COURSE OVERVIEW LE1016
Laboratory Analysis of the Chemical & Physical Properties of Water

Course Title
Laboratory Analysis of the Chemical & Physical Properties of Water

Course Date/Venue
September 28-October 02, 2025/TBA Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE

Course Reference
LE1016

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.

This course is designed to provide participants with a detailed and up-to-date overview of Laboratory Analysis of the Chemical & Physical Properties of Water. It covers the types of water sources and the importance of water quality analysis, regulatory standards and key chemical and physical indicators; the laboratory safety procedures, sampling techniques and preservation, calibration and standardization of instruments; and the analytical techniques, laboratory quality control (QC) and quality assurance (QA), temperature measurement and turbidity analysis.

Further, the course will also discuss the color determination, conductivity and total dissolved solids (TDS) measurement, pH measurement and odor and taste evaluation; the alkalinity and acidity testing, hardness determination, chloride determination, fluoride analysis and sulfate determination; the nitrate and nitrite analysis, dissolved oxygen (DO) measurement, biochemical oxygen demand (BOD) and chemical oxygen demand (COD); the ammonia nitrogen (NH3-N) determination, trace metals by atomic absorption spectroscopy (AAS) and heavy metal testing using ICP-OES; and the phosphorus and phosphate analysis and oil and grease determination.

During this interactive course, participants will learn the total suspended solids (TSS) and volatile solids (VS); the microbiological indicators of water quality covering total coliforms and E. coli detection, incubation and identification, interpretation of results and sterile sampling procedures; and the interpretation of laboratory results through statistical validation of data, detection limits and uncertainty, comparing with regulatory standards and trend analysis.

Course Objectives

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

- Apply and gain an in-depth knowledge on laboratory analysis of the chemical and physical properties of water
- Identify the types of water sources and discuss the importance of water quality analysis, regulatory standards and key chemical and physical indicators
- Carryout laboratory safety procedures, sampling techniques and preservation and calibration and standardization of instruments
- Employ analytical techniques, laboratory quality control (QC) and quality assurance (QA), temperature measurement and turbidity analysis
- Apply color determination, conductivity and total dissolved solids (TDS) measurement, pH measurement and odor and taste evaluation
- Carryout alkalinity and acidity testing, hardness determination, chloride determination, fluoride analysis and sulfate determination
- Illustrate nitrate and nitrite analysis, dissolved oxygen (DO) measurement as well as discuss biochemical oxygen demand (BOD) and chemical oxygen demand (COD)
- Apply ammonia nitrogen (NH3-N) determination, trace metals by atomic absorption spectroscopy (AAS) and heavy metal testing using ICP-OES
- Carryout phosphorus and phosphate analysis and oil and grease determination and discuss total suspended solids (TSS) and volatile solids (VS)
- Recognize microbiological indicators of water quality covering total coliforms and E. coli detection, incubation and identification, interpretation of results and sterile sampling procedures
- Interpret laboratory results through statistical validation of data, detection limits and uncertainty, comparing with regulatory standards and trend analysis

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 laboratory analysis of the chemical and physical properties of water for water quality laboratory technicians, environmental scientists and engineers, water treatment plant operators, chemists and laboratory analysts, health and safety officers, quality control/quality assurance professionals, regulatory and compliance officers, technical staff from water utilities and environmental agencies, researchers and academics in environmental science and professionals from oil and gas, power generation, and industrial sectors involved in water monitoring and testing.

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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:

Mr. Paul Patsi, MSc, BSc, is a **Senior Management Consultant** and an **International Expert** in **Analytical Chemistry Water & Treatment Technology** with over **20 years** of extensive experience in **Analytical Laboratory** and **Water & Wastewater Treatment Engineering**. His expertise covers **Laboratory Assessment**, **Microbiological Quality Assurance**, **Analytical Chemistry**, **Statistical Analysis**, **Laboratory Safety**, **Equipment & Infrastructure Management**, **Budgeting & Planning of Laboratory Consumables**, **Business Administration**, **Personnel Management**, **Laboratory Management**, **Chemical Analysis**, **Laboratory Auditing**, **Risk Assessment**, **Microbiological Analysis of Water & Waste Water**, **Waste Water Treatment Analysis**, **Water Chemistry**, **HACCP**, **ISO 22000**, **ISO 17025**, **ISO 9001**, Good Manufacturing Practice (**GMP**), Good Hygiene Practice (**GHP**) and Good Laboratory Practice (**GLP**). He is also an expert in microbiological indoor air quality, water biology, food sampling and calibration. He is currently the **Head of Industrial Analytical Laboratory** of PINDOS wherein he is in-charge of the budgeting, auditing, consumables, suppliers, personnel management, equipment and infrastructure management along with waste water treatment and water/environmental legislation.

During his career life, Mr. Paul has held key positions such as the **Head of Microbiology & Chemical Laboratory**, **Head of Quality Control**, **Technical Consultant**, **Research Projects Specialist**, **Scientific Consultant**, **Biologist-Scientific Expert** and **Biologist** for multi-billion companies like the **European Union**, **Help LTD**, **Lake Pamvotis Municipality Company**, **Hellenic Centre for Marine Research**, **Cargill** and **Nestle** just to name a few.

Mr. Paul has a **Master** degree in **Food Science and Food Technology** from the **University of Ioannina** (**Greece**) and a **Bachelor** degree in **Biology** from the **Aristotle University of Thessaloniki** (**Greece**). He is a **Certified Instructor/Trainer** and a **Member** of the **Society for Applied Microbiology**, **Society of Biological Scientist** and the **Global Coalition for Sustained Excellence in Food & Health Protection**.

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 + **VAT**. 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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 28th of September 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Water Quality Parameters*** *Types of Water Sources • Importance of Water Quality Analysis • Regulatory Standards (WHO, EPA, Local) • Key Chemical & Physical Indicators*
0930 – 0945	*Break*
0945 – 1030	***Laboratory Safety Procedures*** *Chemical Handling & Storage • PPE Selection & Use • Emergency Response Plans • Safe Disposal of Laboratory Waste*
1030 – 1130	***Sampling Techniques & Preservation*** *Types of Water Samples (Grab, Composite) • Sample Collection Tools & Procedures • Chain of Custody Documentation • Sample Preservation & Holding Times*
1130 – 1215	***Calibration & Standardization of Instruments*** *Importance of Calibration • Calibration Curves & Methods • Use of Standards & Reference Solutions • Common Calibration Errors*
1215 – 1230	*Break*
1230 – 1330	***Basics of Analytical Techniques*** *Gravimetric, Volumetric & Instrumental Methods • Principles of Spectrophotometry • Titrimetric Analysis Basics • Overview of Chromatographic Techniques*
1330 – 1420	***Laboratory Quality Control (QC) & Quality Assurance (QA)*** *Duplicates, Blanks & Spikes • Control Charts & Accuracy Checks • Instrument Validation • Internal & External Audits*
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: ***Monday, 29th of September 2025***

0730 – 0830	***Temperature Measurement & Significance*** *Use of Digital & Mercury Thermometers • Thermocouple Probes • Influence on Chemical Solubility • Recording & Interpreting Trends*
0830 - 0930	***Turbidity Analysis*** *Nephelometric Method (NTU) • Calibration of Turbidimeters • Sources of Turbidity • Regulatory Limits & Reporting*

0930 – 0945	*Break*
0945 – 1100	***Color Determination*** *Visual & Instrumental Methods (APHA Units) • Effect of Organic Matter & Metals • Sample Preparation • Impact on Consumer Perception*
1100 – 1215	***Conductivity & Total Dissolved Solids (TDS)*** *Measurement Principles Using Conductivity Meters • Relationship Between EC & TDS • Sources of Dissolved Solids • Conversion Formulas*
1215 – 1230	*Break*
1230 – 1330	***pH Measurement*** *Electrometric Method Using pH Meters • Buffer Calibration • Temperature Compensation • Interpretation in Environmental Context*
1330 – 1420	***Odor & Taste Evaluation*** *Threshold Odor Number (TON) • Sensory versus Instrumental Techniques • Odor-Causing Compounds • Public Health Relevance*
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: Tuesday, 30th of September 2025

0730 – 0830	***Alkalinity & Acidity Testing*** *Titration Methods Using Standard Acids/Bases • Bicarbonate & Carbonate System • Indicators Used (Methyl Orange, Phenolphthalein) • Role in Buffering Capacity*
0830 – 0930	***Hardness Determination*** *EDTA Titration Technique • Differentiating Calcium & Magnesium • Complexometric Indicators • Impact on Scaling & Soap Usage*
0930 – 0945	*Break*
0945 – 1100	***Chloride Determination*** *Argentometric Titration (Mohr Method) • Use of Silver Nitrate & Potassium Chromate • Interferences • Chloride in Potable & Industrial Water*
1100 – 1215	***Fluoride Analysis*** *SPADNS Colorimetric Method • Ion-Selective Electrodes • Health Effects of Fluoride • Regulatory Standards*
1215 – 1230	*Break*
1230 – 1330	***Sulfate Determination*** *Turbidimetric Method • Use of Barium Chloride • Calibration Curve Preparation • Sulfate in Natural & Wastewater*
1330 – 1420	***Nitrate & Nitrite Analysis*** *Spectrophotometric Methods • Cadmium Reduction Technique • Interference Elimination • Nutrient Pollution Relevance*
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: Wednesday, 01st of October 2025

0730 – 0830	***Dissolved Oxygen (DO) Measurement*** *Winkler Method • Membrane Electrode Method • Sample Preservation • Role in Aquatic Ecosystems*

0830 – 0930	***Biochemical Oxygen Demand (BOD)*** *5-Day Incubation Method • Seeding & Dilution Techniques • Blank Corrections • Significance in Wastewater Analysis*
0930 – 0945	*Break*
0945 – 1100	***Chemical Oxygen Demand (COD)*** *Dichromate Reflux Method • Use of Open & Closed Reflux • Reagents Preparation • Comparison with BOD*
1100 – 1215	***Ammonia Nitrogen (NH3-N) Determination*** *Nesslerization or Ion-Selective Method • Sources of Ammonia • Role in Nitrogen Cycle • Impact on Aquatic Life*
1215 – 1230	*Break*
1230 – 1330	***Trace Metals by Atomic Absorption Spectroscopy (AAS)*** *Sample Digestion Methods • Flame versus Graphite Furnace • Calibration & Sensitivity • Common Metals: Lead, Cadmium, Iron*
1330 – 1420	***Heavy Metal Testing Using ICP-OES*** *Principles of ICP-OES • Multi-Element Analysis • Sample Matrix Interferences • Advantages over AAS*
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: ***Thursday, 02nd of October 2025***

0730 – 0830	***Phosphorus & Phosphate Analysis*** *Molybdenum Blue Method • Colorimetric Detection • Orthophosphate versus Total Phosphorus • Eutrophication Concerns*
0830 – 0930	***Oil & Grease Determination*** *Hexane Extraction & Gravimetric Method • Soxhlet Extraction • Interferences from Surfactants • Environmental Discharge Standards*
0930 – 0945	*Break*
0945 – 1100	***Total Suspended Solids (TSS) & Volatile Solids (VS)*** *Filtration & Drying Technique • Determining Fixed & Volatile Fractions • Sample Pretreatment • Effect on Sedimentation*
1100 – 1215	***Microbiological Indicators of Water Quality*** *Total Coliforms & E. Coli Detection (MPN, Membrane Filtration) • Incubation & Identification • Interpretation of Results • Sterile Sampling Procedures*
1215 – 1230	*Break*
1230 – 1300	***Interpretation of Laboratory Results*** *Statistical Validation of Data • Detection Limits & Uncertainty • Comparing with Regulatory Standards • Trend Analysis*
1300 – 1345	***Final Report Preparation & Presentation*** *Structure of a Water Analysis Report • Data Visualization (Tables, Charts) • Recommendations & Corrective Actions • Client Communication Protocols*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t 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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