COURSE OVERVIEW DE0479
Pulsed Neutron

Course Title
Pulsed Neutron

Course Date/Venue
Session 1: May 04-08, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: November 24-28, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
DE0479

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.

This course is designed to provide participants with a detailed and up-to-date overview of Pulsed Neutron. It covers the basic properties of neutrons and the applications of neutron science; the principles of pulsed neutron sources, neutron production mechanisms and neutron scattering basics; the pulsed neutron facilities and key concepts in neutron transport; the detectors for pulsed neutrons covering gas-based detectors, scintillation detectors and solid-state detectors; the time-of-flight measurement techniques; and the types of neutron moderators, role in shaping neutron energy spectra and moderator design considerations.

During this interactive course, participants will learn the beamline components, neutron energy spectrum analysis and experimental setup and calibration; the material science applications, nuclear applications, biological and medical applications and industrial applications; the ancient artifacts, material composition and non-invasive analysis techniques; the advanced neutron scattering techniques and data analysis in pulsed neutron studies; the neutron reflectometry, neutron activation analysis (NAA) and emerging trends in pulsed neutron science; setting-up basic neutron scattering experiment; the hands-on time-of-flight analysis and sample preparation techniques; and analyzing collected data.

Course Objectives

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

- Apply and gain a good working knowledge on pulsed neutron
- Discuss the basic properties of neutrons and the applications of neutron science
- Explain the principles of pulsed neutron sources, neutron production mechanisms and neutron scattering basics
- Describe pulsed neutron facilities and identify the key concepts in neutron transport
- Recognize detectors for pulsed neutrons covering gas-based detectors, scintillation detectors and solid-state detectors
- Carryout time-of-flight measurement techniques and identify the types of neutron moderators, role in shaping neutron energy spectra and moderator design considerations
- Identify beamline components and apply neutron energy spectrum analysis and experimental setup and calibration
- Carryout material science applications, nuclear applications, biological and medical applications and industrial applications
- Analyze ancient artifacts, identify material composition and apply non-invasive analysis techniques
- Employ advanced neutron scattering techniques and data analysis in pulsed neutron studies
- Discuss neutron reflectometry, neutron activation analysis (NAA) and emerging trends in pulsed neutron science
- Set-up basic neutron scattering experiment, apply hands-on time-of-flight analysis and sample preparation techniques and analyze collected 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 pulsed neutron for petroleum engineers, geoscientists, logging engineers, reservoir engineers, petrophysicists, drilling and completion engineers, field technicians, managers and decision-makers and other technical staff.

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.

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. Chris Kapetan, PhD, MSc, is a **Senior Drilling & Petroleum Engineer** with over **40 years** of international experience within the **onshore** and **offshore oil** & **gas** industry. His wide experience covers **Horizontal & Multilateral Wells**, **Well Completion & Stimulation**, **Artificial Lift System Selection & Design**, **Drilling Practices**, **Drilling Fluids Technology**, Drilling **Operations**, **Directional** Drilling**, Formation Damage** Evaluation & Preventive, **Formation Damage** Remediation, **Drilling & Formation Damage**, Simulation Program for The **International Petroleum Business**, **Well** Testing & Analysis, **Well** Design, **Well** Testing & Oil Well Performance, **Well** Test Design Analysis, **Well Test** Operations, **Well Testing & Perforation**, Root Cause Analysis (**RCA**), RCA Method for Process Plant, **RCA** Techniques, Control Well-Flow Lines Parameters, Decision Analytic Modelling Methods for **Economic Evaluation**, **Probabilistic Risk Analysis** (**Monte Carlo Simulator**) **Risk Analysis** Foundations, Sulphur, Sour Natural Gas, **Natural Gas Sweeting**, **Petroleum Production**, Field Layout, **Production** Techniques & Control, **Surface Production** Operations, **Project Risk Analysis**, **Feasibility Analysis** Techniques, **Capital Operational Costs**, **Flowmetering & Custody Transfer** and **Oil Refinery**. Further, he is also well-versed in Enhanced Oil Recovery (**EOR**), Electrical Submersible Pumps (**ESP**), **Oil Industries Orientation**, **Geophysics**, **Cased Hole** Formation Evaluation, **Cased Hole** Applications, **Cased Hole** Logs, **Production Wells** Operations, **Production** Management, **Perforating** Methods & Design, **Perforating** Operations, **Fishing** Operations, **Well & Reservoir** Testing, **Reservoir** Stimulation, **Hydraulic Fracturing**, **Carbonate** Acidizing, **Sandstone** Acidizing, **Drilling Fluids** Technology, Drilling Operations, **Directional** Drilling, **Artificial Lift**, **Gas Lift Design**, **Gas Lift** Operations, Petroleum Business, **Petroleum Economics**, Field Development Planning, **Gas Lift Valve** Changing & Installation, **Well Completion** Design & Operation, **Well** Surveillance, **Well** Testing, **Well** Stimulation & Control and **Workover** Planning, Completions & Workover, **Rig Sizing**, **Hole Cleaning & Logging**, **Well Completion**, **Servicing & Work-Over** Operations, Practical **Reservoir Engineering**, **X-mas Tree & Wellhead** Operations, Maintenance & Testing, Advanced **Petrophysics/Interpretation** of **Well Composite**, **Construction Integrity** & **Completion**, **Coiled Tubing** Technology, **Corrosion Control**, **Slickline**, **Wireline & Coil Tubing**, **Pipeline Pigging**, **Corrosion** Monitoring, **Cathodic Protection** as well as Root Cause Analysis (**RCA**), Root Cause Failure Analysis (**RCFA**), **Gas Conditioning & Process Technology**, **Production Safety** and **Delusion of Asphalt**. Currently, he is the **Operations Consultant** & the **Technical Advisor** at **GEOTECH** and an independent **Drilling Operations Consultant** of various engineering services providers to the international clients as he offers his expertise in many areas of the **drilling & petroleum discipline** and is well **recognized & respected** for his process and procedural expertise as well as ongoing participation, interest and experience in continuing to promote technology to producers around the world.

Throughout his long career life, Dr. Chris has worked for many international companies and has spent several years **managing** technically **complex wellbore interventions** in both **drilling** & **servicing**. He is a **well-regarded** for his **process** and **procedural expertise**. Further, he was the **Operations Manager** at **ETP Crude Oil Pipeline Services** where he was fully responsible for optimum operations of crude oil pipeline, **workover** and **directional drilling**, **drilling rigs** and equipment, drilling of various geothermal deep wells and **exploration wells**. Dr. Chris was the **Drilling** & **Workover Manager** & **Superintendent** for **Kavala Oil** wherein he was responsible for supervision of **drilling** operations and **offshore exploration**, quality control of performance of **rigs**, **coiled tubing**, **crude oil** transportation via pipeline and abandonment of **well** as per the API requirements. He had occupied various key positions as the **Drilling Operations Consultant**, **Site Manager**, **Branch Manager**, **Senior Drilling** & **Workover Manager** & **Engineer**, **Drilling** & **Workover Engineer**, **Process Engineer**, **Operations Consultant** and **Technical Advisor** in several petroleum companies responsible mainly on an **offshore** sour oil field (under water flood and gas lift) and a gas field. Further, Dr. Chris has been a **Professor** of the **Oil Technology College**.

Dr. Chris has **PhD** in **Reservoir Engineering** and a **Master's** degree in **Drilling & Production Engineering** from the **Petrol-Gaze Din Ploiesti University**. Further, he is a **Certified Surfaced BOP Stack Supervisor** of **IWCF**, a **Certified Instructor/Trainer**, a **Certified Trainer/Assessor/Internal Verifier** by the **Institute of Leadership & Management** (**ILM**) and has conducted numerous short courses, seminars and workshops and has published several technical books on **Production Logging**, **Safety Drilling Rigs** and **Oil Reservoir**.

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 workshop 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 – 0930	***Introduction to Neutron Physics*** *History of Neutron Discovery • Basic Properties of Neutrons • Neutron Interactions with Matter • Applications of Neutron Science*
0930 – 0945	*Break*
0945 – 1030	***Principles of Pulsed Neutron Sources*** *Definition & Characteristics of Pulsed Neutron Sources • Differences Between Steady-State & Pulsed Neutron Sources • Role of Accelerators in Pulsed Neutron Production • Advantages of Pulsed Neutron Sources*
1030 – 1130	***Neutron Production Mechanisms*** *Fission-Based Neutron Sources • Fusion-Based Neutron Sources • Accelerator-Driven Systems • Spallation Neutron Sources*
1130 – 1215	***Neutron Scattering Basics*** *Elastic Scattering versus Inelastic Scattering • Neutron Scattering Cross-Sections • Importance in Material Characterization • Fundamentals of Time-of-Flight Techniques*
1215 – 1230	*Break*
1230 – 1330	***Overview of Pulsed Neutron Facilities*** *Examples of Major Global Facilities (e.g., SNS, ESS, ISIS) • Design Features of Pulsed Neutron Facilities • Types of Experiments Conducted • Safety Considerations in Neutron Facilities*
1330 – 1420	***Key Concepts in Neutron Transport*** *Neutron Slowing Down • Diffusion Theory Basics • Neutron Moderation • Attenuation & Absorption of Neutrons*
1420 – 1430	***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*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Detectors for Pulsed Neutrons*** *Gas-Based Detectors (e.g., He-3 Detectors) • Scintillation Detectors • Solid-State Detectors • Efficiency & Resolution Considerations*
0830 – 0930	***Time-of-Flight Measurement Techniques*** *Principles of Time-of-Flight (ToF) • Energy Measurement Using ToF • Applications in Material Science • Limitations of ToF Techniques*
0930 – 0945	*Break*
0945 – 1100	***Moderator Systems*** *Types of Neutron Moderators (e.g., Water, Heavy Water, Beryllium) • Role in Shaping Neutron Energy Spectra • Moderator Design Considerations • Cooling & Maintenance Challenges*
1100 – 1215	***Beamline Components*** *Collimators & Apertures • Monochromators • Choppers & Shutters • Shielding Materials*
1215 – 1230	*Break*
1230 – 1330	***Neutron Energy Spectrum Analysis*** *Broad Energy Spectrum Characteristics • Low-Energy (Thermal) Neutron Behavior • High-Energy (Fast) Neutron Features • Data Interpretation & Error Reduction*
1330 – 1420	***Experimental Setup & Calibration*** *Preparing Neutron Sources & Beamlines • Calibrating Detectors • Data Acquisition Systems • Troubleshooting Experimental Errors*
1420 – 1430	***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*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Material Science Applications*** *Crystal Structure Determination • Residual Stress Analysis • Phase Transition Studies • Magnetic Properties Investigation*
0830 – 0930	***Energy Research*** *Hydrogen Storage Materials • Lithium-Ion Batteries • Fusion Reactor Materials • Fuel Cell Research*
0930 – 0945	*Break*
0945 – 1100	***Nuclear Applications*** *Reactor Core Material Analysis • Neutron Activation Analysis • Radiation Shielding Studies • Safety Assessments in Nuclear Facilities*
1100 – 1215	***Biological & Medical Applications*** *Imaging Biological Tissues • Neutron Therapy for Cancer • Protein Structure Analysis • Drug Delivery Research*
1215 – 1230	*Break*
1230 – 1330	***Industrial Applications*** *Non-Destructive Testing (NDT) • Stress & Strain Analysis • Oil & Gas Exploration • Advanced Manufacturing Quality Checks*

1330 – 1420	***Archaeology & Cultural Heritage*** *Analyzing Ancient Artifacts • Identifying Material Composition • Non-Invasive Analysis Techniques • Radiocarbon Dating Using Neutrons*
1420 – 1430	***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*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Advanced Neutron Scattering Techniques*** *Small-Angle Neutron Scattering (SANS) • Inelastic Neutron Scattering • Polarized Neutron Techniques • Quasi-Elastic Neutron Scattering*
0830 – 0930	***Monte Carlo Simulations*** *Fundamentals of Monte Carlo Methods • Modeling Neutron Transport • Applications in Experimental Design • Tools for Simulation (e.g., MCNP, Geant4)*
0930 – 0945	*Break*
0945 – 1100	***Data Analysis in Pulsed Neutron Studies*** *Raw Data Processing Techniques • Software Tools for Analysis (e.g., Mantid) • Error Propagation & Uncertainty Analysis • Visualizing Neutron Scattering Data*
1100 – 1215	***Neutron Reflectometry*** *Basics of Reflectometry • Thin-Film & Surface Analysis • Depth Profiling Techniques • Examples of Real-World Applications*
1215 – 1230	*Break*
1230 – 1330	***Neutron Activation Analysis (NAA)*** *Principles of NAA • Applications in Material Identification • Advantages Over X-Ray & Gamma-Ray Techniques • Limitations & Challenges*
1330 – 1420	***Emerging Trends in Pulsed Neutron Science*** *Development of Compact Neutron Sources • Integration of AI & Machine Learning • Quantum-Based Neutron Science • Future Facility Advancements*
1420 – 1430	***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*
1430	*Lunch & End of Day Four*

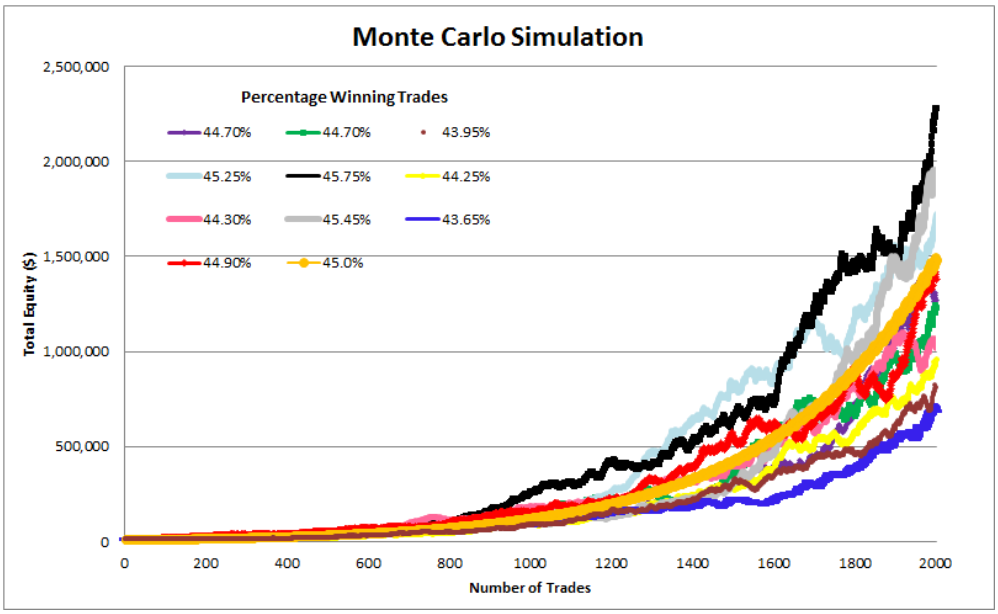
Day 5

0730 – 0830	***Laboratory Experiments*** *Setting Up a Basic Neutron Scattering Experiment • Hands-on Time-of-Flight Analysis • Sample Preparation Techniques • Analyzing Collected Data*
0830 – 0930	***Computational Simulations*** *Running a Monte Carlo Simulation • Modeling Neutron-Matter Interactions • Verifying Experimental Designs • Optimizing Instrument Parameters*
0930 – 0945	*Break*
0945 – 1100	***Case Studies in Pulsed Neutron Applications*** *Industrial Applications (e.g., Stress Analysis) • Energy Material Studies • Biological Investigations • Archaeological Discoveries*
1100 – 1230	***Group Projects & Collaboration*** *Designing a Neutron Experiment • Presenting Results & Findings • Peer Review & Critique • Collaborative Problem-Solving*

1230 – 1245	*Break*
1245 – 1345	***Troubleshooting & Problem-Solving*** *Identifying Common Experimental Errors • Detector Malfunction Diagnosis • Calibration Issues • Safety Protocols During Troubleshooting*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
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 simulator "Monte Carlo".



Monte Carlo Simulation

Course Coordinator

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