

**COURSE OVERVIEW DE0967**  
**Wellbore Stability & Geomechanics**

**Course Title**

Wellbore Stability & Geomechanics

**Course Date/Venue**

September 08-12, 2024/Samriya Meeting Room, Doubletree By Hilton Doha-AI Sadd, Doha, Qatar

**Course Reference**

DE0967

**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.***



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: -

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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.

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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. John Petrus, PhD, MSc, BSc**, is a **Senior Reservoir Engineer & Geologist** with over **30 years of onshore & offshore** experience within the **Oil & Gas, Refinery and Petroleum** industries. His wide experience covers in the areas of **Advanced Pressure-Volume-Temperature (PVT), Production Technology & Engineering, Well Completions, Well Logs, Well Stimulation & Production Logging, Well Completion Design & Operation, Well Surveillance, Well Testing, Well Stimulation & Control and Workover Planning, Completions & Workover, Hole Cleaning & Logging, Servicing and Work-Over Operations, Wellhead Operations, Maintenance & Testing, Petrophysics/Interpretation of Well Composite, Reservoir & Tubing Performance, Practical Reservoir Engineering, Clastic Exploration & Reservoir Sedimentology, Carbonate Reservoir Characterization & Modeling, Seismic Interpretation, Mapping & Reservoir Modelling, Reservoir Geology, Integrating Geoscience into Carbonate Reservoir Management, Faulted & Fractured Reservoirs, Fractured Hydrocarbon Reservoirs, Analyses, Characterisation & Modelling of Fractured Reservoirs & Prospects, Fracture Reservoir Modeling Using Petrel, Reservoir Engineering Applied Research, Artificial Lift, Artificial Lift System Selection & Design, Electrical Submersible Pumps (ESP), Enhance Oil Recovery (EOR), Hydraulic Fracturing, Sand Control Techniques, Perforating Methods & Design, Perforating Operations, Petroleum Exploration & Production, Hydrocarbon Exploration & Production, Exploration & Production, Play Assessment & Prospect Evaluation, Formation Evaluation, Petroleum Engineering Practices, Petroleum Hydrogeology & Hydrodynamics, Project Uncertainty, Decision Analysis & Risk Management, Decision Analysis & Uncertainty Management, Exploration & Development Geology, Sedimentology & Sequence Stratigraphy, Structural Interpretation in Exploration & Development, Petrel Geology, Geomodeling, Structural Geology, Applied Structural Geology in Hydrocarbon Exploration, Petrophysics, Geology of the Oil & Gas Field, Geophysics, Geothermal, Geochemical & Geo-Engineering and Drilling Applied Research, Field Geological Outcrop Mapping & Digital Cartography, Geological Modelling, Geoscience Management in E&P, Geoscience Modelling, Geological Mapping, Structural Geology-Tectonics, Structural Analysis, Tectonic Modelling and Numerical Simulation of Fractured Prospects & Reservoirs, Fracture Network Analysis & Modelling, Prospect Generation, Global Networking, Research and Technology Development Management for Fault & Fracture Analyses & Modelling, Fracture Modelling, Dynamic Modelling, Field Development Planning, Water Injection Planning, Stereophotogrammetry, Fault Mapping, GPS Survey, 2D & 3D Seismic Acquisition & Processing, 3D Seismic Surveys & Mapping, 3D GIS, GMAP, Sandbox Modelling, Sedimentological Logging, GR Logging, Surface & Subsurface 3D Modelling, Best Practices Management System (BPMS), Subsurface Work for Energy Projects, Digitalization Projects, Structural Model using Petrel, G&G Seismic & Well Data Modelling, GIS System Management, Database Management, Strategic Planning, Best Practices and Workflow, Quality Management, Project Management and Risk Assessment & Uncertainty Evaluation. Further, he is also well-versed in **seismic interpretation, mapping & reservoir modelling tools** like **Petrel** software, **LandMark, Seisworks, Geoframe, Zmap** and has extensive knowledge in **MSDos, Unix, AutoCAD, MAP, Overlay, Quicksurf, 3DStudio, Esri ArcGIS, Visual Lisp, Fortran-77 and Clipper**. Moreover, he is a world **expert** in **analysis and modelling of fractured prospects and reservoirs** and a **specialist and developer** of **fracture modelling software tools** such as **FPDM, FMX and DMX** Protocols.**

During his career life, Dr. Petrus held significant positions and dedication as the **Executive Director, Senior Geoscience Advisor, Exploration Manager, Project Manager, Manager, Chief Geologist, Chief of Exploration, Chief of Geoscience, Senior Geosciences Engineer, Senior Explorationist, Senior Geologist, Geologist, Senior Geoscientist, Geomodeller, Geoscientist, CPR Editor, Resources Auditor, Project Leader, Technical Leader, Team Leader, Scientific Researcher and Senior Instructor/Trainer** from various international companies and universities such as the **Dragon Oil Holding Plc., ENOC, MENA, ENI Group of Companies, Ocre Geoscience Services (OGS), Burren RPL, Ministry of Oil-Iraq, Eni Corporate University, Stanford University, European Universities, European Research Institutes, NorskHydro Oil Company, Oil E&P Companies**, just to name a few.

Dr. Petrus has a **PhD in Geology and Tectonophysics** and **Master's and Bachelor's degree in Earth Sciences** from the **Utrecht University, The Netherlands**. Further, he is a **Certified Instructor/Trainer, a Certified Trainer/Assessor/Internal Verifier** by the **Institute of Leadership & Management (ILM)**, a **Secretary and Treasurer of Board of Directors of Multicultural Centre, Association Steunfonds SSH/SSR and Founding Member of Sfera Association**. He has further published several scientific publications, journals, research papers and books 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: Sunday, 08<sup>th</sup> of September 2024**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Introduction</b> What is Geomechanics? • Stress, Strain & Failure • Why Should you Care about Geomechanics?
0930 – 0945	Break
0945 – 1100	<b>Stress &amp; Strains</b> The Relationship Between Stress & Strain • Elastic vs Brittle vs Plastic Deformation • The Principal Stress Magnitudes
1100 – 1215	<b>Stress &amp; Strains (cont'd)</b> Shear Stress & Normal Stress • Stress Tensor
1215 – 1230	Break
1230 – 1420	<b>Stress &amp; Strains (cont'd)</b> Plate Boundary Forces • Effect of Local Structure
1420 – 1430	<b>Recap</b> 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, 09<sup>th</sup> of September 2024**

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



1230 – 1420	<b>The in situ Stress Tensor (cont'd)</b> Rock Properties & Failure Envelopes • Visualising Stress Tensors with Mohr Diagrams
1420 – 1430	<b>Recap</b> 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, 10<sup>th</sup> of September 2024**

0730 – 0930	<b>Determining Rock Mechanical Properties from Petroleum Data</b> Elastic Properties
0930 – 0945	Break
0945 – 1100	<b>Determining Rock Mechanical Properties from Petroleum Data (cont'd)</b> Elastic Properties
1100 – 1215	<b>Determining Rock Mechanical Properties from Petroleum Data</b> Rock Strength
1215 – 1230	Break
1230 – 1420	<b>Determining Rock Mechanical Properties from Petroleum Data (cont'd)</b> Rock Strength
1420 – 1430	<b>Recap</b> 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, 11<sup>th</sup> of September 2024**

0730 – 0930	<b>Stress Determination from Petroleum Data</b> Data QC • Vertical Stress Magnitude • Stresses Around a Wellbore • Horizontal Stress Orientation
0930 – 0945	Break
0945 – 1100	<b>Stress Determination from Petroleum Data (cont'd)</b> Interpreting Image log & Calliper Data • Minimum Horizontal Stress Magnitude (Hydraulic Fracture Tests Theory & Description)
1100 – 1215	<b>Stress Determination from Petroleum Data (cont'd)</b> 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	<b>Stress Determination from Petroleum Data (cont'd)</b> Wireline Stress Estimates (1D Geomechanical Models) (Rock Physics, Geological Environment)
1420 – 1430	<b>Recap</b> 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, 12<sup>th</sup> of September 2024**

0730 – 0930	<b>Petroleum Applications</b> Well Planning • Predictive Wellbore Stability (Generic WBS, Trajectory WBS, Drilling Optimisation)
0930 – 0945	Break
0945 – 1100	<b>Petroleum Applications (cont'd)</b> Structural Permeability (Fault Seal Analysis, Fracture Permeability)
1100 – 1215	<b>Petroleum Applications (cont'd)</b> Sanding
1215 – 1230	Break
1230 – 1345	<b>Petroleum Applications (cont'd)</b> Implications for Fracture Stimulation
1345 – 1400	<b>Course Conclusion</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 – 1415	<b>POST-TEST</b>
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**

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