COURSE OVERVIEW DE0210
Basic Reservoir Engineering for Non-Reservoir Engineers

Course Title
Basic Reservoir Engineering for Non-Reservoir Engineers

Course Date/Venue
December 22-26, 2024/Boardroom, Warwick Hotel Doha, Doha, Qatar

Course Reference
DE0210

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

Oil Reservoirs have been created by complex sedimentary and diagenetic processes, and modified by a history of tectonic change. Reservoirs are complex systems on all scales. Decisions such as pumping and injection, new well placement, and drilling in an active oil field, are typical of the complex relationships between reservoir engineering and oil field/reservoir management.

Reservoir engineering is the application of scientific principles to solve issues arising during the development and production of oil and gas reservoirs. This course covers the engineering operations involved in analysing the production behaviour of oil and gas wells, including well performance engineering, reservoir aspects of well performance, restricted flow into the wellbore, rate decline analysis, and fundamentals of artificial lift.

This course is designed to give participants a detailed overview of the fundamental reservoir engineering to better understand its practices, the required data, its interpretations, the processes and its limitations. Further, the course deals with the basic concepts of fluid flow, leading on with laminar and non-Darcy flow, including multiphase situations, oil and gas reservoirs, from fluid and rock characteristics, production injection analysis, material balance applied to oil reservoirs, immiscible displacement and natural water influx. Case studies will be use throughout the course to demonstrate concepts and real situations.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain a basic knowledge on reservoir engineering
- Discuss the PVT analysis of oil as well as production injection analysis
- Express the general & linear material balance equations applied to oil reservoirs as well as describe Darcy's law and its applications
- Describe the basic differential equation for radial flow in a porous medium as well as the well inflow equations for stabilized flow conditions
- Explain the constant terminal rate solution of the radial diffusivity equation and its application to oilwell testing
- Discuss real gas flow: gas well testing, immiscible displacement and natural water influx

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of reservoir engineering for geologists, petrophysicists, geophysicists, petroleum engineers, production engineers and other technical staff who wants to know the fundamentals of reservoir engineering.

Course Fee

US$ 8,500 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Dr. Saad Aljzwe, PhD, MEng, MSc, BSc, is a **Senior Petroleum & Reservoir Engineer** with over **25 years** of practical and academic experience in the areas of **Petroleum Economic** Analysis, **Economic** Evaluation, **Petroleum Risk** Analysis & Decision Making, **Oil Agreement**, **Reserves Estimation & Uncertainty**, Oil in Place Estimation & Range of Uncertainty, **Exploration & Production** Sharing Agreements, Multidisciplinary Research, Economics & Property Evaluation, Conventional & Unconventional **Oil & Gas Reserves** Estimation, **Reservoir** Management, **Reservoir** Engineering, **Reservoir** Performance Analysis, **Oil Fields Subsurface** Assessment & Forecasting, **Casing** Design, **Drilling & Workover**, **PVT & Core** Analysis, **Production** Operations, **EOR/IOR**, **Field Development** Design & Evaluation, Miscible Gas Injection (**CO2 Injection**) Design & Evaluation, **Special Core Analysis** & Formation Evaluation, **EOR-CO2 Injection**, **Remaining Gas** in Place Estimation, **Material Balance** Method, **Computerized Monitoring & Processing** System Design, **Magnetic Field** Controlling, Comparative **Risk Evaluation & Sensitivity** Analysis, Critical Production Rate for Bottom Water Coning in the Majed (EE-Pool) **Reservoir**, Oil Pipeline **Black Powder Removal**, **Oil Field Water Shutoff Treatment** Methods, **Water-Based Mud Rheological & Fluid Loss Control**, **Empirical Equation**, **Water-Flooding** Performance, **Sandstone Reservoirs**, **Reservoir Fluid** Properties, **Mathematical** Modelling, **Directional Permeability Anisotropy**, **Drilling** Operational Efficiency & Well Cost Reduction, Infill Drilling Program, **Drilling** Efficiency and **Ultra-mud System** Optimization. Further, he is also well-versed in various petroleum software such as the **MBAL** (Reservoir Engineering Toolkit), **KAPPA-Saphir** (Well Testing), **KAPPA-Rubis** (Reservoir Simulation), **CMG** (Reservoir Simulation), **Merak Peep** (Economic Evaluation and Production Decline Analysis) and **Monte Carlo** Simulation.

During Dr. Saad's career, he gained his thorough practical experience through several challenging positions such as the **Senior Lecturer**, **Head** of Petroleum Engineering Department, **Head** of Chemical Engineering Department, **Head** of the Union of Faculty Members, **Assistant Professor**, **Teaching Assistant**, **Researcher** and **Academic Coordinator** from various international well-renowned companies such as the **University of Wyoming**, **Colorado School of Mines**, **American University of Ras Al Khaimah**, **Australian College of Kuwait**, Sirt University and Bright Star University of Technology.

Dr. Saad has **PhD** and **Master** degrees in **Petroleum Engineering** from the **University of Wyoming** and **Colorado School of Mines**, **USA**, respectively as well as **Master** degrees in **Petroleum Economics & Management** and **Reservoir Geosciences & Engineering** from the **Instituit Francias du Petrole**, France and a **Bachelor** degree in **Petroleum Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and a member of the American Society of Petroleum Engineering (**SPE**), Society of Petroleum Resources Economists (**SPRE**), Association of Professional Engineering of Libya, Libyan Society of Earth Science and the Environment Friends Association of Libya. Moreover, he is an **author/co-author** and published **various research papers** in local and international scientific journals and conferences. He has further delivered numerous trainings, courses, workshops, seminars and conferences globally.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 22nd of December 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Some Basic Concepts in Reservoir Engineering*** *Calculation of Hydrocarbon Volumes • Fluid Properties • Fluid Pressure Regimes • Oil Recovery: Recovery Factor • Volumetric Gas Reservoir Engineering*
0930 – 0945	*Break*
0945 – 1100	***Some Basic Concepts in Reservoir Engineering (cont'd)*** *Application of the Real Gas Equation of State • Gas Material Balance: Recovery Factor • Hydrocarbon Phase Behaviour*
1100 – 1230	***PVT Analysis for Oil*** *Definition of the Basic PVT Parameters • Collection of Fluid Samples • Determination of the Basic PVT Parameters in the Laboratory and Conversion for Filed Operating Conditions*
1230 – 1245	*Break*
1245 – 1420	***PVT Analysis for Oil (cont'd)*** *Alternative Manner of Expressing PVT Laboratory Analysis Results • Complete PVT Analysis*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2: ***Monday, 23rd of December 2024***

0730 – 0830	***Production Injection Analysis***
0830 – 0930	***Material Balance Applied to Oil Reservoirs*** *General Form of the Material Balance Equation for a Hydrocarbon Reservoir • The Material Balance Expressed as a Linear Equation • Reservoir Drive Mechanisms • Solution Gas Drive*

0930 – 0945	Break
0945 – 1100	***Material Balance Applied to Oil Reservoirs (cont'd)*** *Gascap Drive • Natural Water Drive • Compaction Drive & Related Pore Compressibility Phenomena*
1100 – 1230	***Darcy's Law & Applications*** *Darcy's Law: Fluid Potential • Sign Convention • Units: Units Conversion • Real Gas Potential*
1230 – 1245	Break
1245 – 1420	***Darcy's Law & Applications (cont'd)*** *Datum Pressures • Radial Steady State Flow: Well Stimulation • Two-Phase Flow: Effective & Relative Permeabilities • The Mechanics of Supplementary Recovery*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3: Tuesday, 24th of December 2024

0730 – 0930	***The Basic Differential Equation for Radial Flow in a Porous Medium*** *Derivation of The Basic Radial Flow Equation • Conditions of Solution*
0930 – 0945	Break
0945 – 1100	***The Basic Differential Equation for Radial Flow in a Porous Medium (cont'd)*** *The Linearization of Equation 5.1 for Fluids of Small & Constant Compressibility*
1100 – 1230	***Well Inflow Equations for Stabilized Flow Conditions*** *Semi-Steady State Solution • Steady State Solution*
1230 – 1245	Break
1245 – 1420	***Well Inflow Equations for Stabilized Flow Conditions (cont'd)*** *Example of the Application of the Stabilized Inflow Equations • Generalized Form of Inflow Equation Under Semi Steady State Conditions*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4: Wednesday, 25th of December 2024

0730 – 0930	***The Constant Terminal Rate Solution of The Radial Diffusivity Equation & Its Application to Oilwell Testing*** *The Constant Terminal Rate Solution • The Constant Terminal Rate Solution for Transient & Semi Steady State Flow • Dimensionless Variables • Superposition Theorem: General Theory of Well Testing • The Matthews, Brons, Hazebroak Pressure Build-Up Theory*
0930 – 0945	Break
0945 – 1100	***The Constant Terminal Rate Solution of The Radial Diffusivity Equation & Its Application to Oilwell Testing (cont'd)*** *Pressure Build-Up Analysis Techniques • Multi-Rate Drawdown Testing • The Effects of Partial Well Completion • Some Practical Aspects of Well Surveying • Pressure Surveys • Afterflow Analysis*

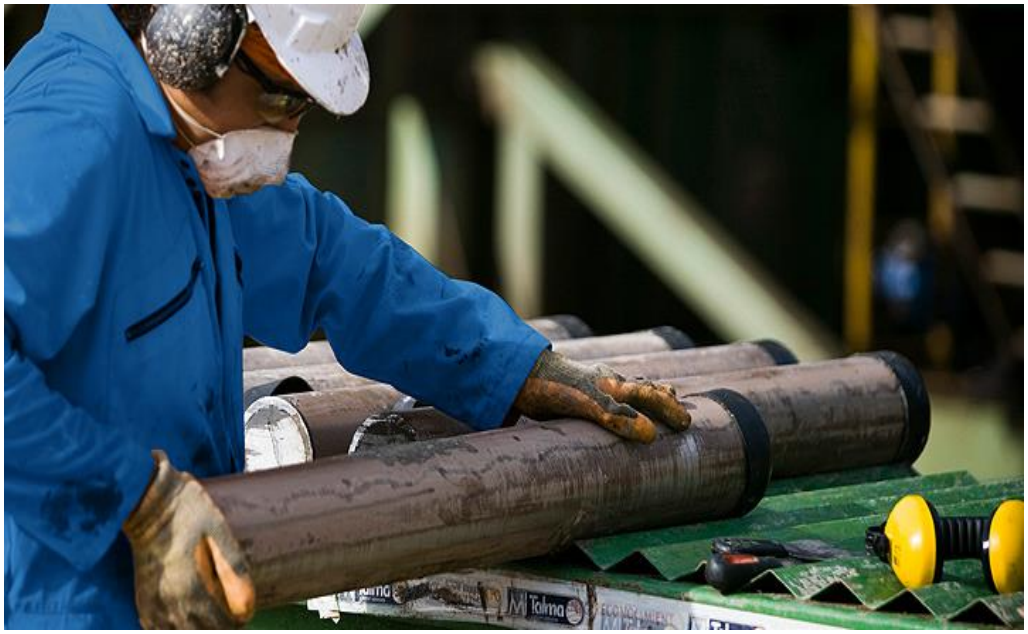
1100 – 1230	***Real Gas Flow: Gas Well Testing*** *Linearization & Solution of the Basic Differential Equation for the Radial Flow of a Real Gas • The Russell, Goodrich, Et. Al, Solution Technique • Comparison of the Pressure Squared & Pseudo Pressure Solution Techniques • Non-Darcy Flow • Determination of the Non-Darcy Coefficient F • The Constant Terminal Rate Solution for the Flow of A Real Gas*
1230 – 1245	*Break*
1245 – 1420	***Real Gas Flow: Gas Well Testing (cont'd)*** *General Theory of Gas Well Testing • Multi-Rate Testing of Gas Wells • Pressure Build-Up Testing of Gas Wells • Pressure Build-Up Analysis in Solution Gas Drive Reservoirs • Summary of Pressure Analysis Techniques*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5: ***Thursday, 26th of December 2024***

0730 – 0930	***Natural Water Influx*** *The Unsteady State Influx Theory of Hurst & Van Everdingen • Application of the Hurst, Van Everdingen Water Influx Theory in History Matching • The Approximate Water Influx Theory of Fetkovitch for Finite Aquifers*
0930 – 0945	*Break*
0945 – 1100	***Natural Water Influx (cont'd)*** *Predicting The Amount of Water Influx • Application of Influx Calculations to Steam Soaking*
1100 – 1230	***Immiscible Displacement*** *Physical Assumptions & Their Implications • The Fractional Flow Equation • Buckley-Leverett One Dimensional Displacement • Oil Recovery Calculations • Displacement Under Segregated Flow Conditions*
1230 – 1245	*Break*
1245 – 1345	***Immiscible Displacement (cont'd)*** *Allowance for The Effect of a Finite Capillary Transition Zone in Displacement Calculations • Displacement in Stratified Reservoirs • Displacement When There is a Total Lack of Vertical Equilibrium • The Numerical Simulation of Immiscible, Incompressible Displacement*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes the real-life case studies and exercises:-



Course Coordinator

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