COURSE OVERVIEW DE0893
Practical Seismic Interpretation with Petrel

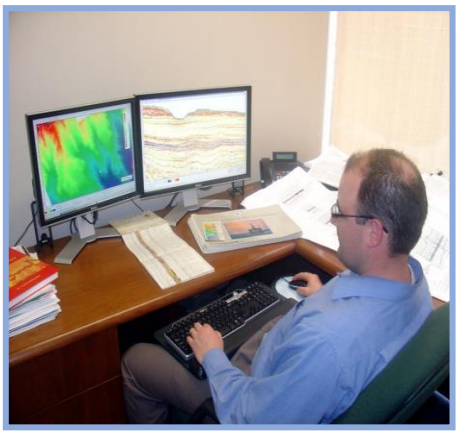
Course Title
Practical Seismic Interpretation with Petrel

Course Date/Venue
Please refer to page 3

Course Reference
DE0893

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

Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

The main objective of this course is to provide E&P professionals with the opportunity to develop hands-on experience of various seismic interpretation techniques using the Petrel software package. The course will cover the essential geological and geophysical information necessary to visualize and interpret seismic data. Participants of the course will gain a solid understanding of the applications and role of the seismic interpreter in studies that involve post-stack seismic attributes, AVO, seismic sequence stratigraphy, seismic geomorphology, 4D time-lapse seismic, and multidisciplinary integration.

A significant percentage of the course is dedicated to reinforcement and advancement of interpretation techniques using practical exercises – both on the Petrel software and by hand. This will guide the participants in the understanding that the integration of all available data into the seismic model will add value in the needed coherent and successful seismic predictions that result from an interpretation.

Further, this course will also discuss the seismic functionality in Petrel workflow tools; the random intersections, generating surface and variogram from attribute maps and importing check shots; the correct sonic log and establishing time – depth relation; generating wavelets and making synthetic seismogram; comparing seismogram with real well seismic; the seismic data interpretation using Petrel software; the applications, importing well seismic data, SEG-Y file parameters, well to seismic tie, seismic – data visualization and seismic data viewing; the advanced quantitative seismic interpretation and Petrel quantitative interpretation; and the synthetics generation, well to seismic matching and rock physics.

During this interactive course, participants will learn the Petrel advance geophysics, Petrel quantitative interpretation, accurate and comprehensive quantitative interpretation and direct hydrocarbon indicators (DHI) – fractured; the seismic attributes, spectral attributes, relative acoustic impedance supervised classification, spectral decomposition, reservoir thickness estimate and spectral attributes; the shear wave techniques, quantitative interpretation for inversion and simulation and contributions of seismic in Petrel reservoir modelling; the 3D structural modeling, 3D property modeling, facies modeling, and fracture modeling volume calculations; the data analysis and plotting; the Petrel user interface, visualization and statistics; importing well seismic data, data viewports, seismic data viewing and well correlation; the well templates well tops – flattening and interactive facies interpretation; and the seismic interpretation workflow, mapping, plotting and creating maps.

Course objectives

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

- Apply and gain an in-depth knowledge on 3D seismic horizon and fault interpretation
- Discuss seismic functionality in Petrel workflow tools and create random intersections
- Generate surface and variogram from attribute maps and import check shots
- Apply correct sonic log and establish time – depth relation
- Generate wavelets and make synthetic seismogram as well as compare seismogram with real well seismic
- Carryout seismic data interpretation using Petrel software
- Illustrate property applications, importing well seismic data, SEG-Y file parameters, well to seismic tie, seismic – data visualization and seismic data viewing
- Employ advanced quantitative seismic interpretation using Petrel quantitative interpretation
- Discuss synthetics generation, well to seismic matching and rock physics
- Determine Petrel advance geophysics, Petrel quantitative interpretation, accurate and comprehensive quantitative interpretation and direct hydrocarbon indicators (DHI)
- Explain seismic attributes, spectral attributes, relative acoustic impedance supervised classification, spectral decomposition, reservoir thickness estimate and spectral attributes
- Apply shear wave techniques, quantitative interpretation for inversion and simulation and contributions of seismic in Petrel reservoir modelling
- Illustrate 3D structural modeling, 3D property modeling, facies modeling, fracture modeling and volume calculations, data analysis and plotting
- Recognize Petrel user interface, visualization and statistics
- Import well seismic data and apply data viewports, seismic data viewing and well correlation
- Create and apply well templates covering well tops – flattening and interactive facies interpretation
- Illustrate the seismic interpretation workflow, mapping, plotting and creating maps

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 3D seismic horizon and fault interpretation for geoscientists, organizations and individuals that are migrating to Petrel from Interpretation Window-focused software as well as staff that may be sheltering in a serial 2D approach to 3D interpretation. It can also be adapted to accommodate geoscientists without an interpretation background such graduates, geomodellers and processing geophysicists.

Course Date/Venue

Session(s)	Date	Venue
1	February 18-22, 2024	Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar
2	April 28-May 02, 2024	
3	September 29-October 03, 2024	
4	December 22-26, 2024	

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

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.

Accommodation

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

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.

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:

Ms. Diana Helmy, PgDip, MSc, BSc, is a **Senior Petroleum & Geologist** with extensive years of experience within the **Oil & Gas**, **Refinery** and **Petrochemical** industries. Her expertise widely covers in the areas of **Tubular & Pipe** Handling, **Tubular Strength**, **Casing & Tubing** Design, **Production/Injection Loads** for Casing Strings & Tubing, **Drilling** Loads, **Drilling & Production Thermal** Loads, **Well** Architecture, **Wellhead Integrity**, **Well Integrity & Artificial Lift**, **Well Integrity** Management, **Well** Completion & Workover, Applied **Drilling** Practices, Horizontal **Drilling**, **Petroleum** Production, **Resource & Reserve Evaluation**, **Reserves Estimation & Uncertainty**, Methods for **Aggregation of Reserves & Resources**, **Horizontal & Multilateral Wells**, **Well Completion & Stimulation**, **Artificial Lift System Selection & Design**, **Well** Testing & Oil Well Performance, **Well** Test Design Analysis, **Well Test** Operations, **Well Testing & Perforation**, **Directional** Drilling, **Formation Damage** Evaluation & Preventive, **Formation Damage** Remediation, **Drilling & Formation Damage**, Simulation Program for The **International Petroleum Business**, **Well** Testing & Analysis, **Horizontal & Multilateral Wells & Reservoir** Concerns, **Oil & Gas Analytics**, **Petrophysics & Reservoir Engineering**, **Subsurface Geology & Logging** Interpretation, **Petroleum Geology**, **Geophysics**, **Seismic** Processing & Exploration, **Seismic** Interpretation, **Sedimentology**, **Stratigraphy & Biostratigraphy**, **Petroleum Economy**, **Core** Analysis, Well Logging Interpretation, **Core Lab Analysis** & **SCAL**, **Sedimentary Rocks**, **Rock** Types, Core & Ditch Cuttings Analysis, Clastic, Carbonate & Basement Rocks, **Stratigraphic Sequences**, **Petrographically** Analysis, Thin Section Analysis, Scanning Electron Microscope (**SEM**), X-ray Diffraction (**XRD**), Cross-Section Tomography (**CT**), **Conventional & Unconventional** Analysis, **Porosity & Permeability**, **Geological & Geophysical** Model, **Sedimentary** Facies, **Formation Damage** Studies & Analysis, **Rig** Awareness, 2D&3D **Seismic** Data Processing, Static & Dynamic Correction, Noise Attenuation & Multiple Elimination Techniques, Velocity Analysis & Modeling and various software such as Petrel, OMEGA, LINUX, Kingdom and Vista. She is currently a **Senior Consultant** wherein she is responsible in different facets of **Petroleum & Process Engineering** from managing **asset integrity**, **well integrity process**, **pre-commissioning/commissioning** and **start up** onshore & offshore process facilities.

During her career life, Ms. Diana worked as a **Reservoir Geologist**, **Seismic Engineer**, **Geology Instructor**, **Geoscience Instructor & Consultant** and **Petroleum Geology Researcher** from various international companies like the **Schlumberger**, Corex Services for Petroleum Services, Petrolia Energy Supplies and Alexandria University.

Ms. Diana has a **Postgraduate Diploma** in **Geophysics**, **Master** degrees in **Petroleum Geology** and **Geophysics** and a **Bachelor's** degree in **Geology**. Further, she is a **Certified Trainer/Assessor/Internal Verifier** by the **Institute of Leadership & Management** (**ILM**) and has delivered numerous trainings, courses, workshops, seminars and conferences internationally.

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 – 0745	*Registration & Coffee*
0745– 0800	*Welcome & Introduction*
0800 – 0815	***PRE-TEST***
0815– 0830	***Seismic Functionality in Petrel Workflow Tools***
0830 – 0845	***Seismic Functionality Updates***
0845 – 0900	***Introduction to Seismic Updates***
0900 – 0930	***New Seismic Functionalities***
0930 – 0945	***Seismic Data Visualization in Base Map Window***
0945– 1000	***Create Random Intersections***
1000 – 1015	*Break*
1015 – 1030	***Optional Survey Manager***
1030 – 1045	***Optional; Miss -Tie Analysis***
1045 – 1100	***Attribute Maps***
1100 – 1200	***Generate Surface & Variogram from Attribute Maps***
1200 – 1215	***Synthetic Seismogram - Slides***
1215 – 1230	***Make Well Section***
1230 - 1245	*Break*
1245 – 1300	***Import Check Shots***
1300 – 1315	***Correct Sonic Log & Establish Time – Depth Relation***
1315 – 1330	***Make Acoustic Impedance Log & Reflection Coefficient Series***
1330 – 1345	***Generate Wavelets & Make Synthetic Seismogram***
1345 – 1400	***Compare Seismogram with Real Well Seismic***
1400 - 1420	***Manual Adjustment & Event Picking***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0800	***Display the Synthetic Trace in a 3D & Interpretation Window***
0800- 0830	***Non-Global Deal Functionalities***
0830 – 0900	***Introduction to Ant-Tracking***
0900 – 0930	***Generate the Structural Smoothing Attribute Cube***
0930– 0945	***Seismic Data Interpretation Using Petrel Software: Workflow*** *Introduction • Project Setup • Types of Data • Petrel User Interface • Data Import, Export, Viewing & Q.C • Well Correlation (Geology & Synthetic Seismogram) • Seismic Data Interpretation • Mapping*
0945 - 1000	***Applications*** *Seismic Data Loading • Well Data Loading (Well Head, Well Trajectory, Well Logs, Check – Shot & Well Tops) •Assigning Check – Shots to Well Data • Creating Synthetic Seismogram • Seismic Attributes • Depth Conversion of Horizon C & Applying Well Adjustment • Maps of Depth Surface*
1000 – 1015	*Break*

1015 – 1030	***Import Well Seismic Data*** *Well Velocity Survey • Check Shots & VSP (Using Petrel Software)*
1030 – 1045	***Seismic Data Import***
1045 – 1100	***SEG-Y File Parameters*** *X & Y Coordinates of the Survey • Inline & Xline Position in the Header • CDP & SP Positions*
1100 – 1200	***Well to Seismic Tie*** *Synthetic to Seismic Matching - Well Ties Using Petrel Software • Time Depth Table • Well Synthetic Seismograms • VSP & Well Seismic*
1200 – 1215	***Seismic – Data Visualization*** *Random / Arbitrary Seismic Lines*
1215 – 1230	***Seismic Data Viewing***
1230 - 1245	*Break*
1245 – 1300	***Introduction to Seismic Interpretation***
1300 – 1315	***Seismic Interpretation Workflow*** *Seismic Data Displaying • Generate Attribute Cubes • Automatic Fault Extraction Workflow • Manual Fault Interpretation • Horizon Interpretation • Time to Depth Conversion (Video) • Mapping & Plotting • Time to Depth Maps • Seismic Attributes (Coherence, Spectral Decomposition, Sweetness & DHI*
1315 – 1330	***Import Data*** *Well Survey • Formation Top • Check Shots & Seismic Survey (2D & 3D)*
1330 – 1345	***Display Data (2D & 3D) & QC***
1345 – 1400	***Reference Datum***
1400 - 1420	***Create Well Correlation (Data Conditioning)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0800	***Stratigraphy***
0800- 0830	***Create Synthetic Seismograms***
0830 – 0900	***Seismic Well Tie (Comparison Between Seismic & Well Data)***
0900 – 0930	***Attributes Attribute Generation*** *Chaos • Structural Smoothing • Dip • Variance • Ant Tracking*
0930– 0945	***Seismic Data Interpretation (Horizons & Faults)***
0945 - 1000	***Automatic Fault Extraction***
1000 – 1015	*Break*
1015 – 1030	***Surface Attributes (Seismic Attribute Map)***
1030 – 1045	***Multi-Z Interpretation***
1045 – 1100	***Mapping (Surfaces)***
1100 – 1200	***Editing Surface & Contour***
1200 – 1215	***Domain Conversion (Depth Modeling)***
1215 – 1230	***Cross Section***
1230 - 1245	*Break*

1245 – 1300	***Quantitative Interpretation***
1300 – 1315	***Create a Seismic Property***
1315 – 1330	***Advanced Quantitative Seismic Interpretation: Petrel Quantitative Interpretation*** *Quantitative Seismic Interpretation Fundamentals • Recapitulation of Seismic Fundamentals • Statistics for Quantitative Interpretation • Log Data Preparation*
1330 – 1345	***Generation of Synthetics*** *Log Editing • Treatment of Different Wavelets/Band Pass Filtering*
1345 – 1400	***Well to Seismic Matching*** *Derivation of Seismic Wavelet • The White Approach to Matching • The Deconvolution Model*
1400 - 1420	***Rock Physics*** *Elastic Moduli & Their Inter-Relations • Hashin-Shtrickman-Berryman Model •Eberhart-Phillips for Shaley Sandstones •The Xu-White Method for Estimation of Vs • The Gassmann Fluid Replacement Algorithm*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0800	***Petrel Advance Geophysics***
0800- 0830	***Petrel Quantitative Interpretation***
0830 – 0900	***Accurate & Comprehensive Quantitative Interpretation*** *Rock Physics • AVO / AVA • Post Stack Deterministic & Stochastic Inversion • Seismic Pore Pressure Prediction •DHI • 4-D Seismic (Time Lapse Analysis)*
0900 – 0930	***Direct Hydrocarbon Indications*** *Direct Hydrocarbon Indicators (DHI) – Fractured Reservoirs & Fault Analysis • Automated Fault Mapping & Fault Attributes • Amplitude Versus Offset (AVO) – Avo Slope & Intercept*
0930– 0945	***Seismic Inversion*** *Pre-Stack Versus Post-Stack • Sparse Spike Method • Model Based Inversion • Stochastic Inversion*
0945 - 1000	***Attributes*** *Seismic Attributes*
1000 – 1015	*Break*
1015 – 1030	***Spectral Attributes***
1030 – 1045	***Relative Acoustic Impedance Supervised Classification***
1045 – 1100	***Spectral Decomposition***
1100 – 1200	***Reservoir Thickness Estimate & Spectral Attributes***
1200 – 1215	***Carbonate Case Study***
1215 – 1230	***Seismic Attributes*** *The Barnes Classification • Coherency & Related Attributes • Geometrical Attributes • Pitfalls*
1230 - 1245	*Break*

1245 – 1300	***Uncertainties*** *Mathematical Derivation • Dependencies • Reserve Calculations*
1300 – 1315	***Shear Wave Techniques*** *The Natih Multicomponent Survey • AVO Application • AVO In Practice • AVO Concept & Related Factors • AVO Pitfalls & Assumptions • Hydrocarbon Detection Using AVO • Processing for AVO Analysis • AVO Modelling & Inversion • Time Lapse (4D) Seismic*
1315 – 1330	***Quantitative Interpretation for Inversion & Simulation*** *Fluid Substitution Pitfall • Fluid Substitution*
1330 – 1345	***Contributions of Seismic in Petrel Reservoir Modelling*** *Introduction • Project Setup • Types of Data • Petrel User Interface • Data Import, Export, Viewing & Q.C • Well Correlation (Geology & Synthetic Seismogram) • Seismic Data Interpretation • Mapping • Application (Data)*
1345 – 1400	***3D Structural Modeling (Horizons & Fault Model).***
1400 - 1420	***3D Property Modeling Based on Well Logs & Trend Data (Stochastic, Deterministic)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

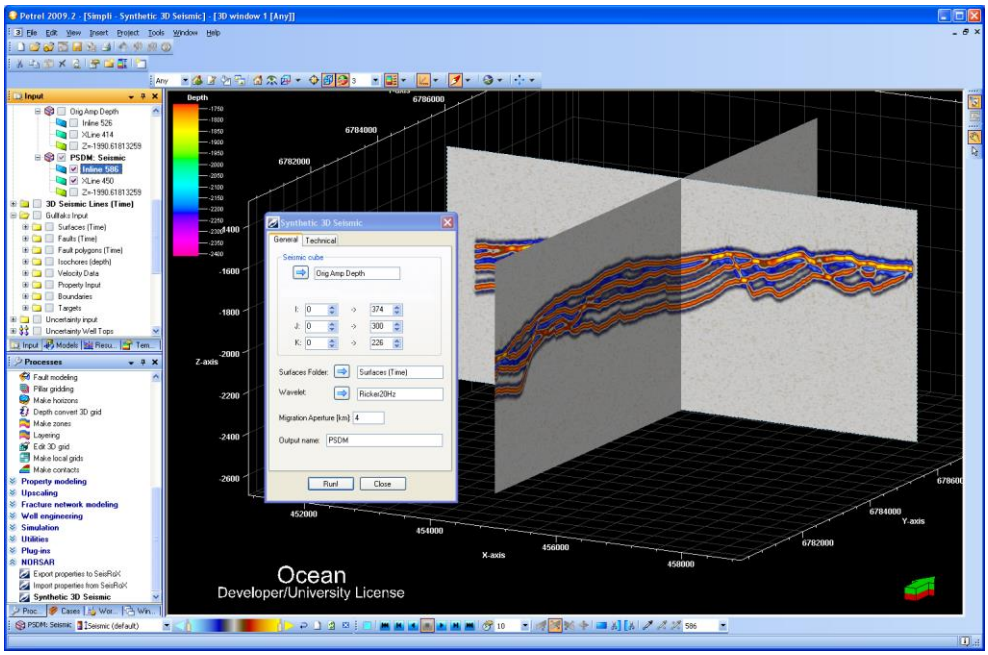
Day 5

0730 – 0800	***Facies Modeling Using Stochastic & Deterministic Methods***
0800- 0830	***Fracture Modeling Using a Discrete Fracture Network Approach to Create Fracture Properties***
0830 – 0900	***Volume Calculations, Data Analysis & Plotting***
0900 – 0930	***Petrel User Interface*** *User Interface • Petrel Explorer Panes •Process Diagram & Function Bar • 3D Buttons • Petrel Menus*
0930– 0945	***Visualization*** *3D Display Window • Create General Intersection*
0945 - 1000	***Importing Data*** *Import Overview • File Types • Organization*
1000 – 1015	*Break*
1015 – 1030	***Well Data Import*** *Process Overview • Well Heads Import • Importing Well Path / Deviation: • Well Logs Importing • Importing Well Tops (Formation Top) • Import Well Tops Overview*
1030 – 1045	***Import Well Seismic Data*** *Well Velocity Survey – Check Shots& VSP • Seismogram Ell to Seismic Tie • Seismic – Synthetic Seismogram*
1045 – 1100	***Well Correlation*** *Data Viewports • Seismic Data Viewing • Well Correlation*
1100 – 1200	***Creating & Applying Well Templates*** *Well Tops – Flattening • Interactive Facies Interpretation*
1200 – 1215	***Introduction to Seismic Interpretation***
1215 – 1230	***Seismic Interpretation Workflow*** *Input Seismic Data • Generate Volume Attributes • Pick the Faults "Using Automatic Extraction or by Manual Interpretation" • Tie the Well to Seismic • Map Your Horizons •Depth Convert for Horizons & All Seismic Volume*

1230 - 1245	*Break*
1245 – 1300	***Mapping & Plotting*** *Gridding • Creating Maps*
1300 – 1315	***Surface Polygons & Fault Polygons*** *Fault Polygons*
1315 – 1330	***Creating Maps*** *Two Way Time (TWT) Surface Map*
1330 – 1345	***Plotting*** *Depth Map • Isochrone Map*
1345 - 1400	***Course Conclusion***
1400 - 1415	***POST-TEST***
1415 - 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the "Petrel" software.



Petrel Software

Course Coordinator

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