TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This course covers the fundamentals of reservoir engineering which include the description and characterization of the oil and gas reservoirs, calculation of fluid in-place and the recoverable reserves, theory and calculation of fluid flow in porous media, and the influence of aquifer on reservoir performance.	
1. Teaching Institution	Al-Ayen University
2. University Department/Centre	College of Petroleum Engineering
3. Course title/code	Reservoir Engineering II
4. Modes of Attendance offered	Online and classrooms
5. Semester/Year	Academic year 2022/2023
6. Number of hours tuition (total)	72 Theoretical hours+48 lab hours=120Hs
7. Date of production/revision of this specification	15/1/2023
8. Aims of the Course	
• Understanding reservoir flow regimes. • Learning techniques to derive and solve equations of fluid flow in porous media.	

9· Learning Outcomes, Teaching, Learning and Assessment Methods

A- Cognitive goals.

A1. Applying different techniques to find the pressure distribution in oil and gas reservoirs.

A2. Predicting performances of oil and gas reservoirs.

B- The skills goals special to the course.

B1. Using graphs to determine reservoir fluid properties.

B2. Plotting graphs to find different parameters used in the reservoir engineering.

Teaching and Learning Methods

- Lectures
- Discussions, dialogues and questions.
- Group tasks.

Assessment methods

- Quizzes
- Monthly exams
- Homework
- Final exam

C. Affective and value goals

C1. Academic honesty in duties and not use cheating.

C2. Get knowledge about the latest technologies.

Teaching and Learning Methods

- Lectures
- Discussions, dialogues and questions.
- Group tasks.

Assessment methods

- Quizzes
- Monthly exams
- Homework
- Final exam

D. General and rehabilitative transferred skills (other skills relevant to employability and personal development)

D1. Encouraging teamwork and self-confidence to accomplish tasks better.

D2. Encouraging creativity, innovation, and modernization.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3 lecture + 2 tutorial	Fundamental concepts, classification of reservoirs and reservoir fluids, properties of natural gases, properties of crude oil systems, properties of reservoir water, PVT lab tests, porosity, permeability, averaging absolute permeabilities, wettability, capillary pressure of reservoir rocks, relative permeability curves for a water-oil system.	Introduction (Review of Fundamental Concepts of Reservoir Engineering I)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
2	3 lecture + 2 tutorial	Rock and liquid expansion, depletion drive mechanism, gas-cap drive, water-drive mechanism, gravity-drainage-drive mechanism, combination-drive mechanism.	Primary Recovery Mechanisms	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
3	3 lecture + 2 tutorial	Basic assumptions of the MBE, general form of the MBE, reservoir drive indices.	Material Balance Applied to oil Reservoirs (Part 1)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
4	3 lecture + 2 tutorial	MBE as an equation of a straight line, volumetric undersaturated-oil reservoirs, volumetric saturated-oil reservoirs (without a gas cap), gas-cap-drive reservoirs, water-drive reservoirs.	Material Balance Applied to oil Reservoirs (Part 2)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
5	3 lecture + 2 tutorial	Horizontal Linear Flow of Incompressible Fluids, Inclined Flow of Incompressible Fluids, Linear Flow of Compressible Fluids (Gases), Radial Flow of Incompressible Fluids.	Steady-State Flow of Reservoir Fluids (Part 1)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
6	3 lecture + 2 tutorial	Radial Flow of Compressible Fluids (Gases), Pressure-Squared Method, Horizontal Multiple-Phase Flow.	Steady-State Flow of Reservoir Fluids (Part 2)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.

7	3 lecture + 2 tutorial	Radial Flow: Continuity Equation, Transport Equation, Compressibility Equation, Slightly Compressible Fluids, Compressible Fluids.	Unsteady-State Flow of Reservoir Fluids (Part 1)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
8	3 lecture + 2 tutorial	Solution of the Diffusivity Equation, Radial Flow of the Slightly Compressible Fluids, The constant-terminal-rate solution, The Ei-function solution, The dimensionless pressure PD solution, Infinite-acting reservoir, Finite-radial system.	Unsteady-State Flow of Reservoir Fluids (Part 2)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
9	3 lecture + 2 tutorial	Solution of the Diffusivity Equation, Radial Flow of the Compressible Fluids, The m(p) Solution-Mothed, (Exact-Solution), The Pressure-Squared Approximation Method (p2-method)	Unsteady-State Flow of Reservoir Fluids (Part 3)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
10	3 lecture + 2 tutorial	The Pressure-Approximation Method, Pseudosteady-State Flow.	Unsteady-State Flow of Reservoir Fluids (Part 4), Pseudosteady-State Flow (Part 1)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
11	3 lecture + 2 tutorial	Radial Flow of Slightly Compressible Fluids.	Pseudosteady-State Flow (Part 2)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
12	3 lecture + 2 tutorial	Radial Flow of Compressible Fluids (Gases), Pressure-Squared Approximation Method, Pressure-Approximation Method.	Pseudosteady-State Flow (Part 3)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
13	3 lecture + 2 tutorial	Skin Factor: Steady-State Radial Flow, Unsteady-State Radial Flow, Pseudosteady-State Flow.	Skin Factor	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
14	3 lecture + 2 tutorial	Turbulent Flow Factor: Unsteady-State Radial Flow, Semisteady-State Flow, Steady-State Flow.	Turbulent Flow Factor	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
15	3 lecture + 2 tutorial	Principle of Superposition, Effects of Multiple Wells, Effects of Variable Flow Rates.	Principle of Superposition (Part 1)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
16	3 lecture + 2 tutorial	Effects of the Reservoir Boundary, Accounting for Pressure-Change Effects.	Principle of Superposition (Part 2)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
17	3 lecture + 2 tutorial	Classification of Aquifers, Degree of Pressure Maintenance, Outer Boundary	Water Influx (Part 1)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.

		Conditions, Flow Regimes, Flow Geometries, Recognition of Natural Water Influx.			
18	3 lecture + 2 tutorial	Water Influx Models: The Pot Aquifer Model, Schilthuis' Steady-State Model, Hurst's Modified Steady-State Model.	Water Influx (Part 2)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
19	3 lecture + 2 tutorial	The Van Everdingen-Hurst Unsteady-State Model, Edge-Water Drive, Bottom-Water Drive.	Water Influx (Part 3)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
20	3 lecture + 2 tutorial	The Carter-Tracy Water Influx Model, Fetkovich's Method.	Water Influx (Part 4)	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
21	3 lecture + 2 tutorial	Different methods of equations of state.	Equation of State	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
22	3 lecture + 2 tutorial	Gas Reservoirs: The Volumetric Method, The Material Balance Method, Volumetric Gas Reservoirs, Water-Drive Gas Reservoirs.	Gas Reservoirs	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
23	3 lecture + 2 tutorial	Gas-Condensate Reservoirs: Introduction, Calculation of Initial Gas and Oil, the Performance of Volumetric Reservoirs, use of Material Balance.	Gas-Condensate Reservoirs	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.
24	3 lecture + 2 tutorial	Exponential Decline, Harmonic Decline, Hyperbolic Decline.	Decline-Curve Analysis	Theoretical lecture & tutorial	Quizzes, monthly exams, homework, and final exam.

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources) A- Recommended books and references (scientific journals, reports…).	1. Reservoir Engineering Handbook by Tarek Ahmed 2. Applied Petroleum Reservoir Engineering by Craft B.C. and Hawkins, M.F. 3. Fundamentals of Reservoir Engineering by L.P. Dake.
B-Electronic references, Internet sites…	

12. The development of the curriculum plan
Adding more technical skills by introducing more problems.