COURSE OVERVIEW LE0089
Advanced UV-Vis Spectrophotometric Analysis

Course Title
Advanced UV-Vis Spectrophotometric Analysis

Course Date/Venue
Session 1: June 15-19, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: October 20-24, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
LE0089

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

This course is designed to provide participants with a detailed and up-to-date overview of Advanced UV-Vis Spectrophotometric Analysis. It covers the principles of UV-Vis spectrophotometry including light sources, monochromators and wavelength selection; the sample preparation, spectral data acquisition and processing; the standardization and calibration in UV-Vis analysis; the applications of UV-Vis spectrophotometry; the advanced absorption spectra analysis and derivative UV-Vis spectroscopy; and the multi-component analysis and UV-Vis method validation.

During this interactive course, participants will learn the kinetic and time-resolved UV-Vis spectroscopy and detecting impurities in petroleum products; the UV-Vis spectroscopy in environmental compliance; the spectrophotometric determination of total petroleum hydrocarbons (TPH); the UV-Vis for catalysis and refining process control; the automation and high-throughput UV-Vis spectroscopy; the common errors and troubleshooting in UV-Vis analysis; the advanced data processing, interpretation and comparative analysis with other spectroscopic methods; and the emerging applications in UV-Vis spectroscopy and regulatory compliance and industry standards.

Course Objectives

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

- Appy and gain an advanced knowledge on UV-Vis spectrophotometric analysis
- Discuss the principles of UV-Vis spectrophotometry including light sources, monochromators and wavelength selection, detectors and optical pathways and sample handling
- Carryout sample preparation for UV-Vis analysis, spectral data acquisition and processing
- Employ standardization and calibration in UV-Vis analysis and the applications of UV-Vis spectrophotometry in petroleum industry
- Apply advanced absorption spectra analysis and recognize derivative UV-Vis spectroscopy
- Carryout multi-component analysis and UV-Vis method validation
- Recognize kinetic and time-resolved UV-Vis spectroscopy and detect impurities in petroleum products
- Interpret UV-Vis spectroscopy in environmental compliance as well as spectrophotometric determination of total petroleum hydrocarbons (TPH)
- Carryout UV-Vis for catalysis and refining process control and integrate with other analytical techniques
- Identify the automation and high-throughput UV-Vis spectroscopy including common errors and troubleshooting in UV-Vis analysis
- Employ advanced data processing and interpretation including the comparative analysis with other spectroscopic methods
- Discuss the emerging applications in UV-Vis spectroscopy and regulatory compliance and industry standards

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 advanced UV-Vis spectrophotometric analysis for laboratory technicians and analysts, research scientists, pharmaceutical and biotechnology professionals, academicians and students, quality control/quality assurance (QC/QA) personnel, regulatory and compliance officers, instrumentation specialists, industry professionals.

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. Ian Kaloudis, PhD, MSc, PGrad, BSc, is a **Senior Analytical Chemist** with almost **30 years** of extensive experience. His expertise widely covers in the areas of **Chemical Analysis**, **Chemical Laboratory**, **Laboratory** Management, **Laboratory** Supervision & Management, **Analytical Laboratory** Management, **Modern Analytical Laboratory**: Management, **Laboratory Consumables Management**, **Laboratory Instrument Calibrations** & Troubleshooting Techniques, Safety and Quality in **Scientific Laboratory**, **Laboratory** Skills, **Pesticides** Application, **PAH**, **VOC**, Advanced Oxidation Processes (**AOP**), **Phenols**, **Cyanotoxins**, Gas Chromatography (**GC**), Mass Spectrometry (**MS**), **GC/MS** Technology & Problem Solving, High Performance Liquid Chromatography (**HPLC**), **HPLC-ICP-MS/ICP-MS**, **Analytical Instrumentation**, Equipment, Safety & Quality (ISO 17025), **Analytical Instrumentation** for Laboratory, **Analytical Chemistry**, **Analytical Laboratory Quality Management System**, **Waste Water Treatment**, **Elucidation** of Mechanisms, **Statistical Analysis of Data**, Statistical Quality Control (**SQC**), Statistics Methods & Measurement Uncertainty, **ISO 17025:2017**, **Food Safety** and **Environmental** Management Systems. He is currently the **Head of Organic Micropollutants Laboratory** of Athens Water Supply and Sewerage Company wherein he is responsible for the development & validation for the determination of organic pollutants in water, research projects related to water quality and development of cyanotoxins analysis laboratory.

All throughout his career life, Dr. Kaloudis had occupied several challenging positions and dedication as **Quality Manager**, **Head of Industrial Waste Water Control Section**, **Consultant**, **Senior Researcher**, **Collaborating Researcher**, **Research Associate**, **Lecturer**, **Trainer** and **Auditor** for various companies such as the KEK DIASTASI - Hellenic Food Authority Training Programs, University of the West of Scotland, Institute of Nanoscience and Nanotechnology (INN), Hellenic Accreditation System (E.SY.D.), Institute of Physical Chemistry, Food Industrial Research and Technological Development Company and Athens Water Supply and Sewerage Company (EYDAP SA).

Dr. Kaloudis has a **PhD** degree in Chemistry (Honors) from the **National and Kapodistrian University of Athens**, a **Master** degree in **Quality Management** from the **University of the West of Scotland**, a **Postgraduate Programme** in **Production Management & Quality Management** from **Technical Educational Institute (TEI) of Piraeus**, a **Bachelor** degree in **Chemistry** (Honors) from **National and Kapodistrian University of Athens**. Further, he is a **Certified Instructor/Trainer**, a **Certified ISO 17025:2017 Auditor**, a **Registered Food Safety and Hygiene Trainer**, a **Certified ISO 9001 Lead Auditor** from International Register of Certificated Auditors (**IRCA**), a **Certified Environmental Management Systems Auditor** from Institute of Environmental Management and Assessment (**IEMA**), a member of the American Chemical Society (**ACS**), a senior member of the American Society for Quality (**ASQ**), a member of the International Water Association (**IWA**), a member of the European Water Platform, a member of the Hellenic Mass Spectrometry Society (**HMSS**), a member of the Italian Society of Toxicology and a member of the Association of Greek Chemists (**AGC**). He has further published numerous journals/books and delivered various trainings, seminars, conferences, workshops and courses globally.

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 + **VAT**. 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 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 UV-Vis Spectrophotometry*** *Principles & Theory of UV-Vis Spectrophotometry • The Electromagnetic Spectrum & Absorbance Theory • Lambert-Beer's Law & Its Applications • Limitations & Deviations from Beer's Law*
0930 – 0945	*Break*
0945 – 1030	***Instrumentation & Components*** *Light Sources (Deuterium, Tungsten, & Xenon Lamps) • Monochromators & Wavelength Selection • Detectors (Photomultiplier Tubes, Photodiodes, & CCDs) • Optical Pathways & Sample Handling*
1030 – 1130	***Sample Preparation for UV-Vis Analysis*** *Selection of Solvents & Their Impact on Absorption • Effect of pH & Ionic Strength on Spectral Properties • Proper Handling & Cleaning of Quartz Cuvettes • Sample Dilution & Concentration Adjustments*
1130 – 1215	***Spectral Data Acquisition & Processing*** *Calibration & Baseline Correction Techniques • Setting Wavelength & Scan Speed for Optimal Resolution • Noise Reduction & Signal Enhancement Methods • Multi-Wavelength Analysis & Bandwidth Considerations*
1215 – 1230	*Break*
1230 – 1330	***Standardization & Calibration in UV-Vis Analysis*** *Preparing Calibration Curves & Reference Standards • Understanding Linearity, Sensitivity, & Detection Limits • Internal & External Calibration Methods • Quality Control Measures for UV-Vis Spectroscopy*

1330 – 1420	***Applications of UV-Vis Spectrophotometry in Petroleum Industry*** *Determination of Aromatic Hydrocarbons in Crude Oil • Monitoring of Sulfur Compounds in Fuel Oils • Measurement of Polycyclic Aromatic Hydrocarbons (PAHs) • Detection of Metal Complexes in Oil Samples*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Advanced Absorption Spectra Analysis*** *Interpretation of Absorption Peaks & Band Shifts • Hyperchromic & Hypochromic Effects in UV-Vis Spectra • Understanding Charge-Transfer Complexes • Impact of Molecular Structure on UV Absorption*
0830 – 0930	***Derivative UV-Vis Spectroscopy*** *Principles of First, Second, & Higher-Order Derivative Spectra • Resolving Overlapping Absorption Peaks • Noise Considerations & Smoothing Techniques • Practical Applications in Petroleum Chemistry*
0930 – 0945	*Break*
0945 – 1100	***Multi-Component Analysis*** *Simultaneous Quantification of Multiple Analytes • Spectral Deconvolution & Chemometric Approaches • Role of Advanced Software in Multi-Component Analysis • Case Studies in Petroleum & Refinery Samples*
1100 – 1215	***UV-Vis Method Validation*** *Validation Parameters (Accuracy, Precision, Specificity, Robustness) • Detection & Quantification Limits (LOD & LOQ) • Recovery Studies & Matrix Effects • Regulatory Requirements for Method Validation*
1215 – 1230	*Break*
1230 – 1330	***Kinetic & Time-Resolved UV-Vis Spectroscopy*** *Real-Time Monitoring of Chemical Reactions • Determining Reaction Rates Using UV-Vis Spectra • Application in Catalytic & Polymerization Processes • Temperature & Solvent Effects on Reaction Kinetics*
1330 – 1420	***Case Studies in Petroleum Applications*** *Analysis of Lubricating Oil Degradation • UV-Vis for Fuel Additive Characterization • Spectroscopic Analysis of Asphaltenes • Case Study on Environmental Monitoring of Petroleum Contaminants*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Detection of Impurities in Petroleum Products*** *Identifying Sulfur & Nitrogen Compounds • UV-Vis Analysis of Oxidation Products in Diesel & Gasoline • Monitoring Metal Chelates in Crude Oil • Spectroscopic Characterization of Heavy Fractions*
0830 – 0930	***UV-Vis Spectroscopy in Environmental Compliance*** *Detection of Oil Spills & Water Contaminants • Measurement of Dissolved Organic Compounds in Industrial Effluents • Analysis of Volatile Organic Compounds (VOCs) in Air • Role of UV-Vis in Monitoring Petroleum Industry Emissions*

0930 – 0945	*Break*
0945 – 1100	***Spectrophotometric Determination of Total Petroleum Hydrocarbons (TPH)*** *Definition & Significance of TPH in Environmental Analysis • Extraction and Sample Preparation Techniques • UV-Vis Method for TPH Quantification • Comparison with Other Spectroscopic & Chromatographic Methods*
1100 – 1215	***UV-Vis for Catalysis & Refining Process Control*** *Real-Time Monitoring of Catalytic Reactions • UV-Vis Spectroscopy for Cracking Process Optimization • Analysis of Catalyst Poisoning Using UV-Vis • Case Studies in Petroleum Refining*
1215 – 1230	*Break*
1230 – 1330	***Integration with Other Analytical Techniques*** *UV-Vis Coupling with Gas Chromatography (GC-UV) • Complementary Use with Infrared (IR) & Fluorescence Spectroscopy • Application of UV-Vis in Tandem with Mass Spectrometry (MS) • Advancements in Hybrid Analytical Techniques for Petroleum*
1330 – 1420	***Automation & High-Throughput UV-Vis Spectroscopy*** *Robotic Sample Handling for High-Volume Analysis • Software Automation for Spectral Interpretation • Online & In-Situ UV-Vis Spectroscopy in Refineries • Future Trends in Automated Petroleum Analysis*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Common Errors & Troubleshooting in UV-Vis Analysis*** *Instrumental Issues & Baseline Drift • Sample Contamination & Handling Errors • Spectral Interferences & Overlapping Peaks • Strategies for Resolving Analytical Errors*
0930 – 0945	*Break*
0945 – 1100	***Advanced Data Processing & Interpretation*** *Spectral Smoothing & Noise Filtering Techniques • Mathematical Corrections for Background Absorption • Handling Complex Spectral Data in Petroleum Samples • Advanced Curve-Fitting & Regression Analysis*
1100 – 1230	***UV-Vis Software & Spectral Libraries*** *Using Chemometric Software for Data Analysis • Library Search for Compound Identification • Advanced Calibration Methods & Spectral Deconvolution • Developing Custom Spectral Libraries for Petroleum Analysis*
1230 – 1245	*Break*
1245 – 1420	***Comparative Analysis with Other Spectroscopic Methods*** *UV-Vis versus FTIR for Hydrocarbon Analysis • UV-Vis versus Fluorescence Spectroscopy for Aromatics • UV-Vis versus Raman for Structural Analysis • Selecting the Best Spectroscopic Technique for Specific Applications*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Case Studies & Real-World Problem Solving*** *Industrial Case Study on UV-Vis for Refinery Quality Control • Environmental Case Study on Oil Spill Detection • Troubleshooting Study on Contaminant Identification • Best Practices for Method Development in Petroleum Laboratories*
0930 – 0945	*Break*
0945 – 1100	***Hands-On Laboratory Session*** *Instrument Calibration & Maintenance • Real Sample Preparation & Measurement • Spectral Interpretation Workshop • Troubleshooting Common Analytical Issues*
1100 – 1230	***Advanced Trends in UV-Vis Spectroscopy*** *Emerging Applications in Petrochemicals & Energy • Advances in Nano-Scale Spectroscopy • Portable & Field-Deployable UV-Vis Instruments • Integration with Artificial Intelligence for Spectral Analysis*
1230 – 1245	*Break*
1245 – 1345	***Regulatory Compliance & Industry Standards*** *ASTM & EPA Methods for UV-Vis Spectroscopy • Compliance with ISO & Petroleum Industry Guidelines • Quality Assurance & Good Laboratory Practices • Environmental Regulations & UV-Vis Applications*
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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