COURSE OVERVIEW LE0091
Ultraviolet (UV) and Visible (VIS) Spectrophotometer Fundamentals

Course Title
Ultraviolet (UV) and Visible (VIS) Spectrophotometer Fundamentals

Course Date/Venue
Session 1: May 18-22, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: November 17-21, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
LE0091

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 Ultraviolet (UV) and Visible (VIS) Spectrophotometer Fundamentals. It covers the fundamentals of spectrophotometry and components of a UV-Vis spectrophotometer; the types of UV-Vis spectrophotometers and sample preparation techniques; the basics of spectral data interpretation and safety and good laboratory practices (GLP); the working principle of UV-Vis spectrophotometry and wavelength selection and optimization; and the calibration and standardization of the instrument including spectral scanning and data acquisition.

During this interactive course, participants will learn the factors affecting UV-Vis measurements and Beer-Lambert law applications; the quantitative analysis techniques, qualitative analysis with UV-Vis and derivative spectrophotometry; the kinetic and time-dependent spectroscopy and UV-Vis in pharmaceutical analysis; the environmental and water analysis, food and beverage analysis and protein and nucleic acid analysis; the UV-Vis in material science and nanotechnology; and the data processing and statistical analysis, method validation and regulatory compliance.

Course Objectives

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

- Apply and gain a basic knowledge on ultraviolet (UV) and visible (Vis) spectrophotometer
- Discuss the fundamentals of spectrophotometry and components of a UV-Vis spectrophotometer
- Identify the types of UV-Vis spectrophotometers and apply sample preparation techniques
- Explain the basics of spectral data interpretation and apply safety and good laboratory practices (GLP)
- Discuss the working principle of UV-Vis spectrophotometry and apply wavelength selection and optimization
- Carryout calibration and standardization of the instrument including spectral scanning and data acquisition
- Recognize the factors affecting UV-Vis measurements and Beer-Lambert law applications
- Employ quantitative analysis techniques, qualitative analysis with UV-Vis and derivative spectrophotometry
- Determine kinetic and time-dependent spectroscopy and apply UV-Vis in pharmaceutical analysis
- Apply environmental and water analysis, food and beverage analysis and protein and nucleic acid analysis
- Discuss UV-Vis in material science and nanotechnology and troubleshoot common issues in UV-Vis analysis
- Illustrate data processing and statistical analysis, method validation and regulatory compliance

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 a basic overview of all significant aspects and considerations of ultraviolet (UV) and visible (VIS) spectrophotometer fundamentals for laboratory technicians, chemists and biochemists, researchers, quality control analysts, environmental scientists, healthcare professionals, instrument technicians and other 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:

Mr. John Swinley is a **Senior Consultant** with over **50 years** of industrial experiences in **Chromatography and Spectroscopy**. His expertise widely covers in the areas of **Vacuum** technology & **Vacuum** Pump Systems, **Gas Chromatography Techniques & Troubleshooting**, **Gas Analyzer**, **Laboratory** Instrument Calibration, **Chromatography** Data System, Isotope Ratio Mass Spectrometry, Vacuum Technology, **Spectroscopic** Techniques, Capillary GC, **Gas Analysis**, **Analytical Laboratory Audit**, **Transformer Oil Gas** Analysis, Natural & Refinery Gas Analysis, **Varian Gas Chromatography** Operation & Maintenance, **Agilent ChemStation** Operation, **GC Device Prevention & Maintenance**, **Process Analyzer**, Modern **Chemical Laboratory**, **Analytical Instrumentation**, Equipment Calibration, **GC Troubleshooting** & User Maintenance, **GC/MS Technology & Problem Solving**, Online **Gas Analyzer**, **GC/MS Mass Spectra** Interpretation, **Laboratory Equipment** Maintenance, Separation Technology, **Natural Gas Testing & Analysis** and **Natural & Refinery Testing**. He is currently involved in method development and optimization in nuclear energy, power generation and petrochemical industries wherein he troubleshoots instrument problems and introduce comprehensive GC applications for on-line analysis in petrochemistry.

During his career life, Mr. Swinley worked with several companies and institutions occupying numerous positions such as being the **Director**, **Product Manager**, **Product Specialist** and **Research Assistant** from the University Witwatersrand, G.D. Searle, SMM Instruments, Wirsam Scientific, Perkin Elmer SA, Scientific Group, Scientific Supply Services and Chromatography Consultants.

Mr. Swinley has a **Bachelor** degree in **Applied Mathematics and Physics** and a **Diploma** in **Industrial Electronics**. Further, he is a **Certified Instructor/Trainer** and has published a book "Practical Gas Analysis by Gas Chromatography" in 2019. He was awarded as the "Chromatographer of the year" by the ChromSA and has delivered numerous trainings, courses, workshops, seminars and conferences internationally.

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.

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 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	***Fundamentals of Spectrophotometry*** *Nature of Light & Electromagnetic Spectrum • Interaction of Light with Matter • Absorption & Transmission of Light • Beer-Lambert Law: Principles & Applications*
0930 – 0945	*Break*
0945 – 1040	***Components of a UV-VIS Spectrophotometer*** *Light Sources: Tungsten, Deuterium, Xenon • Monochromators & Diffraction Gratings • Sample Holders & Cuvettes • Detectors: Photodiodes & Photomultiplier Tubes*
1040 – 1135	***Types of UV-VIS Spectrophotometers*** *Single-Beam Versus Double-Beam Spectrophotometers • Diode-Array Versus Scanning Spectrophotometers • Portable Versus Benchtop Models • Advanced UV-VIS Instruments with Computer Integration*
1135 - 1230	***Sample Preparation Techniques*** *Choosing Appropriate Solvents • Sample Dilution & Concentration Considerations • Path Length & Cuvette Selection • Effects of Impurities on Absorbance Readings*
1230 - 1245	*Break*
1245 – 1335	***Basics of Spectral Data Interpretation*** *Understanding Absorbance & Transmittance • Wavelength Selection for Different Analytes • Peak Identification in UV & VIS Regions • Calibration Curves & Linearity*
1335 - 1420	***Safety & Good Laboratory Practices (GLP)*** *Proper Handling of Optical Components • Cleaning & Maintaining Cuvettes • Safety Precautions with Light Sources • Preventing Contamination in UV-VIS Analysis*
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

0730 – 0830	***Working Principle of UV-VIS Spectrophotometry*** *Absorbance Versus Transmittance Measurements • Spectral Bandwidth & Resolution • Role of Blank Solutions & Baselining • Factors Affecting Accuracy & Precision*
0830 - 0930	***Wavelength Selection & Optimization*** *Importance of Selecting the Right Wavelength • Effect of Bandwidth on Resolution • Fixed Versus Scanning Wavelength Methods • How to Determine λ_Max for Different Compounds*
0930 – 0945	*Break*
0945 – 1040	***Calibration & Standardization of the Instrument*** *Need for Calibration & Standard Operating Procedures • Using Standard Reference Materials (SRMs) • Calibration Curves & Linearity Assessment • Instrument Validation & Troubleshooting*
1040 – 1135	***Spectral Scanning & Data Acquisition*** *Full-Range Spectrum Scanning • Peak Detection & Integration • Kinetics & Time-Dependent Studies • Data Smoothing & Baseline Correction*
1135 - 1230	***Factors Affecting UV-VIS Measurements*** *Influence of Temperature & Solvent Effects • Sample Turbidity & Particulate Interference • Stray Light & Noise Reduction Strategies • Instrumental Drift & Troubleshooting*
1230 - 1245	*Break*
1245 - 1420	***Basic Instrument Handling*** *Step-by-Step Instrument Setup • Performing Blank & Standard Calibration • Analyzing a Simple Sample (e.g., Food Dye, Protein) • Data Interpretation & Error Checking*
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

0730 – 0830	***Beer-Lambert Law Applications*** *Relationship Between Absorbance & Concentration • Linearity & Deviations from Beer's Law • Molar Absorptivity & Path Length Considerations • Applications in Pharmaceuticals & Chemistry*
0830 – 0930	***Quantitative Analysis Techniques*** *Single-Point Calibration Method • Multi-Point Calibration & Linear Regression • Standard Addition Method for Complex Matrices • Use of Internal Standards for Accuracy*
0930 – 0945	*Break*
0945 – 1040	***Qualitative Analysis with UV-VIS*** *Functional Group Identification Via Absorption Spectra • Use of UV-VIS in Purity Testing • Colorimetric Assays & Their Significance • Identifying Structural Changes in Biomolecules*
1040 – 1135	***Derivative Spectrophotometry*** *First, Second, & Higher-Order Derivatives • Resolving Overlapping Peaks • Signal Enhancement for Trace Analysis • Applications in Pharmaceuticals & Environmental Testing*

1135 - 1230	***Kinetic & Time-Dependent Spectroscopy*** *Reaction Monitoring Using UV-VIS • Enzyme Kinetics & Reaction Rate Studies • Real-Time Drug Degradation Monitoring • UV-VIS Applications in Biological Research*
1230 - 1245	*Break*
1245 - 1420	***Practical Session: Quantitative Analysis*** *Preparing Calibration Standards • Constructing & Analyzing Calibration Curves • Determining Unknown Sample Concentrations • Comparing Results with Theoretical Values*
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

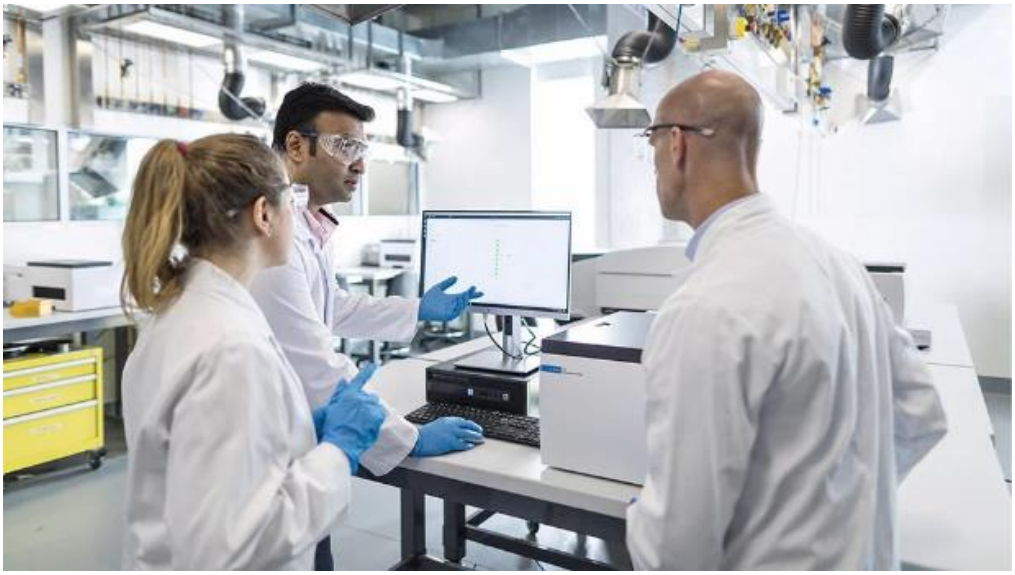
0730 – 0830	***UV-VIS in Pharmaceutical Analysis*** *Drug Identification & Purity Analysis • Dissolution Testing Using UV-VIS • Stability Studies of Pharmaceutical Compounds • Impurity Profiling & Regulatory Requirements*
0830 - 0930	***Environmental & Water Analysis*** *Detection of Pollutants & Heavy Metals • Analysis of Organic Compounds in Water • UV-VIS in Monitoring Wastewater Treatment • Measuring Chlorophyll & Biological Indicators*
0930 – 0945	*Break*
0945 – 1040	***Food & Beverage Analysis*** *Color Measurement in Food Products • Detection of Artificial Dyes & Additives • Monitoring Spoilage & Oxidation • Vitamin & Nutrient Analysis Using UV-VIS*
1040 – 1135	***Protein & Nucleic Acid Analysis*** *Estimating Protein Concentration (Bradford, BCA, Lowry) • DNA & RNA Purity Assessment (A260/A280 Ratio) • Monitoring Protein-Ligand Interactions • Applications in Biotechnology & Diagnostics*
1135 - 1230	***UV-VIS in Material Science & Nanotechnology*** *Optical Properties of Nanoparticles • Thin-Film Characterization • Coatings & Dye-Sensitized Solar Cells • UV-VIS Applications in Semiconductor Research*
1230 - 1245	*Break*
1245 - 1420	***Practical Session: Advanced Data Interpretation*** *Analysis of Complex Spectra • Handling Overlapping Peaks & Noise Reduction • Comparing UV-VIS with Complementary Techniques • Real-World Case Studies from Various Industries*
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

0730 – 0830	***Troubleshooting Common Issues in UV-VIS Analysis*** *Causes of Baseline Drift & Unstable Readings • Troubleshooting Low Absorbance & Noisy Spectra • Handling Lamp Degradation & Stray Light Issues • Best Practices for Long-Term Instrument Maintenance*
0830 - 0930	***Data Processing & Statistical Analysis*** *Spectral Data Smoothing & Baseline Correction • Statistical Methods for Error Analysis • Using Software for UV-VIS Data Analysis • Comparing Experimental Versus Theoretical Results*
0930 – 0945	*Break*
0945 – 1040	***Method Validation & Regulatory Compliance*** *Validation Parameters: Accuracy, Precision, LOD, LOQ • Regulatory Guidelines (USP, ICH, FDA) • Developing SOPs for Routine Analysis • Documentation & Audit Trail Maintenance*
1040 – 1135	***Automation & Software in UV-VIS Spectroscopy*** *Role of Modern Software in Spectroscopic Analysis • Automated Sample Handling & High-Throughput Screening • Cloud-Based Data Storage & AI Integration • Future Developments in Smart Spectrophotometry*
1135 - 1230	***Future Trends in UV-VIS Spectroscopy*** *Miniaturized & Portable UV-VIS Devices • Advances in Fiber-Optic UV-VIS Systems • Integration with AI & Machine Learning • Emerging Applications in Medicine & Industry*
1230 - 1245	*Break*
1245 - 1345	***Hands-On Practical & Course Assessment*** *Real-World Problem-Solving Exercise • Comparative Analysis of Different Samples • Q&A & Discussion on Industrial Applications*
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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