COURSE OVERVIEW DE0012
Rock Physics for Exploration

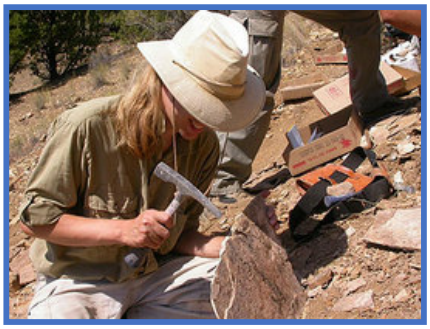
Course Title
Rock Physics for Exploration

Course Date/Venue
Session 1: April 28- May 02, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: July 27-31, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
DE0012

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 provide participants with a detailed and up-to-date overview of applied rock physics. It covers the difference between rock physics and petrophysics; the concept of the representative elementary volume (REV) and effective elastic properties; the Voight/Reuss and Hashin-Shtrikman bounds, modulus-porosity relations for clean sands, critical porosity and mechanical percolation; and the Gasman's equations, fluid substitution, fluid properties, mixtures and diagenetic and sorting trends in velocity-porosity data.

Further, the course will also discuss the velocity-porosity models for shaly sands; the empirical relations between velocity and prosity, clay content, etc; the properties of sand-clay mixtures, velocity-porosity relations for shales, relations between Vp and Vs, rock compressibilities and relation of 4D seismic to well testing, reflection coefficients and AVO; the elastic impedance, rock physics templates and the effective medium and field theories; the velocity-porosity relations for carbonates; and the biot theory, patchy saturation, squirt flow, sediment compaction and the state of stress in the earth.

During this interactive course, participants will learn the pore pressure and the concept of effective stress, poroelasticity and application to pore pressure prediction; the fractured gradient and 3D stress modeling; the effect of stress on seismic body waves and third order elasticity; the granular media and discrete element methods, displacement discontinuity methods, stress sensitivity of sandstones, shales and stress perturbations around a borehole; the determination of velocity variations around a borehole from advanced sonic logging; the wellbore stability and reservoirs geomechanics and stress effects in 4D seismic monitoring; the fractured reservoirs, hydraulic fracture propagation in presence of natural fractures; the seismic characterization of fractures reservoirs; the response of a fractures reservoir, rockphysics models for fractures, shales and unconventional reservoir and anisotrophy of shales; the effect of anisotropy on AVO and microseismic; and the effect of azimuthal anisotropy on propagation of hydraulic fractures.

Course Objectives

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

- Apply and gain an in-depth knowledge on applied rock physics
- Discuss Hooke's law, anisotropy and elastic wave velocities including sedimentary rocks as heterogenous media
- Explain the concept of the representative elementary volume (REV) and effective elastic properties
- Identify Voigt/Reuss and Hashin-Shtrikman bounds, modulus-porosity relations for clean sands, critical porosity and mechanical percolation
- Discuss Gassman's equations and fluid substitution, fluid properties, mixtures and diagenetic and sorting trends in velocity-porosity data
- Describe velocity-porosity models for shaly sands and the empirical relations between velocity and prosity, clay content, etc
- Recognize the properties of sand-clay mixtures, velocity-porosity relations for shales, relations between Vp and Vs, rock compressibility's and relation of 4D seismic to well testing, reflection coefficients and AVO
- Identify elastic impedance, rock physics templates, the effective medium and field theories including the velocity-porosity relations for carbonates
- Explain biot theory, patchy saturation, squirt flow, sediment compaction and the state of stress in the earth as well as pore pressure and the concept of effective stress, poroelasticity and application to pore pressure prediction
- Illustrate fracture gradient and 3D stress modeling as well as recognize the effect of stress on seismic body waves and third order elasticity
- Apply granular media and discrete element methods and displacement discontinuity methods
- Discuss stress sensitivity of sandstones, shales and stress perturbations around a borehole
- Determine velocity variations around a borehole from advanced sonic logging

- Apply wellbore stability, reservoirs geomechanics and stress effects in 4D seismic monitoring
- Identify fractured reservoirs, Hydraulic fracture propagation in presence of natural fractures and seismic characterization of fractures reservoirs
- Model the response of fractures reservoir and describe rockphysics models for fractures, shales and unconventional reservoir and anisotrophy of shales
- Analyze the effect of anisotropy on AVO including the microseismic and effect of azimuthal anisotropy on propagation of hydraulic fractures

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 capillary pressure, saturation height function and rock fluids proprieties for petrophysicist, geologists, geophysicist, reservoir and production engineers and other involved information evaluation and/or reservoir modelling are the target audience. People who work with selection and application of core test data for analyses and/or use hydrocarbon saturations in their models will find this course considerable benefit.

Accommodation

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

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.

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: -

- 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.

- 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.

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. Stan Constantino, MSc, BSc, is a **Senior Petroleum & Reservoir Engineer** with over **40 years** of **Offshore & Onshore** extensive experience within the **Oil**, **Gas & Petroleum** industries**.** His area of expertise include **Cased Hole Logging**, Advanced Petrophysics/Interpretation of **Cased Hole Logs**, **Cased Hole Formation Evaluation**, **Cased Hole Formation** Evaluation, **Cased Hole Evaluation**, **Cased-Hole Logging**, Applied **Production Logging & Cased Hole & Production Log** Evaluation, **Cased Hole Logging & Formation** Evaluation, Open & Cased Hole Logging, **Fractured Reservoir** Classification & Evaluation, Screening of Oil Reservoirs for **Enhanced Oil Recovery**, **Oil Reservoir** Evaluation & Estimation, **Reserves & Resources**, **Reserves Estimation** & **Uncertainty**, **Reserve** Evaluation, **OIP Estimation & Range** of **Uncertainty**, **Reservoir** Characterization, **Water Flooding**, **Reservoir** Souring & Water Breakthrough, **Reservoir Performance** Using Classical Methods, **Fractured Reservoir** Evaluation & Management, **Reservoir Surveillance** & Management, **Reservoir Engineering** & Simulation, **Reservoir Monitoring**, **Pressure Transient** Testing & **Reservoir** Performance Evaluation, **Reservoir** Characterization, **Reservoir** Engineering Applications with ESP & Heavy Oil, **Reservoir** Volumetrics, Water Drive **Reservoir**, **Unconventiona**l **Resource & Reserves** Evaluation, **Oil & Gas Reserves** Estimation, **Petrophysics & Rock** Properties**, Seismic** Technology, **Geological** Modelling, **Water Saturation**, **Crude Oil & Natural Gas** Demand, **Exploration Agreements & Financial** Modelling, **Seismic Survey** Evaluation, **Exploration Well** Identification, **Field Production** Operation, **Field Development** Evaluation, Crude Oil Marketing, **Core & Log Data** Integration, **Core Logging**, Advanced **Core & Log Integration**, **Well Logs & Core Analysis**, **Enhanced Oil Recovery**, **Enhanced Oil Recovery** Techniques, **Petroleum Economic** Analysis, **Oil Industry** Orientation, **Oil Production & Refining**, **Crude Oil Market**, **Global Oil Supply & Demand**, **Global Oil Reserves**, **Crude Oil** Types & Specifications, **Oil Processing**, **Oil Transportation-Methods**, **Oil & Gas** Exploration and Methods, **Oil & Gas** Extraction, Technology Usage in Industrial Security; **Upstream**, **Midstream** & **Downstream Operations**; **Oil Supply & Demand**, **Oil Contracts**, **Government Legislation & Oil Contractual Agreements**, **Oil Projects** & Their Feasibility (revenue and profitability), Rock & Fluid Properties, Fluid Flow Mechanics, PVT Analysis, Material Balance, Darcy's Law & Applications, Radial Flow, **Gas Well** Testing, Natural Water Influx, EOR Methods, Directional Drilling, **Drilling** Production & Operations, Field Development & Production of Oil & Gas, **Wireline Logging**, **Mud Logging**, **Production Logging**, **Slick Line**, **Coil Tubing**, Exploration Wells Evaluation, **Horizontal Wells**, **Well Surveillance**, **Well Testing**, **Design & Analysis**, **Well Testing & Oil Well Performance**, **Well Log Interpretation** (**WLI**), **Formation Evaluation**, **Well Workover Supervision**, **Pressure Transient Analysis** and **Petrophysical Log Analysis**. Currently, he is the **CEO** & **Managing Director** of **Geo Resources Technology** wherein he is responsible in managing the services and providing technical supports to underground energy related projects concerning **field development**, **production**, **drilling**, **reservoir engineering** and **simulation**.

Throughout his long career life, Mr. Stan has worked for many international companies such as the **Kavala Oil**, **North Aegean Petroleum Company** and **Texaco Inc.**, as the **Managing Director**, **Operations Manager**, **Technical Trainer**, **Training Consultant**, **Petroleum Engineering & Exploration Department Head**, **Assistant Chief Petroleum Engineer**, **Reservoir Engineer, Resident Petroleum Engineer**, **Senior Petroleum Engineer** and **Petroleum Engineer** wherein he has been managing the evaluation of exploration wells, reservoir simulation, development training, production monitoring, wireline logging and well testing including selection and field application of well completion methods.

Mr. Stan has a **Master's** degree in **Petroleum Engineering** and a **Bachelor's** degree in **Geology** from the **New Mexico Institute of Mining & Technology** (**USA**) and from the **Aristotelian University** (**Greece**) respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership of Management** (**ILM**) and a member of the Society of Petroleum Engineers, USA (**SPE**), Society of Well Log Professional Analysts, USA (**SPWLA**) and European Association of Petroleum Geoscientists & Engineers (**EAGE**). Moreover, Mr. Stan published numerous scientific and technical papers and delivered various trainings, courses and workshops worldwide.

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 – 0900	***Introduction to Applied Rock Physics***
0900 - 0930	***Hooke's Law, Anisotropy & Elastic Wave Velocities***
0930 – 0945	*Break*
0945 – 1030	***Sedimentary Rocks as Heterogeneous Media***
1030 - 1100	***The Concept of the Representative Elementary Volume (REV) & Effective Elastic Properties***
1100 - 1200	***Voigt/Reuss & Hashin-Shtrikman Bounds***
1200 – 1230	***Modulus-Porosity Relations for Clean Sands***
1215 – 1230	*Break*
1230 - 1300	***Critical Porosity & Mechanical Percolation***
1300 - 1300	***Gassman's Equations & Fluid Substitution***
1330 – 1400	***Fluid Properties & Mixtures***
1400 - 1420	***Diagenetic & Sorting Trends in Velocity-Porosity Data***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Velocity-Porosity Models for Shaly Sands***
0830 - 0930	***Empirical Relations Between Velocity & Porosity, Clay Content, etc***
0930 – 0945	*Break*
0945 – 1030	***Properties of Sand-Clay Mixtures***
1030 - 1100	***Velocity-Porosity Relations for Shales***
1100 - 1200	***Relations Between Vp & Vs***
1200 – 1230	***Rock Compressibility's & Relation of 4D Seismic to Well Testing***
1215 – 1230	*Break*
1230 - 1300	***Reflection Coefficients & AVO***
1300 - 1300	***Elastic Impedance***
1330 – 1400	***Rock Physics Templates***
1400 - 1420	***Effective Medium & Effective Field Theories***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Velocity-Porosity Relations for Carbonates***
0830 - 0930	***Biot Theory***
0930 – 0945	*Break*
0945 – 1030	***Patchy Saturation***
1030 - 1100	***Squirt Flow***
1100 - 1200	***Sediment Compaction & State of Stress in the Earth***

1200 – 1230	***Pore Pressure & Concept of Effective Stress***
1215 – 1230	*Break*
1230 - 1300	***Poroelasticity***
1300 - 1300	***Application to Pore Prediction***
1330 – 1400	***Fracture Gradient & 3D Stress Modeling***
1400 - 1420	***Effect of Stress on Seismic Body Waves***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Third-Order Elasticity***
0830 - 0930	***Granular Media & Discrete Element Methods***
0930 – 0945	*Break*
0945 – 1030	***Displacement Discontinuity Methods***
1030 - 1100	***Stress Sensitivity of Sandstones***
1100 - 1200	***Stress Sensitivity of Shales***
1200 – 1230	***Stress Perturbations Around a Borehole***
1215 – 1230	*Break*
1230 - 1300	***Determination of Velocity Variations Around a Borehole from Advanced Sonic Logging***
1300 - 1300	***Application to Wellbore Stability***
1330 – 1400	***Reservoir Geomechanics & Stress Effects in 4D Seismic Monitoring***
1400 - 1420	***Fractured Reservoirs***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Hydraulic Fracture Propagation in Presence of Natural Fractures***
0830 - 0930	***Seismic Characterization of Fractured Reservoirs***
0930 – 0945	*Break*
0945 – 1030	***Modeling the Response of Fractured Reservoir***
1030 - 1100	***Rock Physics Models for Fractures***
1100 - 1200	***Shales & Unconventional Reservoirs***
1200 – 1230	***Anisotropy of Shales***
1215 – 1230	*Break*
1230 - 1300	***Rock Physics Modeling of Kerogen in Organic-Rich Shales***
1300 - 1300	***Effect of Anisotropy on AVO***
1330 – 1345	***Micro seismic & Effect of Azimuthal Anisotropy on Propagation of Hydraulic Fractures***
1345 - 1400	***Course Conclusion***
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

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