

COURSE OVERVIEW DE0699 **Rock Physics for Exploration**

Course Title

Rock Physics for Exploration

Course Date/Venue

October 05-09, 2026/Liwa 1 Meeting Room,
Grand Millennium Al Wahda Hotel, Abu Dhabi,
UAE

Course Reference

DE0699

Course Duration/Credits

Five days/2.75 CEUs/27.5 PDHs

Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using the “MS Excel” application.

This course is designed to provide participants with a detailed and up-to-date overview of Rock Physics for Exploration. It covers the rock physics, rock properties and geological controls; the fundamentals of elasticity, seismic wave propagation in rocks and rock density; the velocity relationships, rock physics data sources and quality control; the porosity and pore structure effects, effective medium theory, mineral mixing and matrix properties; and the fluid properties and saturation effects, gassmann fluid substitution and dry rock and contact models.

Further, the course will also discuss the rock physics techniques and elastic property crossplot analysis; the seismic petrophysics, seismic reflection and interface properties and amplitude variation with offset (AVO) fundamentals; the AVO classification and rock physics interpretation, seismic inversion fundamentals, elastic impedance and seismic attributes; and the lithology prediction using rock physics and fluid and hydrocarbon prediction.

During this interactive course, participants will learn the pressure and effective stress effects, anisotropy and fracture effects and rock physics of clastic reservoirs; the rock physics of carbonate reservoirs and unconventional and complex reservoir applications; the sources of uncertainty in rock physics models and sensitivity to mineralogy, porosity, fluids and pressure; and the integration of geological, petrophysical, seismic information and calibrated rock physics models from well data.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain an in-depth knowledge on rock physics for exploration
- Discuss rock physics, rock properties and geological controls
- Explain the fundamentals of elasticity, seismic wave propagation in rocks and rock density and velocity relationships, rock physics data sources and quality control
- Recognize porosity and pore structure effects, effective medium theory and mineral mixing and matrix properties
- Identify fluid properties and saturation effects, gassmann fluid substitution and dry rock and contact models
- Review rock physics techniques and apply elastic property crossplot analysis
- Determine seismic petrophysics, seismic reflection and interface properties and amplitude variation with offset (AVO) fundamentals
- Employ AVO classification and rock physics interpretation and discuss seismic inversion fundamentals, elastic impedance and seismic attributes
- Apply lithology prediction using rock physics and fluid and hydrocarbon prediction
- Recognize pressure and effective stress effects, anisotropy and fracture effects and rock physics of clastic reservoirs
- Discuss rock physics of carbonate reservoirs and illustrate unconventional and complex reservoir applications
- Identify the sources of uncertainty in rock physics models and sensitivity to mineralogy, porosity, fluids and pressure
- Integrate geological, petrophysical and seismic information and build calibrated rock physics models from well data

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 rock physics for exploration managers, geoscience managers, chief geophysicists, chief geologists, reservoir engineering managers, senior geophysicists, senior geologists, senior reservoir engineers, geophysicists, geologists, petrophysicists, reservoir engineers, seismic interpretation specialists, rock physics specialists, geophysical data analysts, and petroleum engineers involved in seismic interpretation, reservoir characterization and other technical staff.

Training Methodology

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

Course Fee

US\$ 8,000 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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

Haward's certificates are accredited by the following international accreditation organizations: -

- 
British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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 center, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- 
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 **2.75 CEUs** (Continuing Education Units) or **27.5 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.



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 **Petroleum Geostatistics & Reservoir Characterization**, Static Reservoir Modeling & **Geostatistical** Modeling, Integrated Subsurface Data Analysis, **Reservoir** Modeling & Simulation, Petrel-Based **Reservoir** Modeling, Geoscience & **Reservoir** Data Integration, **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 Physics & Petrophysics**, Integrating **Petrophysical & Geomechanically, 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's** degree 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: **Monday, 05th of October 2026**

0800 – 0815	Registration & Coffee
0815 – 0830	Welcome & Introduction
0830 – 0845	PRE-TEST
0845 – 0900	Introduction to Rock Physics for Exploration Definition, Scope & Objectives of Rock Physics • Role of Rock Physics in Petroleum Exploration & Reservoir Characterization • Integration of Geology, Petrophysics, Geophysics & Reservoir Engineering • Rock Physics Workflow from Well Data to Seismic Interpretation
0900 – 0930	Rock Properties & Geological Controls Mineral Composition, Texture, Grain Size & Sorting • Porosity, Permeability, Density & Fluid Saturation • Depositional Environment, Diagenesis & Compaction Effects • Relationships Between Geological Characteristics & Elastic Properties
0930 – 0945	Break
0945 – 1015	Fundamentals of Elasticity Stress, Strain & Elastic Deformation of Rocks • Young's Modulus, Shear Modulus, Bulk Modulus & Poisson's Ratio • Hooke's Law & Elastic Behavior of Geological Materials • Relationships Between Elastic Constants & Seismic Velocities
1015 – 1045	Seismic Wave Propagation in Rocks Compressional P-Waves & Shear S-Waves • P-Wave & S-Wave Velocity Relationships • Acoustic Impedance & Seismic Reflectivity • Effects of Lithology, Porosity & Fluids on Wave Propagation
1300 – 1315	Break
1315 – 1330	Rock Density & Velocity Relationships Bulk Density, Grain Density & Fluid Density • Density Estimation from Well Logs & Core Measurements • Empirical Velocity-Density Relationships • Geological Factors Controlling Velocity & Density Trends
1330 – 1350	Rock Physics Data Sources & Quality Control Sonic, Density, Neutron & Resistivity Logs • Core Analysis & Laboratory Rock Physics Measurements • Seismic Data & Vertical Seismic Profile Applications • Data Conditioning, Validation, Depth Matching & Quality Control
1350 – 1400	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
1400	Lunch & End of Day One



Day 2: Tuesday, 06th of October 2026

0800 – 0900	Porosity & Pore Structure Effects Primary versus Secondary Porosity • Pore Geometry, Aspect Ratio & Connectivity • Influence of Porosity on Elastic Moduli & Seismic Velocities • Porosity Trends in Clastic & Carbonate Reservoirs
0900 – 0930	Effective Medium Theory Fundamentals of Effective Medium Modeling • Voigt, Reuss & Hill Bounds • Hashin-Shtrikman Bounds & Elastic Property Limits • Applications of Effective Medium Models in Exploration
0930 – 0945	Break
0945 – 1130	Mineral Mixing & Matrix Properties Elastic Properties of Common Reservoir Minerals • Mineral Volume Estimation from Petrophysical Data • Calculation of Effective Matrix Properties • Impact of Clay, Quartz, Calcite & Dolomite Content
1130 – 1300	Fluid Properties & Saturation Effects Elastic Properties of Oil, Gas & Formation Water • Fluid Density & Bulk Modulus Behavior • Influence of Pressure, Temperature & Composition • Effects of Fluid Saturation on Seismic Response
1300 – 1315	Break
1315 – 1330	Gassmann Fluid Substitution Principles & Assumptions of Gassmann's Equations • Dry-Frame, Mineral & Saturated Bulk Moduli • Fluid Substitution from Brine to Hydrocarbon Conditions • Interpretation of Velocity & Impedance Changes After Substitution
1330 – 1350	Dry Rock & Contact Models Hertz-Mindlin Contact Theory • Critical Porosity Concepts • Soft-Sand & Stiff-Sand Models • Selection & Calibration of Appropriate Rock Physics Models
1350 – 1400	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
1400	Lunch & End of Day Two

Day 3: Wednesday, 07th of October 2026

0800 – 0900	Rock Physics Templates Concept & Construction of Rock Physics Templates • Crossplots of Acoustic Impedance & Vp/Vs Ratio • Porosity, Lithology & Saturation Trends • Calibration of Templates Using Well & Core Data
0900 – 0930	Elastic Property Crossplot Analysis Vp versus Vs Relationships • Acoustic Impedance versus Vp/Vs Crossplots • Lambda-Rho versus Mu-Rho Analysis • Identification of Lithology & Fluid Trends
0930 – 0945	Break
0945 – 1130	Seismic Petrophysics Conditioning Logs for Quantitative Seismic Interpretation • Identification & Correction of Bad-Hole Effects • Upscaling Well Logs to Seismic Resolution • Generation of Consistent Elastic Property Datasets
1130 – 1300	Seismic Reflection & Interface Properties Reflection & Transmission at Geological Interfaces • Normal-Incidence Reflection Coefficients • Elastic Contrasts Across Reservoir Boundaries • Influence of Lithology & Pore Fluids on Seismic Amplitudes



1300 – 1315	Break
1315 – 1330	Amplitude Variation with Offset (AVO) Fundamentals Physical Principles Controlling AVO Response • Zoeppritz Equations & Practical Approximations • Intercept & Gradient Concepts • AVO Responses Associated with Hydrocarbon Reservoirs
1330 – 1350	AVO Classification & Rock Physics Interpretation Characteristics of Common AVO Classes • Elastic Property Controls on AVO Behavior • Distinguishing Lithology Effects from Fluid Effects • Integration of AVO Analysis with Rock Physics Models
1350 – 1400	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
1400	Lunch & End of Day Three

Day 4: Thursday, 08th of October 2026

0800 – 0900	Seismic Inversion Fundamentals Objectives of Seismic Inversion in Exploration • Acoustic versus Elastic Inversion • Deterministic & Stochastic Inversion Concepts • Relationship Between Seismic Amplitudes & Subsurface Properties
0900 – 0930	Elastic Impedance & Seismic Attributes Acoustic Impedance & Elastic Impedance Concepts • Vp/Vs Ratio & Poisson's Ratio Interpretation • Lambda-Rho & Mu-Rho Attributes • Selection of Attributes for Lithology & Fluid Discrimination
0930 – 0945	Break
0945 – 1130	Lithology Prediction Using Rock Physics Elastic Signatures of Sandstone, Shale & Carbonate Rocks • Lithology Classification Using Elastic Parameters • Rock Physics Constraints for Seismic Interpretation • Probabilistic Approaches to Lithology Prediction
1130 – 1300	Fluid & Hydrocarbon Prediction Seismic Signatures of Brine, Oil & Gas Saturation • Direct Hydrocarbon Indicators & Rock Physics Support • Fluid Substitution Scenarios for Exploration Prediction • Separating Fluid Effects from Lithological Variations
1300 – 1315	Break
1315 – 1330	Pressure & Effective Stress Effects Effective Stress Concepts in Reservoir Rocks • Influence of Burial Depth & Compaction on Velocities • Pressure-Dependent Elastic Moduli • Implications for Exploration & Reservoir Characterization
1330 – 1350	Anisotropy & Fracture Effects Fundamentals of Seismic Anisotropy • Vertical Transverse Isotropy & Horizontal Transverse Isotropy • Influence of Fractures on Elastic Properties • Rock Physics Interpretation of Fractured Reservoirs
1350 – 1400	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
1400	Lunch & End of Day Four



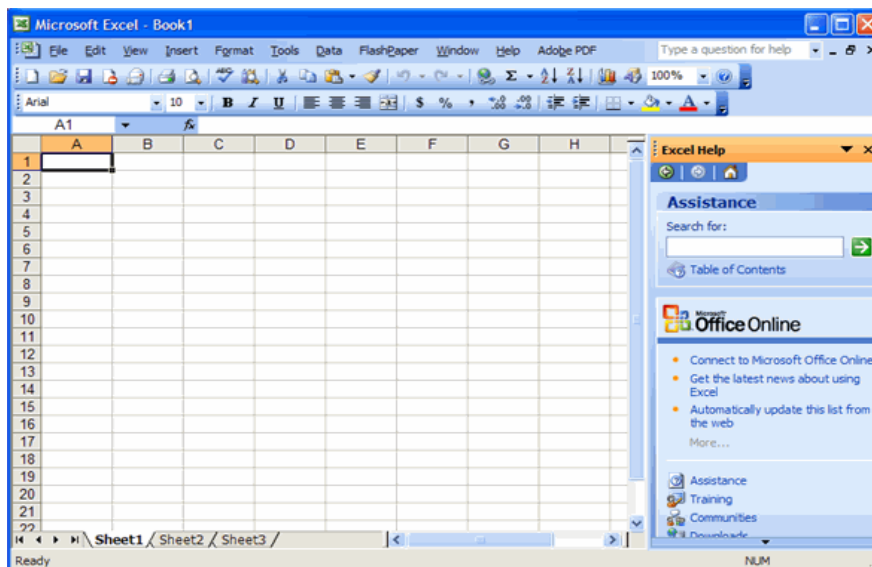
Day 5: Friday, 09th of October 2026

0800 – 0900	Rock Physics of Clastic Reservoirs <i>Sand-Shale Mixtures & Elastic Behavior • Compaction, Cementation & Sorting Effects • Unconsolidated versus Consolidated Sandstone Response • Rock Physics Trends for Clastic Exploration Targets</i>
0900 – 0930	Rock Physics of Carbonate Reservoirs <i>Complex Pore Systems in Carbonate Rocks • Vugs, Molds, Fractures & Microporosity • Effects of Diagenesis & Mineralogy on Elastic Properties • Challenges in Carbonate Rock Physics Interpretation</i>
0930 – 0945	Break
0945 – 1100	Unconventional & Complex Reservoir Applications <i>Organic-Rich Shale Elastic Properties • Effects of Total Organic Carbon & Maturity • Anisotropy & Brittleness Considerations • Rock Physics Applications to Unconventional Exploration</i>
1100 – 1200	Uncertainty & Sensitivity Analysis <i>Sources of Uncertainty in Rock Physics Models • Sensitivity to Mineralogy, Porosity, Fluids & Pressure • Scenario-Based Modeling & Uncertainty Ranges • Risk Reduction in Quantitative Seismic Interpretation</i>
1200 – 1245	Integrated Rock Physics Exploration Workflow <i>Integration of Geological, Petrophysical & Seismic Information • Building Calibrated Rock Physics Models from Well Data • Forward Modeling of Exploration Scenarios • Predicting Reservoir Properties Away from Well Control</i>
1245 – 1300	Break
1300 – 1315	Practical Case Study & Exploration Interpretation <i>Construction of a Rock Physics Model from Representative Well Data • Generation & Interpretation of Rock Physics Crossplots • Fluid Substitution & Seismic Response Prediction • Integrated Lithology, Reservoir Quality & Hydrocarbon Interpretation</i>
1315 – 1330	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1330 – 1345	POST-TEST
1345 – 1400	Presentation of Course Certificates
1400	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 “MS-Excel” application.



MS-Excel

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org