COURSE OVERVIEW LE0075-4D

Modern Chemical Laboratory

Analytical Instrumentation, Equipment Calibration, Operations, Quality & Safety

Course Title

Modern Chemical Laboratory: *Analytical Instrumentation, Equipment Calibration, Operations, Quality & Safety*

Course Date/Venue

November 04-07, 2024/Boardroom, Warwick Hotel Doha, Doha, Qatar

Course Reference

LE0075-4D

Course Duration/Credits

Four days/2.4 CEUs/24 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.

The function of many of today's chemical laboratories is not always easily described. To those in the laboratory it may seem to be at the core of all operations, since the information it provides affect major decisions that can determine the very existence of the organization it serves.

To others, it is merely a convenient way to obtain data on which to base their actions so that they can spend most of their time pursuing more productive activities. In fact, elements of truth are to be found in both concepts. However, everybody agrees about the importance of chemical laboratory for each process plant.

The course links together an understanding of performance characteristics with an appreciation of the limitations imposed by analytical instrument design, leading to the interplay of the validation and qualification processes within quality assurance systems.

The course includes unique framework of topics covers the major instrumental techniques of spectrophotometry, chromatography, capillary electrophoresis and atomic emission spectroscopy. The use of case studies, exercises and practical applications, will help participants to develop a thorough understanding of the various concepts that underpin the different techniques.

The course will cover the major operations performed in an industrial chemical laboratory. It will describe the major equipment used in the chemical laboratory, their operations, validations, calibration and maintenance. The course will concentrate on Standard Operation Procedures (SOP) which includes development, revisions, standards and implementations. Various Quality standards will be discussed. However, the course will concentrate on ISO 17025:2005. Finally, the course will demonstrate the safety practices and its critical impact in an industrial chemical laboratory. OSHA standards and regulations will be discussed and related videos will be shown to course participants.

In addition to the updated knowledge provided to course participants during the course period, each participant will go back to his/her laboratory equipped with an outstanding manual that includes typical SOPs that can be modified and used within participant's laboratory. Further, participants will be given 12 video tapes, compressed in one CD that can be used by the participant in training colleagues and subordinate on laboratory safety.

The outstanding course is a must for every laboratory professional. The updated knowledge and techniques covered during the 5 days of this course, will dramatically improve not only the participant's skills, but will also improve the performance of the participant's laboratory as a whole. However, if you are looking to improve the performance of your laboratory, then you have to commit yourself to pass the knowledge gained in this course to your subordinates and colleagues back in your laboratory as we will give you all the tools needed for this purpose; knowledge, skills, manual, power point slides, videos, Standard Operation Procedures (SOP), forms, and standards.

Course Objectives

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

- Apply an in-depth knowledge and skills in the chemical laboratories including analytical instrumentation, analytical techniques, laboratory equipment, operational procedures, management style, method validation, quality and safety management systems
- Use the major analytical laboratory instruments and equipment and understand their performance characteristics, capabilities, accuracies, reliabilities, speed and limitations including UV/VIS spectrophotometers, atomic absorption spectroscopy, ICP-OES, flow injection, infrared/raman spectroscopy, ion chromatography, pH probes, and gas chromatography
- Calibrate and certify various laboratory instruments and calculate uncertainty and random error
- Analyze the instrument performance characteristics which include types and interaction between different characteristics
- Prepare and handle sample for different analytical instrumentations and extract analytes from complex matrices
- Develop and modify the laboratory standard operating procedures (SOP) and interpret the requirements of the ISO 17025 quality system
- Explain the flow of work and major concerns related to the Industrial Chemical Laboratory

- Gain an in-depth knowledge about laboratory equipment and instruments such as mechanical measurements, chemical analysis and process analyzers
- Carryout sampling and sample handling
- Discuss nuclear magnetic instruments covering its theory, NMR spectroscopy, design and performance idea
- Illustrate NMR applications, multi-dimensional NMR spectroscopy and solid-state NMR spectroscopy
- Perform chemical laboratory operations and gain good skills of developing and modifying the laboratory Standard Operating Procedures (SOP)
- Implement the quality assurance system for chemical laboratory in accordance with the ISO 17025 standard
- Employ the safety and environmental requirements for chemical laboratory as per OSHA standard

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 modern chemical laboratory for those who are involved in analytical instrumentation, equipment calibration, operations, quality and safety including laboratory managers, engineers, chemists, scientists and other laboratory technical staff. Further, the course is suitable for instrumentation engineers and other instrumentation staff who are in-charge of instrument calibration and maintenance.

Accommodation

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

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.

Corse 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 **2.4 CEUs** (Continuing Education Units) or **24 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 Fee

US$ 5,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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. Hesham Abdou, PhD, MSc, BSc, is a **Senior Engineer** with over **35 years** of practical experience in various industrial fields. His specialization widely covers in the areas of Management, Operations, SPC & Quality **ISO 17025**, Risk Management & **ISO 17025**, Medical Laboratory Quality Management **ISO** 15189:2007, Lab Instrument Calibration & Troubleshooting Techniques, Modern **Analytical** Laboratory, Safety in **Analytical** Laboratories, **Analytical** Chemistry & Precise Results Generation, **Network** Management & Supervision, **Basics** Waste Water Treatment, Fundamentals of Water **Utility Regulation**, Operation & Maintenance of **Water Networks**, Water Meter Reading System (**MMR**), Operation & Maintenance of **Sewerage System**, **Principles** of Routine & Preventive Maintenance, **Safety Procedures** in Water Networks, **Sewer & Treated Effluent Network** System, **Sewer Network** Repair & Maintenance, **Valve Chamber** Maintenance, **Water** Analysis & Testing, **Water** Sampling Procedures, **Water System Design** & Installation, **Water Networks Design** Procedures, **Water Pumping** Process, **Equipment Handling** Procedures, **Pipes**, **Fitting & Valves**, **Pipelines**, **Pumps**, **Turbines**, **Heat Exchangers**, **Separators**, **Heaters**, **Compressors**, **Storage Tanks**, **Valves** Selection, **Compressors**, **Tank & Tank Farms** Operations & Performance, **Piping & Pumping** Operations, **Pump** Performance Monitoring, **Rotor Bearing** Modelling, **Hydraulic** Repairs & Cylinders, **Root Cause Analysis**, **Vibration & Condition** Monitoring, **Piping Stress** Analysis, **Gas Conditioning & Processing**, **Cooling Towers** Operation & Troubleshooting, **PCP & Jet Pump**, **Acid Gas** Removal, **Chemical Engineering Process** Design, **Hydrocracker Process Unit** Technology, **Hydro-Treating** Technology, **Distillation** Design, **Production Quality & Process** Troubleshooting, **Process Plant** Optimization, **Rehabilitation**, **Revamping & Debottlenecking**, **Heat Medium Fired Heater** Troubleshooting & Maintenance, **Hydro-Treating** Technology, **Process Plant** Performance & Efficiency, **Hydro Treating & Hydrocracker** Technology, Basics of Operation and Supervision of **Water Tanks Filling Stations**, **Amine Gas Sweetening & Sulfur Recovery**, Heat & Mass Transfer and Fluid Mechanics.

During his career life, Dr. Hesham held significant positions and dedication as the **General Manager**, **Operations Manager**, **Maintenance Manager**, **Section Head**, **Process Engineer** and **Mechanical Engineer** in various companies.

Dr. Hesham has a **PhD** and **Master's** degree in **Mechanical Engineering** and a **Bachelor's** degree in **Process Engineering**. Further, he is a **Certified Instructor/Trainer** and a **Peer Reviewer**. Dr. Hesham is a member of Egyptian Engineering Syndicate. Moreover, he has published technical papers and journals and has delivered numerous trainings, workshops, courses, 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, 04th of November 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome and Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Sampling & Sample Handling*** *Course Overview • Sampling Error • Representative Sampling • Sample Contamination and Sample Preservation • Sample Accountability*
0930 – 0945	*Break*
0945 – 1100	***Laboratory Instrument – UV/VIS Spectrophotometers*** *Spectrophotometer Architecture • Sources, Filters and Detectors • Sampling Devices • Fibre Optic Probes • Miniature Spectrophotometers*
1100 – 1230	***Laboratory Instrument – Infrared & Raman Spectroscopy*** *Background for Vibrational Spectroscopic Measurements • Comparison of Techniques and Relative Roles • IR Instrumentation • Instrumentation: Design and Performance Criteria • Fourier Transform Instruments • Filter Instrumentation • Laser Based Systems*
1230 – 1245	*Break*
1245 – 1420	***Laboratory Instrument - NMR*** *Theory of Nuclear Magnetic Resonance • NMR Spectroscopy • Instrumentation: Design & Performance Criteria • NMR Applications • Multi-Dimensional NMR Spectroscopy • Solid-State NMR Spectroscopy*
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: ***Tuesday, 05th of November 2024***

0730 – 0930	***Laboratory Instrument – Atomic Absorption Spectroscopy*** *Introduction • Flame AAS • Nebulizer/Burner systems • Atomisation and Interferences • Graphite Furnace AAS • Pyrolysis and Atomization • The STPF Concept*
0930 – 0945	*Break*
0945 – 1045	***Laboratory Instrument – ICP - OES*** *Inductively Coupled Plasma - Optical Emission Spectroscopy • Principals of Optical Emission Spectroscopy • Atomic Spectroscopy Sources • Techniques and Instruments • Analytical Performance • Applications of ICP-OES*
1045 – 1130	***Laboratory Instrument – Gas Chromatographs*** *Separation Systems • Selection of Carrier Gases • Gas Chromatography Columns • Column Stationary Phases • Injectors and Detectors • Gas Chromatography – Mass Spectrometry • High Speed and Portable GC*
1130 - 1230	***Laboratory Instrument – Ion Chromatography*** *Introduction • Ion Exchange Chromatography • Ion Exclusion Chromatography • Ion Pair Chromatography • Ion Suppression Chromatography • Conductivity/Suppressed Conductivity Detection • Amperometric Detection • Photometric Detection • Critical Instrumental Aspects*
1230 – 1245	*Break*

1245 – 1420	***Laboratory Instrument – Electrochemical Techniques*** *Principals of Conductivity • Immersed Electrodes – 2 an 4 Electrode Cells • Electrodeless (Non-contact) Measurement • pH Probes – Theory, Calibration, Measurement and Maintenance • Anodic and Cathodic Stripping Voltammetry*
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: Wednesday, 06th of November 2024

0730 – 0830	***ISO 17025 Standard*** *ISO 17025 Standard and Accreditation • Why Standardize? • Technical Competence*
0830 - 0930	***Method Validation*** *Validation Strategy • Validation of Standard Methods • Revalidation • Validation of Analytical Methods • IQ, OQ and PQ*
0930 – 0945	*Break*
0945 – 1100	***Data Validation & Uncertainty*** *Data Validation and Reporting • Measurement Uncertainty • Summary Recommendations*
1100 – 1230	***SOP's & Quality Systems*** *Anatomy of an SOP • SOP Styles • Statistical Quality Control – Testing Frequency and Control Charts • Audits and System reviews • Audits and System Reviews • Audits – Responsibility, Planning, Training, Conducting and Reporting • Responsibilities for Quality*
1230 – 1245	*Break*
1245 – 1420	***Laboratory Efficiency Testing & OHSA Requirements*** *Proficiency Testing Procedure • Evaluation of Proficiency Testing • Advantages for Laboratories and Performance Improvements • OHSA Standard • Chemical Hygiene Plan • Employee Information and Training • MSDS's*
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: Thursday, 07th of November 2024

0730 – 0930	***Certified Reference Standards & Traceability*** *Certified Standards • Applications of Certified Standards • Types of Reference Materials*
0930 – 0945	*Break*
0945 – 1100	***Certified Reference Standards & Traceability (cont'd)*** *Regulatory and Standards Requirements • Laboratory Requirements*
1100 – 1230	***HR & Safety Videos*** *Recruitment Considerations • Communicating Job Responsibilities*
1230 – 1245	*Break*

1245 – 1345	***HR & Safety Videos (cont'd)*** *Training and Documentation • A Series of Chemical Laboratory Safety Videos*
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*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

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