COURSE OVERVIEW DE0967
Wellbore Stability & Geomechanics

Course Title
Wellbore Stability & Geomechanics

Course Reference
DE0967

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

Course Date/Venue

Session(s)	Date	Venue
1	March 03-07, 2024	Oryx Meeting Room, DoubleTree By Hilton Doha-Al Sadd, Doha, Qatar
2	September 08-12, 2024	
3	October 20-24, 2024	

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.

This course is designed to examine the complexity of wellbore stability/drillability analysis in drilling operations with a view to optimizing well planning, construction and post evaluation procedures. Geomechanical models developed from data acquired during previous drilling operations along with log and seismic information will be introduced. Application of real time well bore stability management system through monitoring of surface and down hole drilling parameters, cuttings inspection, drilling fluids and log data analysis provide necessary tools to prevent avoidable instability issues. It is hoped that by combining drilling logs, offset well data and drilling technologies driven by a proper understanding by participants of the geomechanical profile of prospects, future wells will be successfully constructed in terms of cost savings and minimizing time overruns on drilling projects.

The course discusses the fundamental theories that are critical in current well designs and well instability problems. It looks at the issues of rock properties, subsurface stresses and methods for the prediction of rock behaviour under varying operational conditions. The impact of rock and well instability on well economics is emphasized. Well bore instability has continued to be a major cause of non-productive time and cost over runs in several fields while drilling, causing delays and well suspension before reaching drilling targets.

The course is suitable for those involved in petroleum related exploration or well planning without detailed geomechanical experience. It introduces the fundamental concepts underpinning any geomechanical study such as rock properties the relationship between stress and strain, sources of stress and the components of a full stress tensor.

Techniques for estimating rock properties and the stress components are presented with related data requirements. Geomechanical implications for the petroleum industry are discussed and methods for assessing geomechanical risks of wellbore instability, fault seal integrity and sand production are addressed.

Course Objectives

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

- Apply and gain a comprehensive knowledge on wellbore stability-geomechanics
- Define geomechanics and discuss stress, strain and failure
- Differentiate the relationship between stress and strain as well as elastic versus brittle versus plastic deformation
- Explain the principal stress magnitudes, shear stress, normal stress, stress tensor, plate boundary forces and the effect of local structure
- Describe the in situ stress tensor covering reference states, vertical stress, maximum and minimum horizontal stress, andersonian classification, pore pressure stress coupling, rock properties, failure envelopes and tensors with mohr diagrams
- Determine rock mechanical properties from petroleum data including elastic properties and rock strength
- Carryout stress determination from petroleum data comprising of data QC, vertical stress magnitude, stresses around a wellbore, horizontal stress orientation, interpreting image log and calliper data, minimum and maximum horizontal stress magnitude and wireline stress estimates
- Employ petroleum applications for well planning, predictive wellbore stability, structural permeability, sanding and implications for fracture stimulation

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 wellbore stability-geomechanics for drilling petroleum engineers and professionals, well engineers, reservoir engineers, production engineers, drillers, drilling managers, operations staff, well planners, geophysicists, petrophysicists, geologists, academic research staff and well completion engineers.

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:

Mr. Sigve Hamilton, MSc, BSc, is a **Senior Drilling & Petroleum Engineer** with over **20 years** of **onshore & offshore** experience within the **Oil & Gas**, **Refinery** and **Petroleum** industries. His specialization widely covers in the areas of **Advanced Drilling** Operation Management, **Drilling Fluid** Technology, **Directional & Horizontal Drilling**, **Drilling** Optimization & Well Planning, **Drilling** Operation Management, **Drilling** Control & Operation, **Drilling & Completion** Design, **Drilling & Stuck Pipe** Prevention, **Gas Lift** Operations, **Gas Lift** Design & Technology, **Production** Technology, **Production Logging**, **Well Logging**, **Well Test** Analysis, **Well Testing** Procedures & Evaluation, **Well** Performance & **Control**, **Wellhead** Operations, **Wellhead** Design, **Tubing Design & Casing**, **Well Production** Optimization, **Well Control & Blowout** Prevention, **Coiled Tubing** Technology, **Coring & Core** Analysis, **Core & Log Integration**, **Core Logging**, **Carbonate & Seismic Sequence** Stratigraphy, **Completion & Casing** Design, **CO_2 & Injection** System, **Fracture** Characterization & Modelling, **PVT** Analysis, **Fluid** Mechanics, **Fluid** Dynamics, Water Shutoff, **Water Injection** Technology, **Water Flooding**, **Petroleum** Engineering, **Petroleum Geology**, **Petroleum** Physics, **Petroleum** Data Management, **Petroleum** Exploration, **Reservoir** Engineering & Management, **Reservoir** Simulation, **Reservoir** Geophysics, **Naturally Fractured Reservoir**, **Streamline** Simulation, **Carbonate Rocks & Siliciclastic Rocks**, Applied **Rock Mechanics**, **Rock Physics**, Sedimentology & Sequence Stratigraphy, Special Core Analysis, **Artificial Lift** Design, **Enhanced Oil Recovery**, **Subsurface Production** Operation, **Rig** Inspection, **Logging**, **Hydraulic & Pneumatic**, Heterogeneity Modelling for Reservoir Characterization, Prosper, 3D Geological Modelling, Property & Heterogeneity Modelling, IRAP RMS Streamlines, Grid Design & Upscaling for Reservoir Simulation and MBAL, Prosper and GAP Software,

During his career life, Mr. Hamilton held significant positions and dedication as the **Petroleum Engineer**, **Drilling Engineer**, **Petroleum/QHSE Engineer**, **Reservoir Engineer**, **Field Manager**, **Laboratory Engineer**, **Mudlogging Geologist**, **Geoscientist, Petroleum/Production Engineer & Consultant**, **Project Engineer/Risk Advisor**, **Petroleum Consultant/Advisor**, **Inspector/Study Leader** and **Senior Instructor/Lecturer** from various companies and universities such as the University of Akureyri (UNAK), Stavanger Offshore Technical School, Akademiet, Peteka, FMC Technologies, Gerson Lehrman Group, Ocean Rig, Oilfield Technology Group, Talisman, IOR Chemco, Geoservices, ResLab and Roxar.

Mr. Hamilton has a **Master's** degree in **Petroleum Engineering** and a **Bachelor's** degree in **Reservoir Engineering** from **The University of Stavanger**, **Norway**. Further, he is a **Certified Instructor/Trainer** and delivered numerous trainings, workshops, courses, seminars and conferences internationally.

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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction*** *What is Geomechanics? ● Stress, Strain & Failure ● Why Should you Care about Geomechanics?*
0930 – 0945	*Break*
0945 – 1100	***Stress & Strains*** *The Relationship Between Stress & Strain ● Elastic vs Brittle vs Plastic Deformation ● The Principal Stress Magnitudes*
1100 – 1215	***Stress & Strains (cont'd)*** *Shear Stress & Normal Stress ● Stress Tensor*
1215 – 1230	*Break*
1230 – 1420	***Stress & Strains (cont'd)*** *Plate Boundary Forces ● Effect of Local Structure*
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

0730 – 0930	***The in Situ Stress Tensor*** *Reference States ● Vertical Stress*
0930 – 0945	*Break*
0945 – 1100	***The in situ Stress Tensor (cont'd)*** *Maximum Horizontal Stress ● Minimum Horizontal Stress*
1100 – 1215	***The in situ Stress Tensor (cont'd)*** *Andersonian Classification ● Pore Pressure Stress Coupling*
1215 – 1230	*Break*

1230 – 1420	***The in situ Stress Tensor (cont'd)*** *Rock Properties & Failure Envelopes ● Visualising Stress Tensors with Mohr Diagrams*
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

0730 – 0930	***Determining Rock Mechanical Properties from Petroleum Data*** *Elastic Properties*
0930 – 0945	*Break*
0945 – 1100	***Determining Rock Mechanical Properties from Petroleum Data (cont'd)*** *Elastic Properties*
1100 – 1215	***Determining Rock Mechanical Properties from Petroleum Data*** *Rock Strength*
1215 – 1230	*Break*
1230 – 1420	***Determining Rock Mechanical Properties from Petroleum Data (cont'd)*** *Rock Strength*
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

0730 – 0930	***Stress Determination from Petroleum Data*** *Data QC ● Vertical Stress Magnitude ● Stresses Around a Wellbore ● Horizontal Stress Orientation*
0930 – 0945	*Break*
0945 – 1100	***Stress Determination from Petroleum Data (cont'd)*** *Interpreting Image log & Calliper Data ● Minimum Horizontal Stress Magnitude (Hydraulic Fracture Tests Theory & Description)*
1100 – 1215	***Stress Determination from Petroleum Data (cont'd)*** *Maximum Horizontal Stress Magnitude (Breakout Occurrence & Rock Strength, Drilling Induced Tensile Fracture Occurrence & Rock Strength, Frictional Limits, Breakout Width, Stresses around Arbitrarily Inclined Wellbores)*
1215 – 1230	*Break*
1230 – 1420	***Stress Determination from Petroleum Data (cont'd)*** *Wireline Stress Estimates (1D Geomechanical Models) (Rock Physics, Geological Environment)*
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

0730 – 0930	***Petroleum Applications*** *Well Planning ● Predictive Wellbore Stability (Generic WBS, Trajectory WBS, Drilling Optimisation)*
0930 – 0945	*Break*
0945 – 1100	***Petroleum Applications (cont'd)*** *Structural Permeability (Fault Seal Analysis, Fracture Permeability)*
1100 – 1215	***Petroleum Applications (cont'd)*** *Sanding*
1215 – 1230	*Break*
1230 – 1345	***Petroleum Applications (cont'd)*** *Implications for Fracture Stimulation*
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 real-life case studies and exercises:-

Course Coordinator

Jaryl Castillo, Tel: +974 4423 1327, Email: jaryl@haward.org