COURSE OVERVIEW LE0168
Offline Lab Analyzers Maintenance & Design

Course Title
Offline Lab Analyzers Maintenance & Design

Course Date/Venue
Session 1: July 22-26, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 17-21, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
LE0168

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

Course Description

This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

Calibration is a set of operations, performed in accordance with a definite procedure. These procedures compare the measurements performed by the laboratory instrument to those made by a standard or a more accurate instrument. As a result, any error in the functioning of the laboratory instrument can be detected, reported, and, therefore, eliminated. The aim of calibration is to ensure that the readings from the instrument are accurate and consistent with other measurements. It, thus, increases the reliability of the instrument, which is highly important in laboratory practices.

This course is designed to provide participants with a detailed and up-to-date overview of calibration of offline laboratory analyzers. It covers the general methodology comprising of common measurements, traceability standards, hierarchy, measurement standards and substitution of standards; the measurement systems, methods, characteristics, data considerations, IM&TE specification terms, error sources and measurement assurance program (MAP); the calibration systems based on ISO 17025; and the calibration requirements, procedures, standardization and adjustment methods.

Further this course will also discuss the industry practices, regulations, environmental control, validation processes, records management and official reports; the major instruments used in the laboratory, covering gas chromatography, gas chromatography/mass spectrometry (GC/MS), liquid chromatography (LC) and inductively couples plasma (ICP); and the propagation of uncertainty, uncertainty and calibration of instruments, and uncertainty calculation.

During this interactive course, participants will learn the calibration functions, apply analytical procedure calibration and analytical range; the process data, linear calibration function, process data for the linear calibration function, process data for the 2-order calibration function, verification of linearity and precision and recovery function; the calibration error analysis and statistical process control; and the limits of calibration and calibration bias.

Course Objectives

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

- Apply and gain a good working knowledge on calibration of offline laboratory analyzers
- Discuss general metrology covering the common measurements, traceability standards, hierarchy, measurement standards and substitution of standards
- Recognize measurement systems, methods, characteristics, data considerations, IM&TE specification terms, error sources and measurement assurance program (MAP)
- Carryout calibration systems based on ISO 17025 and apply calibration requirements, procedures, standardization and adjustment methods
- Implement industry practices, regulations, environmental control, validation processes, records management and official reports
- Calibrate major instruments used in the laboratory covering gas chromatography, gas chromatography/mass spectrometry (GC/MS), liquid chromatography (LC) and inductively couples plasma (ICP)
- Illustrate propagation of uncertainty, uncertainty and calibration of instruments and uncertainty calculation
- Discuss calibration functions, apply analytical procedure calibration and establish analytical range
- Determine calibration functions and process data, linear calibration function, process data for the linear calibration function, process data for the 2-order calibration function, verification of linearity and precision and recovery function
- Employ calibration error analysis and statistical process control
- Identify the limits of calibration and calibration bias

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 calibration of offline laboratory analyzers for laboratory technicians, foremen, supervisors, those who are involved in managing laboratory facilities, laboratory staff, those who are using major laboratory instruments such as GC, GC/MS, LC, ICP etc. This includes chemists, scientists, analysts, instrument engineers and laboratory technical staff.

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:

Dr. Yousef Al-Mashni, PhD, MSc, BSc, is a **Senior Security Consultant** with over **35 years** of medical and practical experience. His wide expertise covers **Access Control Systems**, **Paramiter and Building Security**, **Manpower Selection & Development**, **Industrial Security Risk Assessment & Management**, **Security Surveying**, **Crisis Management**, **Intelligence**, **Strategic Planning**, **Terrorism**, **Security Management**, **Security Risk Assessment**, **Operating Access Control System**, **Security Operations Management** and **HSE Management**. Further, he is also well-versed in the areas of **Human Resource** Management, **Performance** Management, **Technical** Management, **Quality** Management, **Productivity & Efficiency** Improvements, **Time** Management, **Strategic** Management, **People** Management, **Production** Management, **Management Skills**, **Negotiation Skills**, **Contracts & Procurement Skills**, **Creativity & Innovation**, **Research Methods & Analysis** and **Strategic Thinking & Planning**. He is currently the Deputy **Principal** & **Chief Technical Instructor** of **UNRWA** wherein he is responsible in developing and managing operations at the college/centre including building workshops and laboratories capacity, curriculum development and introducing new courses.

During his long career life, Dr. Yousef worked for many international companies handling key positions such as ICDL Centre **Manager**, **Deputy Principal**, **Chief Technical Instructor**, **Acting Principal**, **Laboratory Supervisor**, **Technical Instructor**, **Technical & Vocational Instructor**, **Senior Medical Laboratory Technician** and **Medical Laboratory Technician**.

Dr. Yousef has a **PhD** degree in **Natural Health Sciences** from the **University of Florida** (**USA**), **Master** degree in **Clinical Microbiology** and **Bachelor** degree **with Honours** in **Microbiology**. Further, he has **Diploma** in Vocational Education (**UNRWA & UNESCO**) and received several **certifications** like **ICDL** and Training of Trainers (**TOT**) in **Cambridge University** (**England**). He is a **Certified Instructor/Trainer** and an active **member** of **Jordan Medical Laboratories Society**, Technical **Accreditation Committee of Medical Laboratories** (**Jordan Institution & Metrology**) and the Technical **Accreditation Committee for Granting ISO 15189 Certificate**. Furthermore, he has also published numerous technical papers and books including **Medical & Diagnostic Microbiology**, **Practical Competencies in Medical Laboratory Technology**, **Safety in Medical Laboratory Science** and **Quality Control in Medical Laboratory Science** just to name a few.

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.

Accommodation

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

Course Fee

US$ 5,500 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 & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***General Metrology*** *Common Measurements ● Traceability Standards and Hierarchy ● Measurement Standard ● Substitution of Standards*
0930 – 0945	*Break*
0945 – 1100	***Measurement Systems*** *Measurement Methods ● Measurement Characteristics ● Measurement Data Considerations ● IM&TE Specification Terms and Characteristic ● Error Sources ● Measurement Assurance Program (MAP)*
1100 – 1230	***Calibration Systems Based on ISO 17025*** *ISO 17025 Calibration Requirements ● Calibration Procedures ● Standardization and Adjustment Methods ● Industry Practices and Regulations*
1230 – 1245	*Break*
1245 – 1420	***Calibration Systems Based on ISO 17025 (cont'd)*** *Environmental Control ● Calibration Processes for IM&TE ● Validation Processes ● Records Management ● Official Reports*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Calibration of Major Instruments Used in the Laboratory*** *Gas Chromatography ● Gas Chromatography/Mass Spectrometry (GC/MS) ●*
0930 – 0945	*Break*
0945 – 1100	***Calibration of Major Instruments Used in the Laboratory (cont'd)*** *Liquid Chromatography (LC) ● Inductively Couples Plasma (ICP)*
1100 – 1230	***Propagation of Uncertainty*** *Mathematical Modelling ● Uncertainty ● Type A Evaluation of Uncertainty ● Pooled Variance ● Type B Evaluation of Standard Uncertainty ● Variance & Uncertainty Range*
1230 – 1245	*Break*
1245 – 1420	***Uncertainty & Calibration of Instruments*** *Linear Relation ● Uncertainty ● Numerical Example ● Other Functions ● Power Function ● Method of Least Squares*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Calculation of Uncertainty*** *Importance of Correct Measurement ● Classical Procedure for Uncertainty Calculations ● Sources of Systematic Uncertainty (Us) ● Combination of Systematic Uncertainty ● Dominant Term ● Total Overall Uncertainty (U) ● Objections to The Above Method*
0930 – 0945	*Break*
0945 – 1100	***Calculation of Uncertainty (cont'd)*** *The BIPM Recommendations 1980 Basis of ISO Guide (GUM) ● ISO GUM-Step-By-Step Procedure for Calculation of Uncertainty ● Propagation of Probability Density Function ● Bayesian Statistics ● Example for Calculations of Uncertainty ● Merits and Limitations of ISO GUM Method*
1100 – 1230	***Calibration Functions*** *Calibration of the Analytical Procedure ● Establishing of an Analytical Range ● Determination of the Calibration Function & Process Data ● Determination for the Linear Calibration Function*
1230 – 1245	*Break*
1245 – 1420	***Calibration Functions (cont'd)*** *Process Data for the Linear Calibration Function ● Process Data for the 2-order Calibration Function ● Verification of Linearity & Precision ● Recovery Function*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Calibration Error Analysis*** *Errors as Uncertainties ● Inevitability of Uncertainty ● Importance of Knowing Uncertainties ● More Examples*
0930 - 0945	*Break*
0945 – 1100	***Calibration Error Analysis (cont'd)*** *Estimating Uncertainties When Reading Scales ● Estimating Uncertainties in Repeatable Measurements*

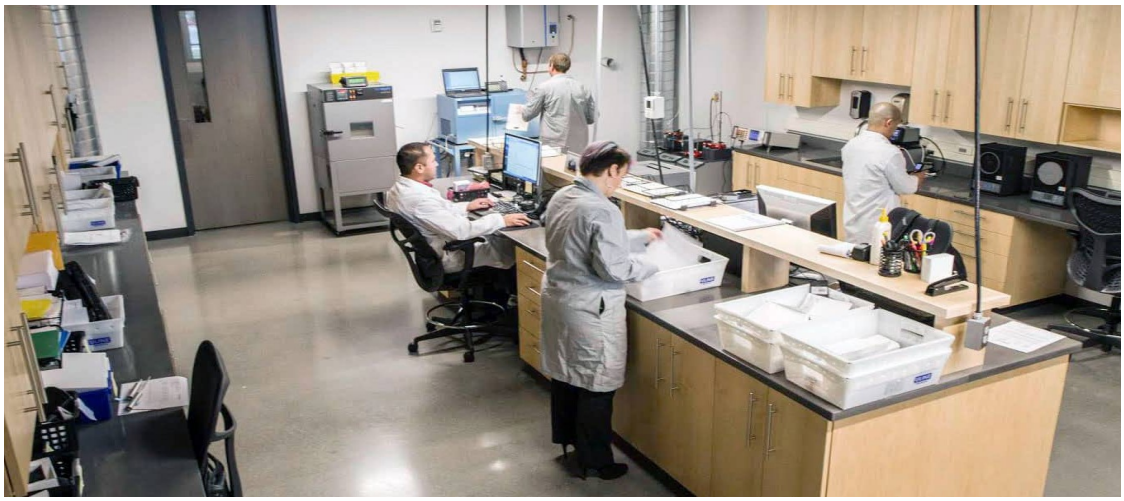
1100 – 1230	***Statistical Process Control*** *Control Charts ● Capability Analysis*
1230 – 1245	*Break*
1245 – 1420	***Statistical Process Control (cont'd)*** *Capability Analysis – An Alternative Consideration*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Limits of Calibration*** *Calibration: Limit Strategies for Laboratory Assay Data ● Limit Strategies ● Method Detection Limit (EPA) ● Data Near The Detection Limits*
0930 – 0945	*Break*
0945 – 1100	***Limits of Calibration (cont'd)*** *More on Statistical Management of Nondetects ● The Kaplan – Meier Method (Nonparametric Approach) for Analysis of Laboratory Data with Nondetects*
1100 – 1230	***Calibration Bias*** *Error ● Uncertainty ● Sources of Uncertainty ● Estimation Methods of Uncertainty ● Calibration Bias*
1230 – 1245	*Break*
1245 – 1345	***Calibration Bias (cont'd)*** *Multiple Instruments ● Crude Versus Precise Methodologies*
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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