edition, the 1971 text.]	Yes
Websites		None

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Mechanical Earth Modeling / PE311	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\18	**Scientific Committee Approval Date** .8

9. **Module Objectives**

Teaching the principle of Mechanical Earth Modeling

10. Module Learning Outcomes

Teaching the students, the main Mechanical Earth Modeling principles the used in petroleum exploration. And the equipment and techniques which developed for this purpose.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

Geophysical maps, Geo sections.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

* Lectures are conducted by face-to-face education in the classroom, two hours per week, and students' technical reports.
* Conducting dialogues and discussions with the request.

Methods of assessment for students.

* Quarterly exams.
* Discussions and assignments.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Define Mechanical Earth Modeling. What are the main physical properties of the rocks?
Week 2	The main physical laws used in geophysical exploration; Snell, Newton, and wave propagation.

Week 3	Gravity Method
Week 4	Application and Problems about gravity method.
Week 5	Analysis the gravity geophysical maps for petroleum traps.
Week 6	Magnetic Method.
Week 7	Application and examples of magnetic method.
Week 8	Examples of basement rock analysis by magnetic surveying.
Week 9	The main equipment and methods
Week 10	Refraction Methods
Week 11	Examples and problems about refraction interpretation
Week 12	Analysis the distribution of subsurface structures using refraction waves
Week 13	Reflection Method, the 2D, 3D and 4D seismic surveying
Week 14	Examples of reflection sections Interpretation
Week 15	Project Discussions

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Geophysics for Petroleum Engineers,** Fred	Yes

	Aminzadeh, Shivaji N. Dasgupta	
Recommended Texts	On significant application of geophysical methods, Mansour Al Garni, 2018	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Production Eng. II / PE307	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\15	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The aim of the production engineering module in the third grade of the petroleum engineering department is to provide students with a comprehensive understanding of the principles and practices involved in the production of oil and gas. The module focuses on developing students' knowledge and skills related to the design, optimization, and management of oil and gas production systems.

Stimulation: Students will gain knowledge of well stimulation methods. This includes understanding different types of well completions, hydraulic fracturing, and acidizing.

Artificial Lift Systems: Students will be introduced to artificial lift methods used to enhance the production rate of oil and gas wells. They will learn about different types of artificial lift systems, including rod pumping, gas lift, and electrical submersible pumps.

Throughout the module, students will also develop practical skills through hands-on exercises, case studies, and simulation exercises. The aim is to equip students with the necessary knowledge and skills to contribute effectively to the production operations in the petroleum industry.

10. Module Learning Outcomes

Understand the fundamental principles of production engineering: Students should be able to demonstrate a comprehensive understanding of the basic principles and concepts of production engineering, including reservoir characteristics, fluid flow, well completion, and artificial lift methods.
Analyze and interpret production data: Students should be able to collect and analyze production data from oil and gas wells, interpret the results, and identify potential production issues or opportunities for optimization.
Design well completions: Students should be able to design and optimize well completions, considering factors such as reservoir characteristics, wellbore stability, and production objectives. They should also be able to evaluate different completion techniques and select the most appropriate ones for specific reservoir conditions.
Evaluate and select artificial lift methods: Students should be able to assess different artificial lift methods, including gas lift, sucker rod pumps, electric submersible pumps (ESPs), and hydraulic pumps. They should be able to analyze well performance and reservoir characteristics to select the most suitable artificial lift method for maximizing production.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

Introduction to Production Engineering: Overview of production engineering in the petroleum industry, its importance, and its role in maximizing hydrocarbon recovery.
Reservoir Fluid Properties: Understanding the behavior of reservoir fluids, including oil, gas, and water, their physical properties, phase behavior, and their impact on production.
Well Performance: Analyzing the performance of oil and gas wells, studying inflow and outflow performance relationships, wellbore flow, and pressure behavior.
Well Completion: Techniques and technologies for completing and optimizing oil and gas wells, including completion design, perforation strategies, and well stimulation.
Artificial Lift Systems: Introduction to artificial lift methods, such as rod pumping, gas lift, and electric submersible pumps (ESP), and their application in enhancing production from oil and gas wells.
Wellbore Hydraulics: Understanding the fluid flow behavior in wellbores, pressure drop calculations, and optimization of production rates through proper design and selection of tubing and flow control equipment.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

* Lectures are conducted by face-to-face education in the classroom, two hours per week, and students' technical reports.
* Conducting dialogues and discussions with the request.

Methods of assessment for students.

* Quarterly exams.
* Discussions and assignments.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Review of production engineering 1 and total production system.
Week 2	Inflow performance relationship (IPR): introduction, definition and explain the different cases
Week 3	Straight line IPR and the requirement to draw the IPR straight line
Week 4	Two phase IPR and the requirement to draw the IPR curve.
Week 5	Using Vogel's chart to construct IPR.
Week 6	Using standing chart to construct IPR.
Week 7	Application to use Vogel's, and standing charts to construct IPR.
Week 8	Construct combination IPR, by different methods.
Week 9	Vertical flow performance (VFP): introduction, definition and explain the different cases. Define the working chart, using working chart.
Week 10	Practice to use the working charts
Week 11	Artificial lift: methods, requirement for each method
Week 12	Gas lift, design and calculation.
Week 13	Electrical submersible pump, ESP, design and calculation.
Week 14	Final Project • Completion of a production engineering 1 project.
Week 15	Exam preparation and review
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	Yes
Websites	None https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Petroleum Drilling Eng. II / PE305	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 90	**(Totally) No. of hours** .7
2024\9\15	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Drilling Engineering Module is designed to provide students with an in-depth understanding of the principles and techniques involved in drilling oil wells. The module covers various aspects of drilling wells, including drilling fluids, including mixing and analysis of rheological properties; drilling hydraulics, drill bit selection, casing design; well cementing; pore pressure and geomechanical considerations in drilling; introduction to directional drilling and deviated wells.

10. Module Learning Outcomes

The purpose of the course is to learn the how to conduct fundamental tasks in well design and drilling operations. The lab specifically deals with the preparation, analysis and properties of fluids used in the drilling of oil and gas wells. Specific course objectives are:

1. Learn the basic components used in drilling and the rig system.
2. Develop casing program, design casing based on pore pressure and fracture gradient and cementing program and understand requirements to protect fresh water. Select casing strings based on burst, collapse, tension.
3. Understand basic methods to select, rig size, BOP ratings, drilling bit, bottom hole assemblies.
4. Maintain well control by calculating mud weight necessary to maintain well control and understand how mud additives can be used to prevent kick and improve hole cleaning.
5. Be introduced to technologies and tools for directional drilling.
6. Know basic fishing tool types and applications.

In addition, the lab are to instruct students on: (1) the primary functions of oilfield drilling fluids; (2) the procedures to measure drilling fluids and cement properties; (3) the common additives used to obtain the desirable properties under various well conditions; (4) the main factors controlling mud selection; and (5) training students on report writing skills.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The purpose of the course is to learn the how to conduct fundamental tasks in well design and drilling operations. The lab specifically deals with the preparation, analysis and properties of fluids used in the drilling of oil and gas wells. Specific course objectives.

General and qualifying transferable skills (other skills related to employability and personal development).

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive

tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

* Lectures are conducted by face-to-face education in the classroom, two hours per week, and students' technical reports.
* Conducting dialogues and discussions with the request.

Methods of assessment for students.
* Quarterly exams.
* Discussions and assignments.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Wellbore Stability & Drilling Problems, I
Week 2, 3	Wellbore Stability & Drilling Problems, II Quiz
Week 4,5	Drilling Cost Analysis, II
Week 6,7	Drilling Cost Analysis, II Quiz
Week 8	Drill stem design, I
Week 9	Drill stem design, I
Week 10,11	Drill stem design, III Quiz
Week 12	Drilling Hydraulics
Week 13, 14	Drilling Hydraulics - Pressure drop calculations Quiz
Week 15	Well Control – Kick, I

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

Week	Material Covered
Week 1	Lab 1: Rig systems
Week 2	Lab 2: Drilling bits A

Week 3	Lab 3: Drilling bits B
Week 4	Lab 4: Kick
Week 5	Lab 5: Cement design
Week 6	Lab 6: Lab demonstration
Week 7	Lab 7: Well design

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Applied Drilling Engineering, Textbook Vol. 2 Authors: A.T. Bourgoyne Jr., K.K. Millheim, M.E. Chenevert	Yes
Recommended Texts	Fundamentals of Drilling Engineering. SPE Textbook Series, Vol 12, Authors: R.F. Mitchell and S.Z Miska	Yes
Websites	None	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Reservoir Management / PE412	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\10\1	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Reservoir Simulation Module is designed to provide students with general understanding of the principles and basic equations involved in reservoir simulation, the numerical principles of finite difference, the data requirements for conducting a reservoir simulation study, the current simulation study approaches, the simulation Steps. The module involves modeling a synthetic reservoir model using a well-known reservoir simulation software. Students will run and analyze many reservoir models.

10. Module Learning Outcomes

The Reservoir management module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess dynamic reservoir models, Solve the governing partial differential equations using finite difference methods, Use a reservoir simulator for studying the reservoir performance in response to different development strategies, Develop static and dynamic model of the reservoir.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course provides an in-depth understanding of reservoir management principles and practices for optimizing hydrocarbon recovery. Topics include reservoir characterization, performance monitoring, and the integration of geological, geophysical, and engineering data for decision-making. Students will explore material balance analysis, reservoir simulation, decline curve analysis, and production optimization techniques. The course also covers enhanced oil recovery (EOR) methods, risk assessment, and economic evaluation of reservoir projects. Emphasis is placed on developing strategies for maximizing recovery while ensuring sustainable resource management. Case studies and real-world applications are used to illustrate effective reservoir management practices in the petroleum industry.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is by explaining the theoretical aspects of the reservoir simulation course with all the related mathematical concepts and the numerical analysis, while at the same time the students will be divided into research groups to build reservoir simulation models, run the dynamic models, encourage students to analysis the results and the reservoir limitation, deliver two reports for the models that they ran. Building numerical models as group of students would encourage them to develop a critical thinking and expand their understanding via working in groups, as they would discuss their models as peers. Also they would discuss the models with their teachers. Then, students would deliver presentations for these reports where they will be discussed about their analyses of the reservoir models. .

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Reservoir management • What is a reservoir management? • Reservoir Life cycle • Objectives of Reservoir Management • Follow Up questions • Reservoir Management Teamwork • Integration of Geoscience & Engineering • Integration Exploration and Development Technology • Reservoir Management Process • Setting Goals • Reservoir characteristics
Week 2	Permeability upscaling of Single-phase flow • Introduction • Upscaling Porosity and Water Saturation • Averaging Permeability • Flow Parallel to Uniform Layers • Flow Across Uniform Layers • Flow through Correlated Random Fields • Additional Averaging Methods • Summary of Permeability Averaging
Week 3	Permeability upscaling of Single-phase flow II • Numerical Methods • Recap on Flow Simulation • Boundary Conditions • Upscaling Errors • Correlated Random Fields • Evaluating the Accuracy of Upscaling • Upscaling of a Sand/Shale Model • Summary of Single-Phase Upscaling
Week 4	Permeability upscaling of Two-phase flow • Introduction • Applying Single-Phase Upscaling to a Two-Phase Problem • Improving Single-Phase Upscaling • Non-Uniform Upscaling • Well Drive Upscaling • Introduction to Two-Phase Upscaling • Steady-State Methods • Capillary-Equilibrium
Week 5	Permeability upscaling of Two-phase flow: Dynamic Methods • Introduction • The Kyte and Berry Method • Discussion on Numerical Dispersion • Disadvantages of the Kyte and Berry Method • Alternative Methods

	• Example of the PVW Method • Summary of Two-Phase Flow
Week 6	Additional Topics of upscaling • Upscaling at Wells • Permeability Tensors • Flow Through Tilted Layers • Simulation with Full Permeability Tensors • Small-Scale Heterogeneity
Week 7	Geopseudo upscaling Method • The Geopseudo Method • Capillary-Dominated Flow • Geopseudo Example • When to use the Geopseudo Method • Uncertainty and Upscaling • Upscaling Summary
Week 8	Geostatistics principles for Simulation • Introduction • Deterministic permeability models • Stochastic permeability models
Week 9	Geostatistics principles for Simulation II • Gaussian models • Kriging method for permeability and porosity distribution • Cokriging method for permeability and porosity distribution
Week 10	Modelling single-phase flow at the pore-scale - a brief overview • Deviations from Darcy's Law • Empirical Models • Probabilistic Models • Capillary Bundle Models • First Principles Derivation of Carmen-Kozeny Model • Network Modelling Techniques
Week 11	Modelling multiphase flow at the pore-scale • Capillary Pressure ― What Does it Mean and When is it Important? • Steady-and Unsteady-State Flow • Drainage at the Pore-Scale • Imbibition at the Pore-Scale • The Pore Doublet Model • Introduction to Percolation Theory • Network Modelling of Multiphase Flow
Week 12	Empirical and theoretical approaches to generating petrophysical properties for reservoir simulation • Methods for Generating Capillary Pressure Curves and Pore Size Distributions • Methods for Generating Relative Permeabilities • Hysteresis Phenomena
Week 13	Wettability - concepts and applications • Introductory Concepts • Wettability Measurement and Classification • The Impact of Wettability on Petrophysical Properties • Network Modelling of Wettability Effects
Week 14	Closing remarks for reservoir case study • Open discussion regard to modeling work, outcome results and conclusion given by students
Week 15	Final Project and Exam Preparation • Completion of Reservoir management Simulation reports

	• Exam preparation and review

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Eclipse; pre-and post-processing software Introduce Eclipse data file for a case study model
Week 2	Lab 2: Modifying the data file model to change the wells control mode and the model running time
Week 3	Lab 3: investigating the effect of permeability variation in layered model
Week 4	Lab 4: Sensitivity analysis on flow behavior for two phase models
Week 5	Lab 5: effect of gravity and capillary pressure in layered models
Week 6	Lab 6: vertical connectivity effect
Week 7	Lab 7: grid coarsening and refining effect

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Secondary Oil Recovery / PE408	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\28	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Secondary Oil Recovery Module is designed to provide students with an in-depth understanding of the principles and techniques involved in testing oil wells. The module covers various aspects of well testing, including planning, design, execution, and interpretation of tests. Students will learn about the equipment and methods used in well testing, as well as the analysis of data obtained from these tests. The module also emphasizes the importance of well testing in reservoir characterization, production optimization, and reservoir management.

10. Module Learning Outcomes

The Secondary Oil Recovery module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess reservoir potential, optimize well performance, and make informed decisions regarding production strategies. Well test analysis helps determine reservoir parameters, evaluate well productivity, identify formation damage, and validate reservoir models. The module also emphasizes the significance of data quality, accuracy, and integrity in well testing, ensuring reliable results for reservoir characterization and production forecasting.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course covers the principles and methods of secondary oil recovery, focusing on water flooding and gas injection techniques. Key topics include reservoir displacement mechanisms, fluid properties, relative permeability, and capillary pressure. The course also examines sweep efficiency, mobility control, and the design and optimization of secondary recovery projects. Practical applications involve reservoir simulation and performance evaluation to enhance oil recovery. Environmental and economic considerations related to secondary recovery processes are also discussed.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Reservoir rock properties Main reservoir rock properties Geological classification of porosity, Methods used for measuring porosity. Methods used for averaging permeability. Methods used to measure Wettability (Amott Index).
Week 2	Introduction to Secondary oil recovery methods Oil Recovery Stages, Selection the Best EOR Methods (Screening Criteria). Water Injection (Technical factors and Economic factors). The goal of water flooding, factors to consider in water flooding)
Week 3	Water Flooding Candidate for water flooding, Advantage and dis advantage of water flooding. Sources and Treatment of Injected Water, Typical Water Flood Project. Optimum time to water flood.
Week 4	Buckley and Leverett Theory Overall recovery efficiency (Displacement, vertical and areal sweep efficacies). Fractional flow equation (Derivation, applications and examples). Effect of Water and Oil Viscosities, effect of Dip Angle and Injection Rate. Derivation the relationship between water cut and water oil ratio.
Week 5	Factors effecting on fractional flow curve Effect of Water and Oil Viscosities, effect of Dip Angle and Injection Rate. Derivation the relationship between water cut and water oil ratio. quiz
Week 6	Frontal Advance Equation Derivation of distance vs time relationship. Water saturation profile during water flooding. quiz
Week 7	Oil Recovery Calculations Data preparation Recovery performance to breakthrough Recovery performance after breakthrough
Week 8	Reservoir Heterogeneity Dykstra-Parson's method Vertical Heterogeneity Dykstra-Parson's permeability variation V (Tutorial example). Lorenz coefficient L
Week 9	Methods of predicting recovery performance for layered reservoirs. Simplified Dykstra–Parsons Method Modified Dykstra–Parsons Method
Week 10	Calculation Vertical Sweep Efficiency. Vertical Sweep Efficiency (Stiles' Method)

	Vertical Sweep Efficiency (The Dykstra-Parsons Method) Quiz.
Week 11	Calculation Areal Sweep Efficiency Factors affecting Areal Sweep Efficiency. Areal Sweep Efficiency (Before, At and After Breakthrough). Fluid Injectivity
Week 12	Selection of flooding patterns Irregular Injection Patterns and Regular injection patterns Peripheral injection patterns and Crestal and basal injection patterns
Week 13	Exams Mid- Term exam.
Week 14	Gas Injection The Displacement of Oil by Gas, with Gravitational Segregation The Displacement of Oil by Gas, without Gravitational Segregation
Week 15	Final Project and Exam Preparation Completion of a secondary oil recovery project Exam preparation and review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Tarek Ahmed PhD PE - Reservoir Engineering Handbook, Third Edition (2006, Gulf Professional Publishing	
Recommended Texts		
Websites	https://petrowiki.spe.org/Waterflooding	

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Directional Drilling Engineering / PE404	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\20	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Directional Drilling Module is designed to build a firm foundation in the principles and practices of directional drilling, calculations, and planning for directional and horizontal wells. Specific problems associated with directional/horizontal drilling such as torque, drag, hole cleaning, and drill string component design are included.
students will receive instruction on planning and evaluating horizontal wells based on the objectives of the horizontal well. The basic applications and techniques for multi-lateral wells are covered in the course. Additionally, they will become familiar with the tools and techniques used in directional drilling such as survey instruments, bottom hole assemblies, motors, steerable motors, and steerable rotary systems. students will be able to predict wellbore path based on historical data and determine the requirements to hit the target.

10. Module Learning Outcomes

Having worked through this module the student will be able to:

General:

- List and describe the applications of directional drilling techniques
- Describe the constraints on the trajectory of a deviated well.
- Define the terms: KOP; BUR; and tangent section of the well trajectory.

Trajectory Design:

- Calculate the: along hole depth, TVD and departure of the end of the build up section and the along hole depth of the bottom of the hole in a build and hold well profile.

Survey Calculations:

- Describe the mathematical models used to describe and calculate the well trajectory: Tangential; balanced tangential; average angle; radius of curvature; and minimum curvature.
- Describe the procedure used to calculate and plot survey results.
- Calculate the northing, easting, TVD, vertical section and dogleg severity of a survey station using the average angle method.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course covers the principles and techniques of directional drilling, including well planning, trajectory design, and bottom hole assembly (BHA) configuration. Topics include drilling fluids, torque and drag analysis, surveying methods, rotary steerable systems, and advanced technologies for horizontal and multilateral wells, with a focus on real-world applications.

General and qualifying transferable skills (other skills related to employability and personal development).

The Applied Reservoir Engineering course for fourth-year students in the Petroleum Engineering department focuses on providing students with the knowledge and skills necessary to analyze and optimize hydrocarbon reservoirs. Here are some strategies that can help students excel in the course:

1. Understand Reservoir Fundamentals: Start by developing a strong foundation in reservoir engineering concepts. This includes understanding key terminology, reservoir properties,

fluid flow mechanisms, and reservoir characterization techniques.

2. Master Reservoir Simulation: Reservoir simulation is a critical tool in reservoir engineering.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Directional drilling Overview the applications of directional drilling. Principle terminology in directional drilling. Types and applications of different directional well profiles.
Week 2	Directional well planning Reference Systems and Coordinates • Planning the well trajectory. •
Week 3	Surveying calculations -1 Tangential method. • Balance Tangential method. • Average angle method. •
Week 4	Surveying calculations-2 Radius of curvature method. Minimum curvature method.
Week 5	Directional wells Design-1 Type-1 (build& hold)- well profile design and calculations. • Quiz •
Week 6	Directional wells Design-2 Type-2 (S-shape) well-profile design and calculations •
Week 7	Directional surveying tools Inclination surveying tools • Magnetic Single shot (MSS • Magnetic Multi-shot (EMS) • Gyroscope(Conventional, North seeking and inertial) •
Week 8	Directional well deflection- tools-1 Down hole motors (Turbines, Positive displacement motors (PDM) • whipstocks • jetting action •
Week 9	Directional well deflection tools-2 Down hole motors and bent sub • Steerable positive displacement motors • Rotary steerable system (RSS) •
Week 10	Bottom hole Assemble (BHA) design for directional wells Pendulum assembly •

	Packed bottom hole assembly • Rotary build assembly • Rotary drop assembly • Steerable assembly • Mud motor and bent sub assembly •
Week 11	Horizontal and multi-lateral wells Types and applications of horizontal and multi-lateral wells • Profiles of horizontal wells . •
Week 12	Well profile and Design considerations of horizontal wells Design and calculations of single-build horizontal well • Design and calculations of Double-build horizontal well •
Week 13	Torque and drag while directional drilling Calculation of Torque while rotating of bottom. • Calculation of Torque while rotating on bottom. • Calculation of drag while drilling and tripping. •
Week 14	Hole cleaning considerations in deviated and horizontal wells Discus and analysis the effect of hole cleaning on horizontal drilling performance •
Week 15	Final Project and Exam Preparation Completion of a directional drilling project. • Exam preparation and review •

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	*HORIZONTAL AND DIRECTIONAL DRILLING* by Richard S. Carden and Robert D. Grace	
Recommended Texts	Well engineering and construction by H. Rabia Applied drilling Engineering by Adam T. Bourgoyne	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Natural Gas Engineering / PE410	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\28	**Scientific Committee Approval Date** .8

9. **Module Objectives**

This course aims to provide fourth-stage petroleum engineering students with a comprehensive understanding of natural gas exploration, production, processing, and transportation. Students will learn about the physical and chemical properties of natural gas, reservoir behavior, and the principles of gas flow in porous media and pipelines. The course covers gas separation, dehydration, sweetening, and liquefaction processes. Emphasis is placed on gas field development, production optimization, and environmental considerations. By the end of the course, students will be equipped to design, analyze, and optimize natural gas operations, ensuring efficient and sustainable resource management.

10. Module Learning Outcomes

By the end of this course, fourth-stage petroleum engineering students will understand the fundamental properties, behavior, and processing of natural gas. They will be able to analyze gas reservoirs, apply flow equations, and evaluate production techniques. Students will gain knowledge of gas separation, dehydration, compression, and transportation processes. Additionally, they will develop skills in designing and optimizing natural gas processing facilities while considering safety and environmental regulations. The course will also enhance problem-solving abilities, enabling students to interpret data and make informed decisions in natural gas exploration, production, and processing operations.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course provides an in-depth understanding of natural gas properties, behavior, and processing techniques. Key topics include the composition and classification of natural gas, phase behavior, and thermodynamic properties. The course covers natural gas exploration, production, and transportation methods, including pipeline design and gas compression. Gas reservoir engineering principles, such as material balance, flow in porous media, and reservoir simulation, are discussed. Additionally, gas processing techniques like dehydration, sweetening, and liquefaction (LNG) are explored. Environmental impacts, safety regulations, and economic aspects of natural gas production and utilization are also included.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction: What is Natural gas Reservoir Utilization of natural gas
Week 2	Natural gas industry Natural gas resources.
Week 3	Properties of natural gas.
Week 4	Properties of natural gas.
Week 5	Natural gas composition and phase behavior Quiz
Week 6	Natural gas exploration , Drilling and well completion
Week 7	Midterm Exam
Week 8	Natural gas well deliverability
Week 9	Natural gas production: Darcy and Non-Darcy flow in porous media
Week 10	Natural gas deliverability. Quiz.
Week 11	Natural Gas Processing: Separation of gas liquids, Dehydration
Week 12	Natural gas Sweeting-Acid gases removal testing.
Week 13	Natural gas transportation: pipelines and compressed natural gas..
Week 14	Liquefied natural gas (LNG).
Week 15	Natural gas supply, Alternative energy source, and the environment. Exam preparation and review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Xiuli Wang and Michael Economides, Advanced Natural Gas Engineering, Copyright © 2009 by Gulf Publishing Company, Houston, Texas. n	
Recommended Texts	H. Dale Beggs-Gas Production Operations -Oil & Gas Consultants International (2002)..	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Reservoir Management / PE401	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\10\1	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Reservoir Simulation Module is designed to provide students with general understanding of the principles and basic equations involved in reservoir simulation, the numerical principles of finite difference, the data requirements for conducting a reservoir simulation study, the current simulation study approaches, the simulation Steps. The module involves modeling a synthetic reservoir model using a well-known reservoir simulation software. Students will run and analyze many reservoir models.

10. Module Learning Outcomes

The Reservoir simulation module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess dynamic reservoir models, Solve the governing partial differential equations using finite difference methods, Use a reservoir simulator for studying the reservoir performance in response to different development strategies, Develop static and dynamic model of the reservoir.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course provides an in-depth understanding of reservoir management principles and practices for optimizing hydrocarbon recovery. Topics include reservoir characterization, performance monitoring, and the integration of geological, geophysical, and engineering data for decision-making. Students will explore material balance analysis, reservoir simulation, decline curve analysis, and production optimization techniques. The course also covers enhanced oil recovery (EOR) methods, risk assessment, and economic evaluation of reservoir projects. Emphasis is placed on developing strategies for maximizing recovery while ensuring sustainable resource management. Case studies and real-world applications are used to illustrate effective reservoir management practices in the petroleum industry.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is by explaining the theoretical aspects of the reservoir simulation course with all the related mathematical concepts and the numerical analysis, while at the same time the students will be divided into research groups to build reservoir simulation models, run the dynamic models, encourage students to analysis the results and the reservoir limitation, deliver two reports for the models that they ran. Building numerical models as group of students would encourage them to develop a critical thinking and expand their understanding via working in groups, as they would discuss their models as peers. Also they would discuss the models with their teachers. Then, students would deliver presentations for these reports where they will be discussed about their analyses of the reservoir models. .

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Reservoir simulation What is a simulation model? A simple example of a simulation model What is a reservoir simulation model? The task of reservoir simulation What are we trying to do and how complex must our model be?
Week 2	Field Applications of Reservoir Simulation Discussion of Changes in Reservoir Simulation; 1970s – 2000 The Treatment of Uncertainty in Reservoir Simulation Study example of a reservoir simulation Types of reservoir simulation model
Week 3	Reservoir Simulation Model Set-Up Setting up a reservoir simulation model Data input and output Example input data file Reservoir System to be Modelled ECLIPSE Syntax Model Dimensions
Week 4	Reservoir Simulation Model Set-Up: II Grid and Rock Properties Fluid Properties Initial Conditions Output Requirements Production Schedule Running eclipse and file name Conventions Running ECLIPSE on a PC File Name Conventions
Week 5	Gridding And Well Modelling: Gridding Introduction Gridding in Reservoir Simulation Accuracy of Simulations and Numerical Dispersion Grid Orientation Effects Local Grid Refinement (LGR) Distorted Grids and Corner Point Geometry Issues in Choosing a Reservoir Simulation Grid Streamline Simulation
Week 6	Gridding And Well Modelling: Block to block flow calculations The calculation of block to block flows in reservoir simulators Introduction to Averaging of Block to Block Flows Averaging of the Two-Phase Mobility Term
Week 7	Gridding And Well Modelling: Wells in Reservoir Simulation Basic Idea of a Well Model Well Models for Single and Two-Phase Flow Well Modelling in a Multi-Layer System Modelling Horizontal Wells

Week 8	The Flow Equations: single phase The single phase pressure equation Extension of Single Phase Pressure Equation to 2D & 3D
Week 9	The Flow Equations: two phase flow The two-phase flow equations Review of Two-Phase Flow Concepts Derivation of the Two-Phase Conservation Equations. The Two-Phase Pressure Equation Simplified Two-Phase Pressure and Saturation Equations
Week 10	Numerical Methods in Reservoir Simulation Introduction Review of finite differences Application of finite differences to partial differential equations (PDEs) Forward, Backward, and Central Difference Formulas for the First Derivative Finite Difference Formulas Using Taylor Series Expansion Finite Difference Formulas of First Derivative Two-point forward difference formula for first derivative Two-point central difference formula for first derivative Finite Difference Formulas for the Second Derivative
Week 11	Numerical Methods: Explicit and Implicit Finite Difference Approximation Explicit Finite Difference Approximation of the Linear Pressure Equation Implicit Finite Difference Approximation of the Linear Pressure Equation
Week 12	Numerical Methods: Implicit Finite Difference in 2D models Implicit Finite Difference Approximation of the 2D Pressure Equation Discretisation of the 2D Pressure Equation Numbering Schemes in Solving the 2D Pressure Equation Implicit Finite Difference Approximation of Non-linear Pressure Equations Application of finite differences to two-phase flow Discretisation of the Two-Phase Pressure and Saturation Equations IMPES Strategy for Solving the Two-Phase Pressure and Saturation Equations
Week 13	Numerical Methods: Matrix principles Definitions of matrices Determinant of Matrix Cofactor of matrix Transpose of Matrix Adjugate and Inverse of Matrix Matrix for finite difference
Week 14	Numerical Methods: Matrix solutions Solving systems of linear equations Direct Methods: Gaussian Elimination and Gauss Jorden Iterative Methods: Jacobi iteration and Gauss Seidel Thomas Algorithm Solving Implicit finite difference problems
Week 15	Final Project and Exam Preparation Completion of Reservoir Simulation reports Exam preparation and review

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Eclipse; pre-and post-processing software Introduce Eclipse data file for a case study model
Week 2	Lab 2: Modifying the data file model to change the wells control mode and the model running time
Week 3	Lab 3: investigating the effect of permeability variation in layered model
Week 4	Lab 4: Sensitivity analysis on flow behavior for two phase models
Week 5	Lab 5: effect of gravity and capillary pressure in layered models
Week 6	Lab 6: vertical connectivity effect
Week 7	Lab 7: grid coarsening and refining effect

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Engineering Project-II / EN411	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\10\5	**Scientific Committee Approval Date** .8

9. **Module Objectives**

1. Practical Application: The course aims to provide students with an opportunity to apply the theoretical knowledge they have acquired throughout their studies to a real-world engineering project. This includes understanding the practical aspects of petroleum engineering and the challenges involved in implementing engineering solutions.
2. Project Management Skills: The course aims to develop students' project management skills by guiding them through the different stages of an engineering project. This includes planning, organizing, and executing a project within specified constraints such as time, budget, and resources.
3. Interdisciplinary Collaboration: The course aims to promote interdisciplinary collaboration by encouraging students to work in teams with members from different engineering disciplines. Petroleum engineering projects often require collaboration with geologists, mechanical engineers, environmental engineers, and other specialists. The course aims to enhance students' ability to work effectively in a multidisciplinary team.

10. Module Learning Outcomes

1- Project Planning and Management: Students will learn how to effectively plan and manage engineering projects in the petroleum industry. This includes developing project schedules, allocating resources, and understanding the project life cycle.
2- Technical Analysis and Problem Solving: Students will develop advanced skills in technical analysis and problem-solving specific to petroleum engineering projects. They will learn to identify and address engineering challenges, evaluate different solutions, and make informed decisions.
3- Engineering Design and Optimization: Students will gain knowledge and practical experience in designing and optimizing engineering systems and processes within the petroleum industry. They will learn to apply engineering principles, use software tools, and consider factors such as safety, cost-effectiveness, and environmental impact.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The Engineering Project course involves the application of petroleum engineering principles to solve real-world industry problems. Students will engage in project planning, data collection, analysis, and interpretation related to drilling, reservoir management, production optimization, or enhanced oil recovery. Emphasis is placed on using simulation software, technical report writing, and effective presentation skills. The course fosters teamwork, critical thinking, and problem-solving abilities while addressing economic, environmental, and safety considerations in petroleum engineering projects.

General and qualifying transferable skills (other skills related to employability and personal development).

The engineering project course for fourth-class students in the petroleum engineering department typically focuses on providing students with practical experience in planning, designing, and executing engineering projects related to the petroleum industry. Here are some strategies that could be employed in such a course:
Project Selection: Encourage students to select projects that align with their interests and are relevant to the petroleum engineering field. This could involve exploring various topics such as reservoir engineering, drilling operations, production optimization, or petrochemical processes. models. .

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Engineering Projects
Week 2	Project Planning and Initiation
Week 3	Project Organization and Team Formation
Week 4	Project Risk Management
Week 5	Project Scheduling and Resource Management
Week 6	Project Cost Estimation and Budgeting
Week 7	Project Quality Management
Week 8	Project Execution and Monitoring
Week 9	Project Communication and Reporting
Week 10	Project Integration and Scope Management
Week 11	Finalizing project reports and handover procedures
Week 12	Project Case Studies and Presentations: Analyzing and discussing real-world engineering project case studies
Week 13	Project Case Studies and Presentations: Presenting individual or group projects to the class
Week 14	Project Case Studies and Presentations: Q&A sessions and feedback on project presentations
Week 15	Project Case Studies and final Presentations:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- A Hamdy, Operations Research an introduction, Edition, Pearson Prentice Hall, 8th, 2007.	
Recommended Texts	2. Introduction to Operations Research, Seventh Edition/ F.S. Hillier/G. J. Lieberman, Mc Graw-Hill.	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Applied Reservoir Engineering / PE402	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 75	**(Totally) No. of hours** .7
2024\9\25	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The aims of the Applied Reservoir Engineering course for fourth-class students in the Petroleum Engineering department are to provide a comprehensive understanding of the principles and techniques used in reservoir engineering and their practical application in the oil and gas industry. The course aims to equip students with the necessary skills and knowledge to analyze and manage reservoirs efficiently. Here are the specific aims of the course:

1. Introduction to Reservoir Engineering: The course aims to introduce students to the fundamental concepts and terminology of reservoir engineering, including the types of reservoirs, fluid properties, and basic reservoir equations.
2. Reservoir Characterization: Students will learn various methods for characterizing reservoirs, including geological, geophysical, and petrophysical techniques. The aim is to develop skills in interpreting and analyzing data to understand reservoir properties and behavior.

10. Module Learning Outcomes

The Applied Reservoir Engineering course for fourth-class students in the Petroleum Engineering department, students should be able to achieve the following learning outcomes:

1. Understand the fundamentals of reservoir engineering: Students will have a solid understanding of the basic concepts and principles of reservoir engineering, including fluid properties, rock properties, reservoir characterization, and fluid flow in porous media.
2. Analyze reservoir data: Students will be able to interpret and analyze reservoir data, including well logs, pressure data, production data, and core data. They will learn how to use this data to estimate reservoir properties, such as porosity, permeability, and fluid saturations.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The course covers fundamental reservoir engineering concepts, including fluid properties, reservoir rock characteristics, material balance equations, and flow through porous media. Topics include reservoir drive mechanisms, well testing, pressure analysis, enhanced oil recovery (EOR) techniques, and reservoir simulation. Practical applications focus on optimizing hydrocarbon recovery and reservoir performance evaluation.

General and qualifying transferable skills (other skills related to employability and personal development).

The Applied Reservoir Engineering course for fourth-year students in the Petroleum Engineering department focuses on providing students with the knowledge and skills necessary to analyze and optimize hydrocarbon reservoirs. Here are some strategies that can help students excel in the course:

1. Understand Reservoir Fundamentals: Start by developing a strong foundation in reservoir engineering concepts. This includes understanding key terminology, reservoir properties, fluid flow mechanisms, and reservoir characterization techniques.
2. Master Reservoir Simulation: Reservoir simulation is a critical tool in reservoir engineering.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Applied Reservoir Engineering.
Week 2	Fundamental concepts and introduction to depletion drive, gas cap drive, water drive, gravity drainage reservoir, combination drive reservoir,
Week 3	Maintenance, secondary recovery, gas reservoir, gas condensate reservoir, miscellaneous subject
Week 4	Oil reservoir and application of Material Balance Equation
Week 5	material balance equation Applications in Gas Reservoirs
Week 6	Single Phase Gas Reservoir
Week 7	Mid term exam
Week 8	Gas Condensate Reservoir
Week 9	Material Balance Equation in Oil Reservoirs
Week 10	Under-saturated & Saturated Oil Reservoirs
Week 11	Water influx
Week 12	Oil Well Performance and MBE
Week 13	Driving Mechanisms and driving indices
Week 14	Final Project and Review • Students work on a final project related to Applied Reservoir Engineering. • Review of key concepts and topics covered throughout the course. • Discussion and presentation of final projects. •
Week 15	• Exam preparation and review. **Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Craft, B. C., & Hawkins, M. F.** (1991). *Applied Petroleum Reservoir Engineering* (2nd ed.). Prentice Hall.	
Recommended Texts	**Ahmed, T.** (2010). *Reservoir Engineering Handbook* (4th ed.). Gulf Professional Publishing.	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Applied Numerical Methods / PE400	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 75	**(Totally) No. of hours** .7
2024\9\25	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Applied Numerical Methods course aims to provide fourth-stage petroleum engineering students with essential numerical techniques to solve engineering problems related to exploration, drilling, and reservoir management. Students will learn methods such as finite difference techniques, solving linear and nonlinear equations, interpolation, and numerical integration. The course emphasizes practical applications using software like MATLAB or Python for solving real-world petroleum challenges, including fluid flow, heat transfer, and reservoir simulation. By the end of the course, students will develop critical problem-solving skills, apply numerical models effectively, and analyze simulation results for informed decision-making in petroleum engineering.

10. Module Learning Outcomes

Module Learning Outcomes of Applied Numerical Methods for Petroleum Engineering

By the end of this course, students will be able to apply numerical methods to solve complex petroleum engineering problems, including fluid flow, heat transfer, and reservoir simulations. They will demonstrate proficiency in using computational tools like MATLAB or Python for modeling and analysis. Students will also develop the ability to evaluate the accuracy and stability of numerical solutions, interpret simulation results, and make data-driven decisions to optimize petroleum engineering processes and operations.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The course covers numerical techniques including finite difference methods, solving linear and nonlinear equations, interpolation, and numerical integration. Applications focus on reservoir simulation, fluid flow modeling, heat transfer analysis, and optimization in petroleum engineering processes using computational tools like MATLAB and Python for practical problem-solving.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. Using pdf and ppt format during the course of study will be main tools within different level of exercises and solved problem.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Interpolation, (Linear, Lagrange),
Week 2	• Matrices, Review of matrix properties,
Week 3	• Determinates, inverse of matrix,
Week 4	• solution of system of linear equations (Gaussian elimination, Gauss
Week 5	Jordan method, Jacobi method, Gauss Seidel method),
Week 6	• least Square method (linear equations, polynomial equations)
Week 7	• Reservoir simulation (Introduction, types of simulators) flow through
Week 8	porous media (derivation of single phase, one-dimensional flow equation,
Week 9	• two and three-dimensional flow equation),
Week 10	• finite difference method (Taylor series, forward difference, backward
Week 11	difference, central difference, concepts of explicit and method implicit
Week 12	methods),
Week 13	Interpolation, (Linear, Lagrange),
Week 14	• Matrices, Review of matrix properties,
Week 15	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Chapra, S. C., & Canale, R. P.** (2015). *Numerical Methods for Engineers* (7th ed.). McGraw-Hill Education.	
Recommended Texts	**Ahmed, T.** (2010). *Reservoir Engineering Handbook* (4th ed.). Gulf Professional Publishing.	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Well Testing / PE406	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\20	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Oil Well Test Module is designed to provide students with an in-depth understanding of the principles and techniques involved in testing oil wells. The module covers various aspects of well testing, including planning, design, execution, and interpretation of tests. Students will learn about the equipment and methods used in well testing, as well as the analysis of data obtained from these tests. The module also emphasizes the importance of well testing in reservoir characterization, production optimization, and reservoir management.

10. Module Learning Outcomes

The Well Test module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess reservoir potential, optimize well performance, and make informed decisions regarding production strategies. Well test analysis helps determine reservoir parameters, evaluate well productivity, identify formation damage, and validate reservoir models. The module also emphasizes the significance of data quality, accuracy, and integrity in well testing, ensuring reliable results for reservoir characterization and production forecasting.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The course covers fundamental concepts of well testing, including pressure transient analysis, flow regimes, and wellbore storage effects. Topics include drawdown, buildup tests, and interference testing. Analytical and numerical methods for interpreting test data are discussed, focusing on reservoir characterization, permeability estimation, and skin factor evaluation.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Introduction to Directional drilling Overview the applications of directional drilling. Principle terminology in directional drilling. Types and applications of different directional well profiles.
Week 2	Directional well planning

	Reference Systems and Coordinates • Planning the well trajectory. •
Week 3	Surveying calculations -1 Tangential method. • Balance Tangential method. • Average angle method. •
Week 4	Surveying calculations-2 Radius of curvature method. Minimum curvature method.
Week 5	Directional wells Design-1 Type-1 (build& hold)- well profile design and calculations. • Quiz •
Week 6	Directional wells Design-2 Type-2 (S-shape) well-profile design and calculations •
Week 7	Directional surveying tools Inclination surveying tools • Magnetic Single shot (MSS • Magnetic Multi-shot (EMS) • Gyroscope(Conventional, North seeking and inertial) •
Week 8	Directional well deflection- tools-1 Down hole motors (Turbines, Positive displacement motors (PDM) • whipstocks • jetting action •
Week 9	Directional well deflection tools-2 Down hole motors and bent sub • Steerable positive displacement motors • Rotary steerable system (RSS) •
Week 10	Bottom hole Assemble (BHA) design for directional wells Pendulum assembly • Packed bottom hole assembly • Rotary build assembly • Rotary drop assembly • Steerable assembly • Mud motor and bent sub assembly •
Week 11	Horizontal and multi-lateral wells Types and applications of horizontal and multi-lateral wells • Profiles of horizontal wells . •
Week 12	Well profile and Design considerations of horizontal wells Design and calculations of single-build horizontal well • Design and calculations of Double-build horizontal well •
Week 13	Torque and drag while directional drilling

	Calculation of Torque while rotating of bottom. • Calculation of Torque while rotating on bottom. • Calculation of drag while drilling and tripping. •
Week 14	Hole cleaning considerations in deviated and horizontal wells Discus and analysis the effect of hole cleaning on horizontal drilling performance •
Week 15	Final Project and Exam Preparation Completion of a directional drilling project. • Exam preparation and review •

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	*HORIZONTAL AND DIRECTIONAL DRILLING* by Richard S. Carden and Robert D. Grace	
Recommended Texts	Well engineering and construction by H. Rabia Applied drilling Engineering by Adam T. Bourgoyne	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Engineering Ethics / PE413	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\20	**Scientific Committee Approval Date** .8

9. **Module Objectives**

Course Aims:

- To enhance students' analytical, critical, and creative thinking skills in relation to ethical issues in engineering.
- To familiarize students with classic cases in engineering ethics and typical ethical and professional issues that arise in engineering.
- To train students in analyzing complex problems and finding ethical resolutions

10. Module Learning Outcomes

Learning Outcomes:
- Develop the ability to identify and evaluate ethical issues in engineering.
- Apply ethical frameworks and principles to engineering decision-making.
- Demonstrate an understanding of the relationship between ethics and the law in engineering.
- Analyze and solve ethical dilemmas in engineering practice.
- Communicate ethical considerations effectively in written and oral forms.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course covers the fundamental principles of **engineering ethics**, focusing on professional responsibility, integrity, and ethical decision-making in engineering practice. Key topics include the **codes of ethics** from professional organizations, conflict of interest, safety and risk management, environmental sustainability, and ethical dilemmas in engineering projects. Students will explore case studies related to real-world engineering challenges, emphasizing the importance of ethical behavior in protecting public health, safety, and the environment, while fostering professional accountability and social responsibility.

General and qualifying transferable skills (other skills related to employability and personal development).

Teaching Strategies for the Course:

- Case studies and real-world examples to illustrate ethical dilemmas in engineering.
- Group discussions and debates to encourage critical thinking and perspective sharing.
- Ethical decision-making frameworks and tools for analyzing and resolving ethical problems.
- Guest lectures from industry professionals to provide practical insights.
- Assignments and projects requiring ethical analysis and reflection.
- Role-playing exercises to simulate ethical scenarios and decision-making processes.

Please note that these points are based on the provided keywords and may require further refinement and elaboration when developing the actual course material.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Course Materials.
Week 2	The Profession of Engineering. 1
Week 3	• The Profession of Engineering. 2
Week 4	Professionalism and Codes of Ethics. 1
Week 5	Professionalism and Codes of Ethics. 2 Quiz
Week 6	• Understanding Ethical Problems. 1
Week 7	Midterm Exam
Week 8	Understanding Ethical Problems. 2
Week 9	Ethical Problem-Solving Techniques. 1
Week 10	Ethical Problem-Solving Techniques. 2 Quiz.
Week 11	Risk, Safety, and Accidents.
Week 12	• The Rights and Responsibilities of Engineers. 1
Week 13	The Rights and Responsibilities of Engineers.2 .
Week 14	Ethics in Research and Experimentation.
Week 15	Global Issues. Exam preparation and review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Charles B. Fleddermann, “Engineering Ethics”, Fourth Edition,2012, Pearson Education, Inc., publishing as Prentice Hall, 1 Lake Street, Upper Saddle River, NJ 07458,USA. 2- Charles B. Fleddermann, “Engineering Ethics”,Thired Edition, 2008 , Pearson Education, Inc., publishing as Prentice Hall, 1 Lake Street, Upper Saddle River, NJ 07458,USA.	

	3-Naagarazan R.S., “A Textbook on Professional Ethics and Human Values”,2006, New Age International (P) Ltd., Publishers, New Delhi, India.	
Recommended Texts	1-Charles E. Harris, Michael S. Pritchard, Michael J. Rabins, “Engineering Ethics, Concepts and Cases”, Fourth Edition, 2009,Wadsworth, USA.	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Enhanced Oil Recovery / PE409	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\9\20	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The **Enhanced Oil Recovery (EOR)** course aims to provide students with a comprehensive understanding of advanced techniques used to maximize hydrocarbon recovery from reservoirs. Students will explore thermal, chemical, and gas injection methods, along with emerging technologies like microbial EOR. The course emphasizes the evaluation of reservoir conditions, selection of appropriate EOR techniques, and analysis of their economic and environmental impacts. Practical case studies and simulations will enhance problem-solving skills for optimizing oil recovery processes.

10. Module Learning Outcomes

By the end of this course, students will understand the principles and techniques of Enhanced Oil Recovery (EOR), including thermal, chemical, and gas injection methods. They will be able to analyze reservoir conditions to select appropriate EOR techniques and evaluate their efficiency. Students will also develop skills in modeling EOR processes using simulation tools, interpret performance data, and propose strategies to optimize oil recovery. Additionally, they will understand the environmental and economic impacts of EOR operations.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course covers the principles and techniques of Enhanced Oil Recovery (EOR), including thermal recovery, gas injection, and chemical flooding methods. Topics include reservoir characterization, fluid-rock interactions, and screening criteria for EOR selection. The course also explores CO_2 injection, microbial EOR, and emerging technologies. Emphasis is placed on numerical modeling, simulation techniques, and economic evaluation of EOR processes. Case studies and field applications are discussed to illustrate the practical implementation of EOR strategies in petroleum engineering.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Reservoir rock properties Main reservoir rock properties Geological classification of porosity, Methods used for measuring porosity. Methods used for averaging permeability. Methods used to measure Wettability (Amott Index).
Week 2	Introduction to Secondary oil recovery methods Oil Recovery Stages, Selection the Best EOR Methods (Screening Criteria). Water Injection (Technical factors and Economic factors). The goal of water flooding, factors to consider in water flooding)
Week 3	Water Flooding Candidate for water flooding, Advantage and dis advantage of water flooding. Sources and Treatment of Injected Water, Typical Water Flood Project. Optimum time to water flood.
Week 4	Buckley and Leverett Theory Overall recovery efficiency (Displacement, vertical and areal sweep efficacies). Fractional flow equation (Derivation, applications and examples). Effect of Water and Oil Viscosities, effect of Dip Angle and Injection Rate. Derivation the relationship between water cut and water oil ratio.
Week 5	Factors effecting on fractional flow curve Effect of Water and Oil Viscosities, effect of Dip Angle and Injection Rate. Derivation the relationship between water cut and water oil ratio. quiz
Week 6	Frontal Advance Equation Derivation of distance vs time relationship. Water saturation profile during water flooding. quiz
Week 7	Oil Recovery Calculations Data preparation Recovery performance to breakthrough Recovery performance after breakthrough
Week 8	Reservoir Heterogeneity Dykstra-Parson's method Vertical Heterogeneity Dykstra-Parson's permeability variation V (Tutorial example). Lorenz coefficient L
Week 9	Methods of predicting recovery performance for layered reservoirs. Simplified Dykstra–Parsons Method Modified Dykstra–Parsons Method
Week 10	Calculation Vertical Sweep Efficiency. Vertical Sweep Efficiency (Stiles' Method) Vertical Sweep Efficiency (The Dykstra-Parsons Method)

	Quiz.
Week 11	Calculation Areal Sweep Efficiency Factors affecting Areal Sweep Efficiency. Areal Sweep Efficiency (Before, At and After Breakthrough). Fluid Injectivity
Week 12	Selection of flooding patterns Irregular Injection Patterns and Regular injection patterns Peripheral injection patterns and Crestal and basal injection patterns
Week 13	Exams Mid- Term exam.
Week 14	Gas Injection The Displacement of Oil by Gas, with Gravitational Segregation The Displacement of Oil by Gas, without Gravitational Segregation
Week 15	Final Project and Exam Preparation Completion of a secondary oil recovery project Exam preparation and review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Optimization / PE411	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\9\20	**Scientific Committee Approval Date** .8

9. **Module Objectives**

Course Objectives:
- To introduce students to the concept and importance of optimization.
- To provide an understanding of the applications of optimization in various fields.
- To develop knowledge and skills in linear programming and its formulation.
- To explore the graphical method and simplex method for solving linear programming problems.
- To understand the applications of the simplex method in optimizing complex systems.
- To introduce the transportation method and its significance in optimization.
- To explore nonlinear programming and its techniques for solving optimization problems.
- To familiarize students with the Lagrange multiplier method and its role in constrained optimization.
- To examine the applications of the Lagrange multiplier method in economics, physics, and other domains.

10. Module Learning Outcomes

By the end of this course,

- Understand the concept and importance of optimization.
- Apply linear programming techniques to formulate and solve optimization problems.
- Utilize the graphical method to solve linear programming problems and analyze real-world applications.
- Apply the simplex method to solve linear programming problems and optimize complex systems.
- Model and solve transportation problems using optimization techniques.
- Analyze and solve nonlinear programming problems using appropriate algorithms.
- Apply the Lagrange multiplier method to solve constrained optimization problems.
- Understand the applications of optimization in various fields such as logistics, supply chain management, economics, and physics.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This module covers optimization techniques essential for solving petroleum engineering problems. Topics include linear and nonlinear optimization, constrained and unconstrained optimization, and gradient-based methods. Applications focus on optimizing drilling parameters, reservoir performance, and production strategies. Students will learn to implement algorithms such as the Newton-Raphson method, least squares, and simplex methods using computational tools like MATLAB or Python. Emphasis is placed on practical problem-solving, model accuracy, and improving operational efficiency in petroleum engineering.

General and qualifying transferable skills (other skills related to employability and personal development).

Teaching Strategies for the Optimization Course:

1. Lecture-Based Instruction:
   - Delivering comprehensive lectures to introduce key concepts and theories related to optimization.
   - Providing explanations, examples, and illustrations to enhance understanding.
   - Engaging students through interactive discussions and Q&A sessions.

2. Problem-Solving Exercises:
- Assigning regular problem sets to reinforce understanding and application of optimization techniques.
- Providing step-by-step guidance and feedback on problem-solving approaches.
- Encouraging students to work collaboratively on challenging problems to promote critical thinking and problem-solving skills.

3. Case Studies and Real-World Examples:
- Integrating case studies and real-world examples to demonstrate the practical applications of optimization in various fields.
- Analyzing and discussing the optimization strategies employed in real-life scenarios.
- Encouraging students to identify optimization opportunities and propose effective solutions.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction.
Week 2	Applications in optimization.
Week 3	Linear programming.
Week 4	Applications in linear programming.
Week 5	Graphical method. Quiz
Week 6	Applications in graphical method.
Week 7	Midterm Exam
Week 8	Simplex method. 1
Week 9	Application in Simplex method.
Week 10	Transportation method. Quiz.
Week 11	Application in transportation method.
Week 12	Nonlinear programming.
Week 13	Applications in nonlinear programming..
Week 14	Lagrange multiplier method.
Week 15	Applications in Lagrange multiplier method.

	Exam preparation and review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- A Hamdy, Operations Research an introduction, Edition, Pearson Prentice Hall, 8th, 2007.	
Recommended Texts	2. Introduction to Operations Research, Seventh Edition/ F.S. Hillier/G. J. Lieberman, Mc Graw-Hill.	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Reservoir Management / PE401	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\10\1	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Reservoir Simulation Module is designed to provide students with general understanding of the principles and basic equations involved in reservoir simulation, the numerical principles of finite difference, the data requirements for conducting a reservoir simulation study, the current simulation study approaches, the simulation Steps. The module involves modeling a synthetic reservoir model using a well-known reservoir simulation software. Students will run and analyze many reservoir models.

10. Module Learning Outcomes

The Reservoir simulation module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess dynamic reservoir models, Solve the governing partial differential equations using finite difference methods, Use a reservoir simulator for studying the reservoir performance in response to different development strategies, Develop static and dynamic model of the reservoir.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course provides an in-depth understanding of reservoir management principles and practices for optimizing hydrocarbon recovery. Topics include reservoir characterization, performance monitoring, and the integration of geological, geophysical, and engineering data for decision-making. Students will explore material balance analysis, reservoir simulation, decline curve analysis, and production optimization techniques. The course also covers enhanced oil recovery (EOR) methods, risk assessment, and economic evaluation of reservoir projects. Emphasis is placed on developing strategies for maximizing recovery while ensuring sustainable resource management. Case studies and real-world applications are used to illustrate effective reservoir management practices in the petroleum industry.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is by explaining the theoretical aspects of the reservoir simulation course with all the related mathematical concepts and the numerical analysis, while at the same time the students will be divided into research groups to build reservoir simulation models, run the dynamic models, encourage students to analysis the results and the reservoir limitation, deliver two reports for the models that they ran. Building numerical models as group of students would encourage them to develop a critical thinking and expand their understanding via working in groups, as they would discuss their models as peers. Also they would discuss the models with their teachers. Then, students would deliver presentations for these reports where they will be discussed about their analyses of the reservoir models. .

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Reservoir simulation What is a simulation model? A simple example of a simulation model What is a reservoir simulation model? The task of reservoir simulation What are we trying to do and how complex must our model be?
Week 2	Field Applications of Reservoir Simulation Discussion of Changes in Reservoir Simulation; 1970s – 2000 The Treatment of Uncertainty in Reservoir Simulation Study example of a reservoir simulation Types of reservoir simulation model
Week 3	Reservoir Simulation Model Set-Up Setting up a reservoir simulation model Data input and output Example input data file Reservoir System to be Modelled ECLIPSE Syntax Model Dimensions
Week 4	Reservoir Simulation Model Set-Up: II Grid and Rock Properties Fluid Properties Initial Conditions Output Requirements Production Schedule Running eclipse and file name Conventions Running ECLIPSE on a PC File Name Conventions
Week 5	Gridding And Well Modelling: Gridding Introduction Gridding in Reservoir Simulation Accuracy of Simulations and Numerical Dispersion Grid Orientation Effects Local Grid Refinement (LGR) Distorted Grids and Corner Point Geometry Issues in Choosing a Reservoir Simulation Grid Streamline Simulation
Week 6	Gridding And Well Modelling: Block to block flow calculations The calculation of block to block flows in reservoir simulators Introduction to Averaging of Block to Block Flows Averaging of the Two-Phase Mobility Term
Week 7	Gridding And Well Modelling: Wells in Reservoir Simulation Basic Idea of a Well Model Well Models for Single and Two-Phase Flow Well Modelling in a Multi-Layer System Modelling Horizontal Wells

Week 8	The Flow Equations: single phase The single phase pressure equation Extension of Single Phase Pressure Equation to 2D & 3D
Week 9	The Flow Equations: two phase flow The two-phase flow equations Review of Two-Phase Flow Concepts Derivation of the Two-Phase Conservation Equations. The Two-Phase Pressure Equation Simplified Two-Phase Pressure and Saturation Equations
Week 10	Numerical Methods in Reservoir Simulation Introduction Review of finite differences Application of finite differences to partial differential equations (PDEs) Forward, Backward, and Central Difference Formulas for the First Derivative Finite Difference Formulas Using Taylor Series Expansion Finite Difference Formulas of First Derivative Two-point forward difference formula for first derivative Two-point central difference formula for first derivative Finite Difference Formulas for the Second Derivative
Week 11	Numerical Methods: Explicit and Implicit Finite Difference Approximation Explicit Finite Difference Approximation of the Linear Pressure Equation Implicit Finite Difference Approximation of the Linear Pressure Equation
Week 12	Numerical Methods: Implicit Finite Difference in 2D models Implicit Finite Difference Approximation of the 2D Pressure Equation Discretisation of the 2D Pressure Equation Numbering Schemes in Solving the 2D Pressure Equation Implicit Finite Difference Approximation of Non-linear Pressure Equations Application of finite differences to two-phase flow Discretisation of the Two-Phase Pressure and Saturation Equations IMPES Strategy for Solving the Two-Phase Pressure and Saturation Equations
Week 13	Numerical Methods: Matrix principles Definitions of matrices Determinant of Matrix Cofactor of matrix Transpose of Matrix Adjugate and Inverse of Matrix Matrix for finite difference
Week 14	Numerical Methods: Matrix solutions Solving systems of linear equations Direct Methods: Gaussian Elimination and Gauss Jorden Iterative Methods: Jacobi iteration and Gauss Seidel Thomas Algorithm Solving Implicit finite difference problems
Week 15	Final Project and Exam Preparation Completion of Reservoir Simulation reports Exam preparation and review

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Eclipse; pre-and post-processing software Introduce Eclipse data file for a case study model
Week 2	Lab 2: Modifying the data file model to change the wells control mode and the model running time
Week 3	Lab 3: investigating the effect of permeability variation in layered model
Week 4	Lab 4: Sensitivity analysis on flow behavior for two phase models
Week 5	Lab 5: effect of gravity and capillary pressure in layered models
Week 6	Lab 6: vertical connectivity effect
Week 7	Lab 7: grid coarsening and refining effect

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Engineering Project-II / EN411	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 45	**(Totally) No. of hours** .7
2024\10\5	**Scientific Committee Approval Date** .8

9. **Module Objectives**

1. Practical Application: The course aims to provide students with an opportunity to apply the theoretical knowledge they have acquired throughout their studies to a real-world engineering project. This includes understanding the practical aspects of petroleum engineering and the challenges involved in implementing engineering solutions.
2. Project Management Skills: The course aims to develop students' project management skills by guiding them through the different stages of an engineering project. This includes planning, organizing, and executing a project within specified constraints such as time, budget, and resources.
3. Interdisciplinary Collaboration: The course aims to promote interdisciplinary collaboration by encouraging students to work in teams with members from different engineering disciplines. Petroleum engineering projects often require collaboration with geologists, mechanical engineers, environmental engineers, and other specialists. The course aims to enhance students' ability to work effectively in a multidisciplinary team.

10. Module Learning Outcomes

1- Project Planning and Management: Students will learn how to effectively plan and manage engineering projects in the petroleum industry. This includes developing project schedules, allocating resources, and understanding the project life cycle.
2- Technical Analysis and Problem Solving: Students will develop advanced skills in technical analysis and problem-solving specific to petroleum engineering projects. They will learn to identify and address engineering challenges, evaluate different solutions, and make informed decisions.
3- Engineering Design and Optimization: Students will gain knowledge and practical experience in designing and optimizing engineering systems and processes within the petroleum industry. They will learn to apply engineering principles, use software tools, and consider factors such as safety, cost-effectiveness, and environmental impact.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

The Engineering Project course involves the application of petroleum engineering principles to solve real-world industry problems. Students will engage in project planning, data collection, analysis, and interpretation related to drilling, reservoir management, production optimization, or enhanced oil recovery. Emphasis is placed on using simulation software, technical report writing, and effective presentation skills. The course fosters teamwork, critical thinking, and problem-solving abilities while addressing economic, environmental, and safety considerations in petroleum engineering projects.

General and qualifying transferable skills (other skills related to employability and personal development).

The engineering project course for fourth-class students in the petroleum engineering department typically focuses on providing students with practical experience in planning, designing, and executing engineering projects related to the petroleum industry. Here are some strategies that could be employed in such a course:
Project Selection: Encourage students to select projects that align with their interests and are relevant to the petroleum engineering field. This could involve exploring various topics such as reservoir engineering, drilling operations, production optimization, or petrochemical processes.
models. .

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Engineering Projects
Week 2	Project Planning and Initiation
Week 3	Project Organization and Team Formation
Week 4	Project Risk Management
Week 5	Project Scheduling and Resource Management
Week 6	Project Cost Estimation and Budgeting
Week 7	Project Quality Management
Week 8	Project Execution and Monitoring
Week 9	Project Communication and Reporting
Week 10	Project Integration and Scope Management
Week 11	Finalizing project reports and handover procedures
Week 12	Project Case Studies and Presentations: Analyzing and discussing real-world engineering project case studies
Week 13	Project Case Studies and Presentations: Presenting individual or group projects to the class
Week 14	Project Case Studies and Presentations: Q&A sessions and feedback on project presentations
Week 15	Project Case Studies and final Presentations:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- A Hamdy, Operations Research an introduction, Edition, Pearson Prentice Hall, 8th, 2007.	
Recommended Texts	2. Introduction to Operations Research, Seventh Edition/ F.S. Hillier/G. J. Lieberman, Mc Graw-Hill.	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Drilling Optimization / PE405	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\10\1	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Drilling Optimization course aims to provide students in the fourth class of the Petroleum Engineering department with a comprehensive understanding of the principles and techniques involved in optimizing drilling operations in the oil and gas industry. The course focuses on equipping students with the necessary knowledge and skills to enhance drilling efficiency, reduce costs, and maximize productivity.

Throughout the course, students will engage in practical exercises, case studies, and simulations to reinforce their understanding of drilling optimization concepts and apply them to real-world drilling scenarios. The aim is to equip students with the necessary skills to optimize drilling operations, improve drilling performance, and contribute to the overall efficiency and success of oil and gas drilling projects.

10. Module Learning Outcomes

The module learning outcomes for this course are as follows:
Understand drilling fundamentals: Students will acquire a strong foundation in drilling principles, including the types of drilling methods, equipment used, and drilling processes involved in the oil and gas industry. They will learn about the various components of a drilling rig and their functions.
Analyze drilling parameters: Students will learn how to analyze and interpret drilling parameters, such as rate of penetration, weight on bit, rotary speed, and mud properties. They will understand the significance of these parameters and how they impact drilling performance.
Optimize drilling performance: Students will be able to identify drilling challenges and apply optimization techniques to improve drilling performance. They will learn about different optimization strategies, such as bit selection, drillstring design, and mud system optimization, to achieve efficient and cost-effective drilling operations.
Utilize drilling software: Students will gain hands-on experience with drilling software commonly used in the industry. They will learn how to input drilling parameters, analyze data, and interpret the results obtained from these software tools. This will enable them to make informed decisions and optimize drilling operations.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course focuses on the integration of geological, geophysical, and petrophysical data to describe reservoir properties and behavior. Key topics include rock and fluid properties, porosity, permeability, saturation, and reservoir heterogeneity. Techniques such as well logging, core analysis, seismic interpretation, and reservoir modeling are covered.
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General and qualifying transferable skills (other skills related to employability and personal development).

The drilling optimization course for fourth-class petroleum engineering students focuses on enhancing their understanding of drilling operations and equipping them with strategies to optimize drilling processes. Here are some brief descriptions of strategies covered in the course:
Planning and Design: Students learn how to plan and design drilling operations effectively. This

involves considering factors such as well trajectory, target depth, formation characteristics, and drilling equipment selection. By creating a comprehensive plan, engineers can optimize drilling performance and minimize costs.
Real-time Monitoring: The course emphasizes the importance of real-time monitoring during drilling operations. Students learn to utilize various technologies and instruments to collect data on drilling parameters, formation characteristics, and wellbore stability. Analyzing this data helps identify potential issues and enables timely adjustments to optimize drilling performance.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction drilling optimization Overview the importance of drilling optimization in oil and gas industry . Bit selection and evaluation based on cost per foot of drilled formations . Using Break –even analysis for bit performance evaluation .
Week 2	Factors affecting rate of penetration General review on factors effecting rate of penetration . Introduction to Controllable and uncontrollable factors.
Week 3	Factors affecting rate of penetration according to Lummus' study Effect of rock properties on rate of penetration . Fundamentals of rock failure . Effect of weight on bit (WOB) on rate of penetration. Effect of rotary speed (RPM) on rate of penetration. Effect of bit size and bit type on rate of penetration.
Week 4	Effect of drilling fluid properties on rate of Penetration Effect of drilling fluid density on rate of penetration. Effect of drilling fluid viscosity on rate of penetration. Effect of drilling fluid filtration loss on rate of penetration.
Week 5	Effect of drilling fluid properties on rate of Penetration Effect of drilling fluid solid content on rate of penetration. Effect of drilling fluid oil content on rate of penetration. Effect of drilling fluid chemical composition on rate of penetration. Quiz
Week 6	Hydraulic Optimization Hydraulics Fundamentals Overview of pressure losses in circulation system. Pressure losses calculations in circulation system.
Week 7	Hydraulic Optimization with limited surface Pressure General form of Hydraulic optimization. Using Maximum Hydraulic horsepower as optimization criterion . Determining the turbulence index using Robinson method Determining the optimum flow rate and the optimum pressure drop at the bit.

	Selecting the optimum Nozzles size.
Week 8	Hydraulic Optimization with limited surface Pressure Using Maximum Impact force as optimization criterion . Determining the turbulence index using Robinson method Determining the optimum flow rate and the optimum pressure drop at the bit. Selecting the optimum Nozzles size.
Week 9	Hydraulic Optimization using the Modified Goins method Discussing the effect of increasing mud density on hydraulics optimization Discussing the effect of increasing surface pressure on hydraulics optimization Determining the optimum flow rate and the optimum pressure drop at the bit using the modified Goins method.
Week 10	Expected value as optimization criterion Introducing the concept of expected value. Determining the optimum drill pipe size.
Week 11	Expected value as optimization criterion Determining the optimum drill collar size. Determining the optimum mud circulation time.
Week 12	Mathematical drilling Models The concept of a Mathematical drilling model Steps for Developing a mathematical drilling model. Factors to be considered in Developing a mathematical drilling model. Overview of drilling models used in oil industry.
Week 13	Mathematical drilling models for optimizing drilling parameters Introducing the development of Galle-Woods mathematical drilling model Application of Galle-Woods model for selecting the optimum (WOB, &RPM) Application of Young- Bourgoyne drilling model for selecting the optimum (WOB, &RPM)
Week 14	Reviewing the recent advances in drilling optimization The concept of real-time drilling optimization. Field cases of drilling optimization
Week 15	Final Project and Exam Preparation Completion of a drilling optimization project. Exam preparation and review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Applied drilling Engineering by Adam T. Bourgoyne - Drilling and well completions by Carl Gatlin -	
Recommended Texts	Advanced oil well drilling Engineering by Bill-J-Mitchell	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Reservoir Characterization / PE403	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\10\1	**Scientific Committee Approval Date** .8

9. **Module Objectives**

Understand the Fundamentals: The course aims to provide students with a solid understanding of the fundamental concepts and principles related to reservoir characterization. This includes topics such as reservoir properties, fluid behavior, rock types, and basic geological concepts.
Data Acquisition and Analysis: Students will learn various methods and techniques for data acquisition and analysis in reservoir characterization. This includes studying well logs, core samples, seismic data, and other relevant data sources to understand reservoir properties and behavior.
Reservoir Description: The course aims to teach students how to describe reservoirs accurately. This involves interpreting and integrating various data sets to build a comprehensive reservoir description. Students will learn about techniques such as petrophysics, geostatistics, and reservoir modeling.

10. Module Learning Outcomes

By the end of this course, students will be able to analyze and interpret geological, geophysical, and petrophysical data to characterize petroleum reservoirs accurately. They will demonstrate proficiency in techniques such as well logging, seismic interpretation, and core analysis to assess reservoir properties like porosity, permeability, and fluid saturation. Students will develop skills in building reservoir models, integrating multidisciplinary data, and evaluating reservoir heterogeneity. Additionally, they will be able to apply characterization results to optimize reservoir management and improve hydrocarbon recovery strategies.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course focuses on the integration of geological, geophysical, and petrophysical data to describe reservoir properties and behavior. Key topics include rock and fluid properties, porosity, permeability, saturation, and reservoir heterogeneity. Techniques such as well logging, core analysis, seismic interpretation, and reservoir modeling are covered. The course emphasizes data integration for constructing accurate reservoir models, aiding in reserve estimation, reservoir performance prediction, and decision-making for field development and enhanced oil recovery strategies in petroleum engineering.

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General and qualifying transferable skills (other skills related to employability and personal development).

This course focuses on advanced techniques for reservoir characterization, integrating geological, petrophysical, and engineering data to evaluate reservoir properties. Key topics include core analysis, well logging, seismic interpretation, and fluid behavior modeling. Emphasis is placed on using data-driven approaches such as reservoir simulation and geostatistical methods to improve reservoir performance predictions. Students will also explore uncertainty analysis and risk assessment to enhance decision-making in reservoir development and management for optimal hydrocarbon recovery. .

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Reservoir Characterization**.**
Week 2	Introduction to Petrophysical Rock Properties: CAL, SCAL.
Week 3	Introduction to Petrophysical Rock Properties: Wireline methods, and seismic inversion.
Week 4	Rock-Fabric Classification
Week 5	Depositional Textures
Week 6	Depositional Petrophysics
Week 7	Mid term exam
Week 8	Reservoir Data Reconciliation.
Week 9	Reservoir Mapping, and Volumetric.
Week 10	Reservoir Characterization Workflow
Week 11	Reservoir Characterization Workflow
Week 12	• Reservoir Classification.
Week 13	• Reservoir Classification.
Week 14	Final Project and Review Students work on a final project related to Applied Reservoir Engineering. Review of key concepts and topics covered throughout the course. Discussion and presentation of final projects.
Week 15	Exam preparation and review. Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Jensen, J. L., Lake, L. W., Corbett, P. W. M., & Goggin, D. J.** (2000). *Statistics for Petroleum Engineers and Geoscientists* (2nd ed.). Elsevier.	
Recommended Texts	**Tiab, D., & Donaldson, E. C.** (2015). *Petrophysics: Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties* (4th ed.). Gulf Professional Publishing.	
Websites		

MODULE DESCRIPTION FORM

MODULE DESCRIPTION

The syllabus for this course provides a necessary summary of the most important course characteristics and learning outcomes that the teacher can achieve demonstrably if he or she is able to make the most of the learning opportunities available. The alternative must be described.

University of Misan / Engineering College	**University / College** .1
Petroleum Engineering	**Department** .2
Multiphase Flow in Porous Media / PE407	**Module / Name of model Code** .3
Department Requirements	**Study Program** .4
Compulsory	**Student Workload** .5
Course	**Year / Course** .6
Hours 60	**(Totally) No. of hours** .7
2024\10\5	**Scientific Committee Approval Date** .8

9. **Module Objectives**

The Oil Well Test Module is designed to provide students with an in-depth understanding of the principles and techniques involved in testing oil wells. The module covers various aspects of well testing, including planning, design, execution, and interpretation of tests. Students will learn about the equipment and methods used in well testing, as well as the analysis of data obtained from these tests. The module also emphasizes the importance of well testing in reservoir characterization, production optimization, and reservoir management.

10. Module Learning Outcomes

The Well Test module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess reservoir potential, optimize well performance, and make informed decisions regarding production strategies. Well test analysis helps determine reservoir parameters, evaluate well productivity, identify formation damage, and validate reservoir models. The module also emphasizes the significance of data quality, accuracy, and integrity in well testing, ensuring reliable results for reservoir characterization and production forecasting.

Teaching and learning methods

- ✓ The teacher prepares lectures on the subject in electronic (pdf) (and PowerPoint) format and presents them to the students.
- ✓ The teacher delivers lectures in detail.
- ✓ The teacher requests periodic reports, homework, and questions to be answered immediately to ensure students' interaction within the classroom regarding the basic topics of the subject.

Evaluation methods

- ✓ Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- ✓ Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- ✓ Giving part of each semester's grade to homework assignments.
- ✓ Request immediate participation by students.
- ✓ Daily exams and monthly exams for the curriculum and the final exam

Indicative Contents

This course covers fundamental numerical techniques essential for solving petroleum engineering problems. Topics include solving linear and nonlinear equations, interpolation, numerical differentiation and integration, and finite difference methods. Applications focus on fluid flow, heat transfer, and reservoir simulation. Students will also learn about error analysis, stability, and convergence of numerical solutions. Practical sessions involve using computational tools like MATLAB and Python to model and solve real-world petroleum engineering challenges, such as optimizing drilling operations and reservoir performance.

General and qualifying transferable skills (other skills related to employability and personal development).

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Introduction to Multiphase Flow in Porous Media Overview of well testing objectives and applications Types of well tests: drill stem tests, production tests, interference tests Data acquisition and analysis
Week 2	Reservoir Properties and Wellbore Storage Reservoir properties affecting Multiphase Flow in Porous Media analysis Wellbore storage effects and correction methods
Week 3	Well Test Design and Planning Test objectives and design considerations Test types and duration Well test planning process
Week 4	Well Test Equipment Introduction to Multiphase Flow in Porous Media equipment Downhole tools, surface equipment, and measurement devices
Week 5	Well Test Execution Procedures for conducting well tests Safety precautions and operational considerations quiz
Week 6	Pressure Transient Analysis Pressure transient behavior and analysis techniques Pressure buildup and drawdown tests
Week 7	Well Test Interpretation - Analytical Methods Introduction to analytical well test interpretation Pressure derivative and type curve analysis
Week 8	Well Test Interpretation - Numerical Methods Introduction to numerical well test interpretation Finite difference and finite element methods
Week 9	Well Test Interpretation - Unconventional Reservoirs Well test analysis in unconventional reservoirs Challenges and considerations
Week 10	Multi -rate and Multilayer Well Test Analysis Analysis techniques for multi-rate and multilayer reservoirs Interpretation challenges and solutions. Quiz.
Week 11	Well Test Analysis in Fractured Reservoirs Well test analysis in fractured reservoirs Dual porosity and dual permeability models
Week 12	Well Test Analysis in Naturally Fractured Reservoirs Well test analysis in naturally fractured reservoirs

	Fracture matrix interaction models	
Week 13	Well Test Analysis in Gas Reservoirs Analysis techniques for gas reservoirs Deliverability and deliverability testing. Report Due.	
Week 14	Well Test Analysis Case Studies Review and analysis of real-world well test data Interpretation challenges and solutions	
Week 15	Final Project and Exam Preparation Completion of a well test project Exam preparation and review	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	
Websites		