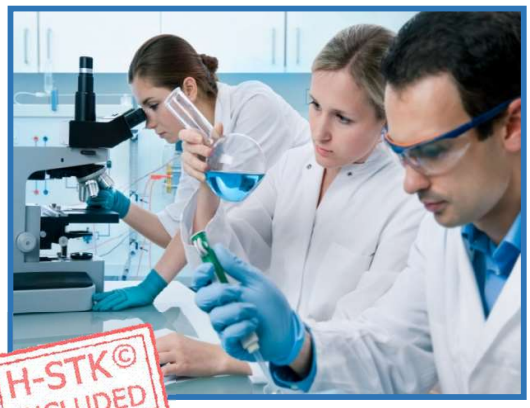
COURSE OVERVIEW LE0360
Sample Preparation and Analysis Techniques

Course Title
Sample Preparation and Analysis Techniques

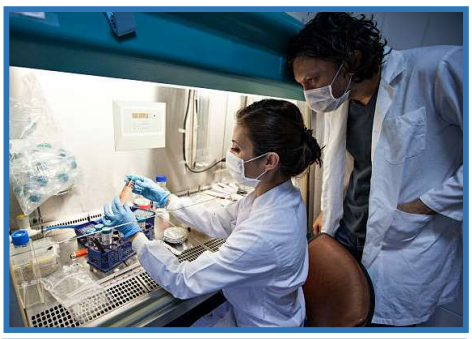


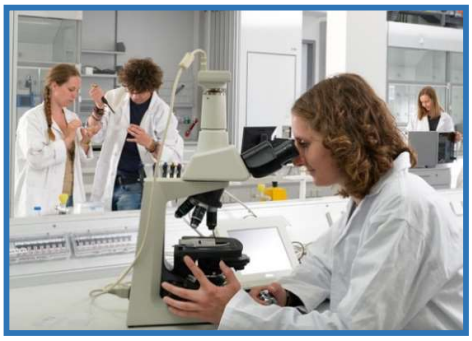
Course Date/Venue
Session 1: May 26-30, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: October 05-09, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
LE0360

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

Course Description





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

There has been unprecedented growth in measurement techniques over the last few decades. Instrumentation, such as chromatography, spectroscopy and microscopy, as well as sensors and microdevices, have undergone phenomenal developments. Despite the sophisticated arsenal of analytical tools, complete noninvasive measurements are still not possible in most cases due to improper sample preparation and development.

Sample development and preparation is often the bottleneck in a measurement process, as it tends to be slow and labor-intensive. Despite this reality, it did not receive much attention until quite recently. However, the last two decades have seen rapid evolution and an explosive growth of this industry. This was particularly driven by the needs of the environmental and the pharmaceutical industries, which analyze large number of samples requiring significant efforts in sample preparation.

Sample preparation is important in all aspects of chemical, biological, materials and surface analysis. Notable among recent developments are faster, greener extraction methods and microextraction techniques. Specialized sample preparations, such as self-assembly of analytes on nano-particles for surface enhancement, have also evolved. Developments in high-throughput workstations for faster preparation-analysis of a large number of samples are impressive. Considering all these, sample preparation has evolved to be a separate discipline within the analytical/measurement sciences.

This course is designed to provide an overview of a variety of chemical sample preparation techniques and to bring the diverse methods under a common banner. Knowing fully well that it is impossible to cover all aspects in a single course, this course attempts to cover some of the more important and widely used techniques for chemicals.

Course Objectives

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

- Apply systematic techniques in sample development and preparation for analytical laboratory
- Employ various sampling and sample handling methods including representative sampling, sample contamination and preservation, transmittal of samples to laboratory, sample receiving, etc
- Discuss liquid sampling including sampling types, principles, general aspects, techniques, equipment, etc
- Determine that physiochemical properties of aqueous and solid environmental matrices as well as analyte losses during storage
- Use sampling selected solid materials and employ sample preparation for water analysis
- Differentiate liquid-liquid extraction (LLE), solid phase extraction and solid phase microextraction
- Define membrane extraction and membrane inlet mass spectrometry and demonstrate the extraction techniques for solid samples as well as the hot (subcritical) water extraction
- Explain the recent development in the chemistry and the application of analytical derivatizations as well as the automation of sample preparation
- Explain novel firous systems for contaminant removal

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 is intended for those involved in sample development and preparation within analytical laboratories, R&D and R&T such as analytical chemists, engineers, supervisors, scientists, analysts and other 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 an **International Expert** in **Analytical Laboratory** with over **30 years** of extensive experience. He is an **authority** in **Laboratory Equipment**, **Laboratory Quality Management Systems** (**ISO 17025** and **ISO 15189**), **Lab Safety & Health**, Good Laboratory Practice (**GLP**) and **Safety Procedure** in **Laboratories**. His wide expertise also covers **Water Analysis** & **Reporting**, **Water Sampling** & **Testing**, **Water Analyzer**, **Medical Laboratory Auditing**, **ISO 15489**, **Infection Control**, Internal **Quality Control** for **Microbiologists**, **Analytical Techniques**, **Biochemical**, **Hematological**, **Parasitological**, **Biochemical**, **Microbiological** & **Serological Analysis** of **Clinical Specimens**, **Helmith Ova** & **Salmonella** in **Waste Water** & **Sludge**, **Microbiological** Aspects & **Analysis** of **Wastewater**, Microbiology of **Wetlands**, Microbiological **Indoor Air Quality**, **Entrococcus**, **Pseudomonas** & **Aeromonas**, **Sulfate Reducing Bacteria**, **Fluorescense Microscopy**, **Planktology** of **Ambient Environment**, **Oral**, **Medical** & **Diagnostic Microbiology** and **Oral** & **Dental Hygiene**. Further, he is also well-versed in the areas of **Food Hygiene** and **HACCP**, **Food Safety**, **Food Poisoning**, **First Aid & CPR** and **Fire Safety**. 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 Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), 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.

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.

Accommodation

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

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	***Sampling & Sample Handling*** *Introduction • Representative Sampling • Sample Contamination • Sample Preservation • Transmittal of Samples to the Laboratory • Sample Receiving • Disposal of Completed Samples • Sample Accountability*
0930 – 0945	*Break*
0945 – 1100	***Liquid Sampling*** *Introduction • Types of Samples from Environmental Waters • Principles of Pre-Selection of Sampling Technique • General Aspects of Sampling of Liquids • Sampling Techniques and Equipment • Sampling of Groundwater from Small Boreholes • Sampling of Unsaturated Soil Water • Sampling of Piped Water for Determination of Volatile Compounds and Dissolved Gases • Automatic Sampling Systems • Passive Water Sampling • General Aspects of Preparing Water Samples for Analysis • Sample Pre-treatment Methods for Water • Preservation and Water Sample Storage*
1100 – 1230	***Physiochemical Properties of Aqueous and Solid Environmental Matrices*** *Introduction • Temperature • pH • Physicochemical Chemical Properties of Solid Matrices • pH Value*
1230 – 1245	*Break*
1245 – 1420	***Analyte Losses during Storage*** *Introduction • Electropolished Canisters • Hydrocarbons and Halocarbons • Solid Adsorbents • Semi-Volatile Organic Compounds*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Sampling Selected Solid Materials*** *Introduction • Sampling Soils • Sampling Soil Profiles • Sampling Soil from Surface Layers • Soil Sample Preparation for Analysis • Sampling Site Selection • Sampling Sediments*
0930 – 0945	*Break*
0945 – 1100	***Sample Preparation for Water Analysis*** *Introduction • Target Versus Non-Target Analysis, Offsite Versus On-Site Analysis • Sample Extraction and Clean-up • Enrichment Factor • Recovery • Limit of Detection (LOD) • Liquid-liquid Extraction (LLE) • Solvent Evaporation • Solid-phase Extraction in Analysis • Field Analysis • Applications • Natural Organic Matter • Polluted Aqueous Samples*
1100 – 1230	***Headspace Gas Chromatography*** *Introduction • Static versus Dynamic Headspace • Partition Coefficient • Parameters Affecting the Partition Coefficient • Mixing • Injection volume • Volatiles in High-boiling Oils • Environmental Methods*
1230 – 1245	*Break*
1245 – 1420	***Samples Preparation Techniques for Soil Analysis*** *Introduction • Analysis of Petroleum Hydrocarbons (PHCs) • Extraction of Semi-volatile Petroleum Hydrocarbons with an Organic Solvent • Solventless Extraction of PHCs from Soil • Direct Analysis of BTEX and Gasoline in Soil • Analysis of Metals in Soils and Sediments*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Liquid-Liquid Extraction (LLE)*** *Introduction to Liquid-Liquid Extraction for Sample Preparation • Goals of Performing LLE • Advantages of LLE • Problems with the Classical Approach • Kinetics and Mechanism • Quantitative Analysis by LLE • Soxhlet Extraction • Drop Techniques with Two Phases • Drop Dissolution in the Aqueous Phase • Modes of Single Drop LPME • Future Directions*
0930 – 0945	*Break*
0945 – 1100	***Solid Phase Extraction*** *Introduction • Historical Development • As a Replacement of Liquid-liquid Extraction • Choice of Cartridge or Disc Formats • Sorbent Types and their Applications • General Application of Inorganic Oxide Adsorbents • Low-specificity Sorbents • Structures of Silica-based Chemically Bonded Sorbents • Samples in Aqueous Solution • Samples in Organic Solvents*
1100 – 1215	***Solid Phase Extraction (cont'd)*** *Compound and Class-specific Sorbents • Multi-mode Extractions • Surface Ligand Bonding • Theory of Solid-Phase Extraction • Breakthrough Volumes • Determination of Breakthrough Volumes • Retention • Method Development • Sample Processing Parameters and their influence on recovery by Solid-phase extraction • Sample Processing Parameters for Disks • SPE Automation*
1215 – 1230	*Break*

1230 – 1420	***Solid Phase Microextraction*** *Introduction • Principles of Solid Phase Microextraction • Extraction Modes with Coated Fiber • Extraction Modes with in-tube SPME • Fiber Coatings • Fiber Preparation • Experimental Parameters Affecting Extraction Efficiency • Interfaces to Analytical Instrumentation • SPME/GC Interface • Commercial SPME Devices • Method Development and Optimization • Applications of SPME*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Membrane Extraction*** *Membrane Separation Involving Size Exclusion • Membrane Extraction • Exhaustive Extraction • Membrane Extraction with Sorbent Interface (MESI)*
0930 – 0945	*Break*
0945 – 1100	***Membrane Inlet Mass Spectrometry*** *Introduction • Membrane Inlet Designs • Sampling from Gases • Sampling from Liquids • Sampling from Solids • Future Perspective*
1100 – 1230	***Extraction Techniques for Solid Samples*** *Introduction • Supercritical Fluid Extraction • Instrumentation • Methods of Analysis • Recommendations for SFE Method Development • Theoretical Aspects • Instrumentation • Methods of Analysis • Pressurized Fluid Extraction • Theoretical Considerations • Instrumentation • Methods of Analysis • Comparison on Extraction Techniques*
1230 – 1245	*Break*
1245 – 1420	***Hot (Subcritical) Water Extraction*** *Introduction • Background • Apparatus and Techniques Dynamic (Flowing) Extractions and Analyte Collection*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Recent Developments in the Chemistry and Application of Analytical Derivatizations*** *Introduction • Derivatization • Fluorescence • Amines • Carbonyls • Derivatization Hydroxyls, Amines, Carboxylic Acids and carbonyls for Gas Chromatographic Analysis • Silylation • Bromoacetonitrile • Derivatization at Carboxylic Acids and Phenols • Inorganic Analyses*
0930 – 0945	*Break*
0945 – 1100	***Automation of Sample Preparation*** *Introduction • Liquid-liquid Extraction • Solid-phase Extraction: Off-line Cartridges*
1100 – 1230	***Novel Fibrous Systems for Contaminant Removal*** *Introduction • Activated Carbon • Ion Exchange Beads • Recent Developments • Chemical Activation*
1230 – 1245	*Break*

1245 – 1345	***Novel Fibrous Systems for Contaminant Removal (cont'd)*** *Effect of Pore Surface Chemistry on Adsorption Behavior • Ion Exchange Fibers to Remove Inorganic Contaminants • Coated Ion Exchange Fibers • Application: Heavy Metal Removal • Carbon-Based IEFs*
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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