COURSE OVERVIEW DE0378
Modelling & Managing Uncertainty in the Subsurface

Course Title
Modelling & Managing Uncertainty in the Subsurface

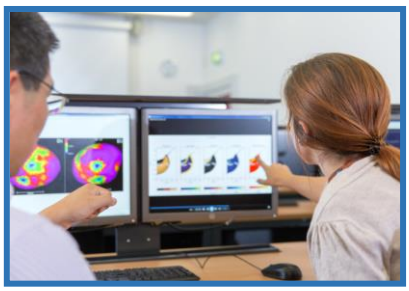
Course Reference
DE0378

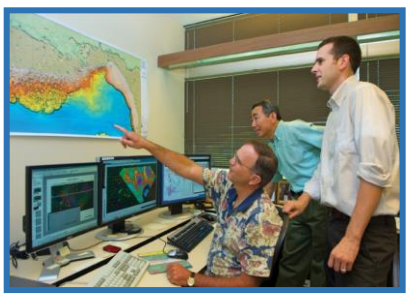
Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

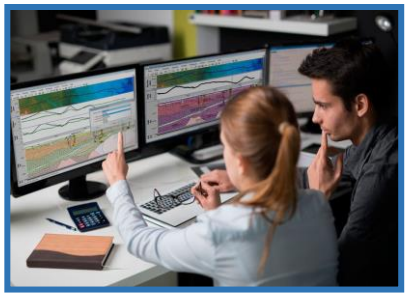
Course Date/Venue

Session(s)	Date	Venue
1	October 13-17, 2024	Boardroom, Warwick Hotel Doha, Doha, Qatar
2	November 24-28, 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 provide participants with a detailed and up-to-date overview of Modelling & Managing Uncertainty in the Subsurface. It covers the types of uncertainty in subsurface modelling comprising of statistical, spatial and model uncertainty; the principles of geostatistics including data acquisition and quality; the difference between deterministic and probabilistic modelling; the advanced geostatistical methods of stochastic modelling; the uncertainty of petrophysical properties; and the statistical sampling and distribution models and seismic data in stochastic models.

During this interactive course, participants will learn the reservoir heterogeneity and uncertainty; the structural modelling, fluid distribution and flow uncertainty; the scenario analysis and sensitivity studies, well test data and machine learning in subsurface modelling; the Monte Carlo simulation and risk analysis; the condition models to dynamic data, history matching and model updating; the proper tools and methods for effective communication; the decision analysis under uncertainty; and the risk management strategies, economic aspects of uncertainty, emerging trends and future directions.

Course Objectives

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

- Apply and gain an in-depth knowledge on modelling and managing uncertainty in the subsurface
- Identify the types of uncertainty in subsurface modelling covering statistical, spatial and model uncertainty
- Discuss the principles of geostatistics including data acquisition and quality
- Identify the difference between deterministic and probabilistic modelling
- Carryout advanced geostatistical methods of stochastic modelling and discuss the uncertainty of petrophysical properties
- Illustrate statistical sampling and distribution models and integrate seismic data in stochastic models
- Identify reservoir heterogeneity and uncertainty and illustrate structural modelling, fluid distribution and flow uncertainty
- Carryout scenario analysis and sensitivity studies, integrate well test data and describe machine learning in subsurface modelling
- Apply Monte Carlo simulation and risk analysis, conditioning models to dynamic data, history matching and model updating
- Use proper tools and methods for effective communication and apply decision analysis under uncertainty
- Employ risk management strategies and discuss economic aspects of uncertainty, emerging trends and future directions

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 for modelling and managing uncertainty in the subsurface for geoscientists, petroleum and reservoir engineers, data scientists and project managers needing a practical understanding for modelling and managing uncertainty in the subsurface.

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 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:

Dr. Saad Aljzwe, PhD, MEng, MSc, BSc, is a **Senior Petroleum & Reservoir Engineer** with over **25 years** of practical and academic experience in the areas of **Petroleum Economic** Analysis, **Economic** Evaluation, **Petroleum Risk** Analysis & Decision Making, **Oil Agreement**, **Exploration & Production** Sharing Agreements, Multidisciplinary Research, Economics & Property Evaluation, Conventional & Unconventional **Oil & Gas Reserves** Estimation, **Reservoir** Management, **Reservoir** Engineering, **Reservoir** Performance Analysis, **Oil Fields Subsurface** Assessment & Forecasting, **Casing** Design, **Drilling & Workover**, **PVT & Core** Analysis, **Production** Operations, **EOR/IOR**, **Field Development** Design & Evaluation, Miscible Gas Injection (**CO2 Injection**) Design & Evaluation, **Special Core Analysis** & Formation Evaluation, **EOR-CO2 Injection**, **Remaining Gas** in Place Estimation, **Material Balance** Method, **Computerized Monitoring & Processing** System Design, **Magnetic Field** Controlling, Comparative **Risk Evaluation & Sensitivity** Analysis, Critical Production Rate for Bottom Water Coning in the Majed (EE-Pool) **Reservoir**, Oil Pipeline **Black Powder Removal**, **Oil Field Water Shutoff Treatment** Methods, **Water-Based Mud Rheological & Fluid Loss Control**, **Empirical Equation**, **Water-Flooding** Performance, **Sandstone Reservoirs**, **Reservoir Fluid** Properties, **Mathematical** Modelling, **Directional Permeability Anisotropy**, **Drilling** Operational Efficiency & Well Cost Reduction, Infill Drilling Program, **Drilling** Efficiency and **Ultra-mud System** Optimization. Further, he is also well-versed in various petroleum software such as the **MBAL** (Reservoir Engineering Toolkit), **KAPPA-Saphir** (Well Testing), **KAPPA-Rubis** (Reservoir Simulation), **CMG** (Reservoir Simulation), **Merak Peep** (Economic Evaluation and Production Decline Analysis) and **Monte Carlo** Simulation.

During Dr. Saad's career, he gained his thorough practical experience through several challenging positions such as the **Senior Lecturer**, **Head** of Petroleum Engineering Department, **Head** of Chemical Engineering Department, **Head** of the Union of Faculty Members, **Assistant Professor**, **Teaching Assistant**, **Researcher** and **Academic Coordinator** from various international well-renowned companies such as the **University of Wyoming**, **Colorado School of Mines**, **American University of Ras Al Khaimah**, **Australian College of Kuwait**, Sirt University and Bright Star University of Technology.

Dr. Saad has a **PhD** and **Master's** degree in **Petroleum Engineering** from the **University of Wyoming** and **Colorado School of Mines**, **USA**, respectively as well as **Master** degrees in **Petroleum Economics & Management** and **Reservoir Geosciences & Engineering** from the **Instituit Francias du Petrole**, France and a **Bachelor** degree in **Petroleum Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and a member of the American Society of Petroleum Engineering (**SPE**), Society of Petroleum Resources Economists (**SPRE**), Association of Professional Engineering of Libya, Libyan Society of Earth Science and the Environment Friends Association of Libya. Moreover, he is an **author/co-author** and published **various research papers** in local and international scientific journals and conferences. He has further delivered numerous trainings, courses, workshops, seminars and conferences globally.

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 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 & Introductions*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Introduction to Subsurface Modelling:*** *Overview & Significance*
0900 - 0930	***Types of Uncertainty in Subsurface Modelling:*** *Statistical, Spatial, & Model Uncertainties*
0930 – 0945	*Break*
0945 – 1100	***Principles of Geostatistics:*** *Basics & Applications in Uncertainty Modelling*
1100 – 1230	***Data Acquisition & Quality:*** *Impact on Uncertainty*
1230 – 1245	*Break*
1245 – 1330	***Deterministic versus Probabilistic Modelling:*** *Differences & Applications*
1330 - 1420	***Case Studies:*** *Real-World Examples of Uncertainty in Subsurface Models*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Advanced Geostatistical Methods:*** *Kriging, Co-Kriging, & Simulation*
0830 - 0930	***Stochastic Modelling:*** *Principles & Techniques*
0930 – 0945	*Break*
0945 – 1100	***Uncertainty in Petrophysical Properties:*** *Porosity, Permeability, & Saturation*
1100 – 1230	***Statistical Sampling & Distribution Models:*** *Techniques for Handling Subsurface Data*
1230 – 1245	*Break*
1245 – 1330	***Integrating Seismic Data in Stochastic Models:*** *Methods & Challenges*
1330 - 1420	***Practical Exercise:*** *Hands-On Session on Stochastic Modelling*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Reservoir Heterogeneity & Uncertainty:*** *Identifying & Modelling Heterogeneities*
0830 - 0930	***Structural Modelling & Uncertainty:*** *Faults, Fractures, & Their Impact*
0930 – 0945	*Break*
0945 – 1100	***Fluid Distribution & Flow Uncertainty:*** *Impact on Reservoir Performance*
1100 – 1230	***Scenario Analysis & Sensitivity Studies:*** *Exploring Different Subsurface Scenarios*

1230 – 1245	*Break*
1245 – 1330	***Integrating Well Test Data:*** *Impact on uncertainty reduction*
1330 - 1420	***Workshop:*** *Creating Reservoir Models with Varying Uncertainty Parameters*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

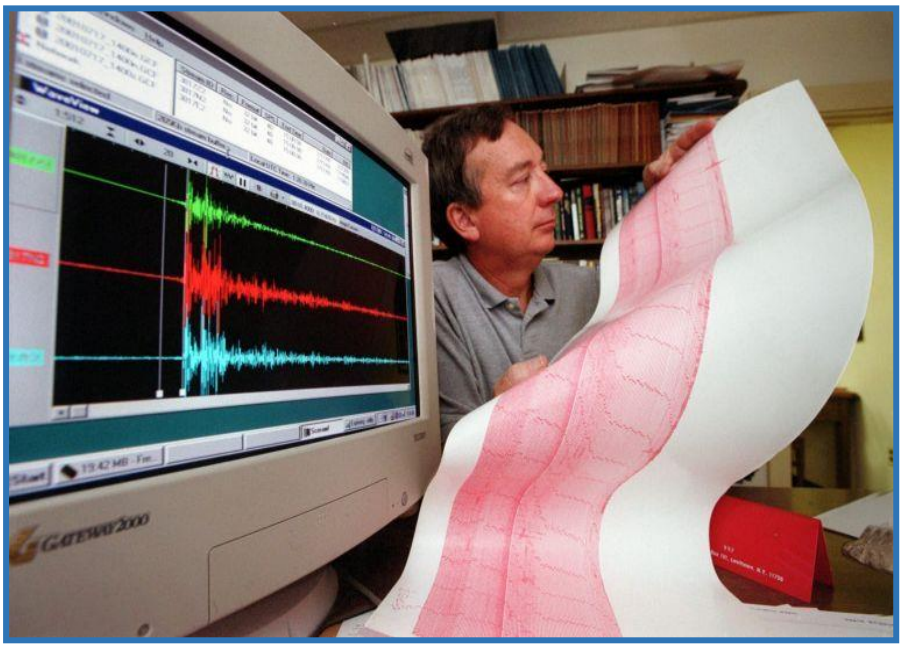
0730 – 0830	***Machine Learning in Subsurface Modelling:*** *Applications & Potential*
0830 - 0930	***Monte Carlo Simulation & Risk Analysis:*** *Techniques & Case Studies*
0930 – 0945	*Break*
0945 – 1100	***Conditioning Models to Dynamic Data:*** *Real-Time Data Integration*
1100 – 1230	***History Matching & Model Updating:*** *Balancing Models with Production Data*
1230 – 1245	*Break*
1245 – 1330	***Visualizing Uncertainty:*** *Tools & Methods for Effective Communication*
1330 - 1420	***Group Project:*** *Collaborative Uncertainty Modelling Exercise*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Decision Analysis Under Uncertainty:*** *Frameworks & Approaches*
0830 - 0930	***Risk Management Strategies:*** *Identifying, Assessing, & Mitigating Risks*
0930 – 0945	*Break*
0945 – 1100	***Economic Aspects of Uncertainty:*** *Impact on Project Valuation & Investment Decisions*
1100 – 1230	***Case Studies in Uncertainty Management:*** *Lessons from Industry*
1230 – 1245	*Break*
1245 – 1400	***Emerging Trends & Future Directions:*** *Innovations in Uncertainty Modelling.*
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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