COURSE OVERVIEW LE0170

GC Troubleshooting & User Maintenance (Gas Chromatography)

Course Title
GC Troubleshooting & User Maintenance (Gas Chromatography)

Course Date/Venue
June 21-25, 2026/Tactic Meeting Room, Aloft Dharan Hotel, Al Khobar, KSA

Course Reference
LE0170

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

Course Description

This practical and highly-interactive course includes practical sessions and exercises where participants will visit the laboratory and they will be introduced to various lab instruments and gas chromatography process. Practical sessions will be performed using one of the lab equipment in order to apply the theory learnt in the class.

This course is designed to provide participants with a detailed and up-to-date overview of GC Troubleshooting & User Maintenance (Gas Chromatography). It covers the components of a GC system and types of GC configurations; the principles of gas chromatography, carrier gas systems and GC columns and stationary phases; the sample introduction techniques, basic chromatogram interpretation and inlet, column, detector and gas system maintenance; the temperature calibration verification, heating element troubleshooting, temperature programming optimization; and the cooling system checks.

Further, the course will also discuss the autosampler maintenance; the syringe cleaning and replacement, alignment and calibration, preventing carryover and routine inspection procedures; the no peaks / low signal, peak tailing, peak fronting, baseline noise and drift and retention time shifts; the contaminated syringe or inlet, residual sample in column, autosampler carryover issues; and the improper cleaning protocols.

During this interactive course, participants will learn the resolution improvement, sensitivity optimization, method development and complex troubleshooting strategies; the detector-specific issues comprising of FID flame problems, TCD thermal balance issues, ECD contamination sensitivity and MS interface troubleshooting; the preventive maintenance planning, quality assurance and control, safety in GC operation and good laboratory practices (GLP); the system performance tests, detector response verification, column efficiency checks; and the final system readiness checklist.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain an in-depth knowledge on gas chromatography troubleshooting and user maintenance
- Identify the components of a GC system and the various types of GC configurations
- Discuss the principles of gas chromatography, carrier gas systems and GC columns and stationary phases
- Apply sample introduction techniques, basic chromatogram interpretation and inlet, column, detector and gas system maintenance
- Carryout temperature calibration verification, heating element troubleshooting, temperature programming optimization and cooling system checks
- Employ autosampler maintenance covering syringe cleaning and replacement, alignment and calibration, preventing carryover and routine inspection procedures
- Recognize no peaks / low signal, peak tailing, peak fronting, baseline noise and drift and retention time shifts
- Identify contaminated syringe or inlet, residual sample in column, autosampler carryover issues and improper cleaning protocols
- Apply resolution improvement, sensitivity optimization, method development and complex troubleshooting strategies
- Identify the detector-specific issues comprising of FID flame problems, TCD thermal balance issues, ECD contamination sensitivity and MS interface troubleshooting
- Carryout preventive maintenance planning, quality assurance and control, safety in GC operation and good laboratory practices (GLP)
- Apply system performance tests, detector response verification, column efficiency checks and final system readiness checklist

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 GC troubleshooting and user maintenance (gas chromatography) for chemists, laboratory analysts, laboratory technicians, QA/QC personnel using GC, process / plant laboratory staff (especially oil and gas sector), R&D personnel working with GC systems, instrument / laboratory engineers, anyone responsible for GC operation, troubleshooting, or maintenance, professionals with basic GC knowledge who want to improve troubleshooting skills 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

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. **John Swinley** is a **Senior Consultant** with over **30 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.

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.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

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: ***Sunday, 21st of June 2026***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0915	***GC System Overview*** *Components of a GC System (Injector, Column, Detector, Oven) • Flow Path & Sample Journey • Types of GC Configurations (Split/Splitless, On-Column) • Role of Software & Data Systems*
0915 – 1000	***Principles of Gas Chromatography*** *Separation Mechanisms (Partitioning, Adsorption) • Retention Time & Selectivity Concepts • Resolution & Efficiency Parameters • Factors Affecting Chromatographic Performance*
100 – 1015	*Break*
1015 – 1115	***Carrier Gas Systems*** *Types of Carrier Gases (He, H_2, N_2) • Gas Purity Requirements & Contamination Risks • Gas Flow Control (Constant Pressure versus Constant Flow) • Gas Line Setup & Regulators*
1115 – 1215	***GC Columns & Stationary Phases*** *Capillary versus Packed Columns • Stationary Phase Polarity & Selection • Column Dimensions & Their Impact • Column Conditioning Procedures*
1215 – 1230	*Break*
1230 - 1315	***Sample Introduction Techniques*** *Split versus Splitless Injection • Injection Volume & Reproducibility • Autosampler versus Manual Injection • Common Injection Errors*
1315 - 1420	***Basic Chromatogram Interpretation*** *Peak Identification & Retention Time • Peak Area versus Height • Baseline & Noise Recognition • Common Peak Anomalies*
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, 22nd of June 2026

0730 – 0830	***Inlet Maintenance*** *Septum Replacement Procedures • Liner Types & Cleaning Schedules • O-Ring Inspection & Replacement • Avoiding Contamination in the Inlet*
0830 – 0930	***Column Maintenance*** *Column Trimming Techniques • Detecting Column Degradation • Proper Column Installation • Storage & Handling of Columns*
0930 – 0945	*Break*
0945 – 1100	***Detector Maintenance*** *Cleaning Detector Components • Replacing Consumables (Jets, Filaments) • Detector-Specific Maintenance (FID, TCD, ECD) • Detector Calibration Checks*
1100 – 1215	***Gas System Maintenance*** *Leak Checking Methods (Electronic versus Soap Solution) • Filter & Trap Replacement • Moisture & Oxygen Contamination Prevention • Regulator Maintenance*
1215 – 1230	*Break*
1230 – 1330	***Oven & Temperature Control*** *Temperature Calibration Verification • Heating Element Troubleshooting • Temperature Programming Optimization • Cooling System Checks*
1330 - 1420	***Autosampler Maintenance*** *Syringe Cleaning & Replacement • Alignment & Calibration • Preventing Carryover • Routine Inspection Procedures*
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, 23rd of June 2026

0730 – 0830	***No Peaks / Low Signal*** *Injection Issues (Missed Injection, Leaks) • Detector Failure or Misconfiguration • Column Blockage or Breakage • Incorrect Method Parameters*
0830 – 0930	***Peak Tailing*** *Active Sites in the Inlet or Column • Contaminated Liner or Septum • Column Overloading • Poor Column Selection*
0930 – 0945	*Break*
0945 – 1100	***Peak Fronting*** *Sample Overload Issues • Inlet Temperature Problems • Column Damage • Incorrect Injection Technique*
1100 – 1215	***Baseline Noise & Drift*** *Electrical Interference • Contaminated Gases or Leaks • Detector Instability • Temperature Fluctuations*
1215 – 1230	*Break*
1230 – 1330	***Retention Time Shifts*** *Flow Rate Inconsistencies • Temperature Variation Issues • Column Aging Effects • Method Setup Errors*

1330 - 1420	***Ghost Peaks & Carryover*** *Contaminated Syringe or Inlet • Residual Sample in Column • Autosampler Carryover Issues • Improper Cleaning Protocols*
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, 24th of June 2026

0730 – 0830	***Resolution Improvement*** *Adjusting Temperature Programs • Optimizing Carrier Gas Flow • Column Selection Strategies • Impact of Column Length & Diameter*
0830 – 0930	***Sensitivity Optimization*** *Detector Parameter Tuning • Injection Volume Optimization • Minimizing Sample Loss • Signal-To-Noise Improvement Techniques*
0930 – 0945	*Break*
0945 – 1100	***Method Development Basics*** *Selecting Appropriate Columns • Choosing Detector Types • Developing Temperature Gradients • Sample Preparation Considerations*
1100 – 1215	***Complex Troubleshooting Strategies*** *Systematic Troubleshooting Approach • Root Cause Analysis Techniques • Using Diagnostic Tests • Interpreting System Logs*
1215 – 1230	*Break*
1230 – 1330	***Detector-Specific Issues*** *FID Flame Problems • TCD Thermal Balance Issues • ECD Contamination Sensitivity • MS Interface Troubleshooting (If Applicable)*
1330 - 1420	***Software & Data System Issues*** *Method Setup Errors • Integration Problems • Calibration Curve Issues • Data Acquisition Failures*
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, 25th of June 2026

0730 – 0830	***Preventive Maintenance Planning*** *Maintenance Schedules (Daily/Weekly/Monthly) • Documentation & Logs • Spare Parts Management • Risk-Based Maintenance Planning*
0830 – 0930	***Quality Assurance & Control*** *System Suitability Testing • Calibration Standards & Checks • Validation Parameters (Accuracy, Precision) • Control Charts & Trending*
0930 – 0945	*Break*
0945 – 1100	***Troubleshooting Case Studies*** *Real-World GC Failure Scenarios • Step-By-Step Problem Solving • Identifying Root Causes • Lessons Learned*
1100 – 1215	***Safety in GC Operation*** *Handling Gases Safely (H_2 Hazards) • High-Temperature Precautions • Chemical Handling Protocols • Waste Disposal Procedures*
1215 – 1230	*Break*
1230 – 1315	***Good Laboratory Practices (GLP)*** *Documentation Standards • Sample Traceability • Instrument Logbooks • Audit Readiness*

1230 – 1345	***Performance Verification & Final Checks*** *System Performance Tests • Detector Response Verification • Column Efficiency Checks • Final System Readiness Checklist*
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/Lab Visit

Lab Site visit will be organized during the course for delegates to practice the theory learnt:-

Course Coordinator

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