MERCURY

Advanced Gas Chromatography Techniques and Troubleshooting Course

4 – 8 July 2027
Dubai (UAE)



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Ref: 16064_1004862 **Date:** 4 – 8 July 2027 **Location:** Dubai (UAE) **Fees:** 4900 Euro

Introduction

The Advanced Gas Chromatography Techniques and Troubleshooting course provides an in-depth foundation for mastering advanced GC methods in modern laboratory environments. It strengthens analytical capabilities through advanced gas chromatography techniques that address complex separation challenges. Participants will explore the whole workflow of system preparation, method development, and optimisation for high-precision applications.

The Advanced Gas Chromatography Techniques and Troubleshooting training course examines common gas chromatography troubleshooting issues and introduces effective diagnostic pathways. It also focuses on GC system performance, stability, and accuracy in various analytical conditions. Real-world case discussions enhance understanding of gas chromatography instrumentation and troubleshooting practices.

Learners will explore the petrochemical, industrial, environmental, and pharmaceutical applications. By the end of the Advanced Gas Chromatography Techniques and Troubleshooting program, participants will be able to evaluate system failures, apply corrective actions, and enhance routine laboratory operations.

Targeted Groups

This Advanced Gas Chromatography Techniques and Troubleshooting training targets professionals seeking specialized knowledge and skills:

- Laboratory analysts working with routine and advanced gas chromatography techniques.
- Quality control specialists involved in method validation and GC troubleshooting.
- Petrochemical lab staff handling advanced GC methods and complex sample matrices.
- Industrial and environmental testing technicians require strong system optimisation skills.
- Chromatography supervisors are responsible for troubleshooting gas chromatography systems.
- Researchers are conducting advanced GC techniques and troubleshooting training projects.
- Professionals in chemical, pharmaceutical, and food safety labs using advanced GC instrumentation.

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Course Objectives

Participants will achieve the following objectives by completing the Advanced Gas Chromatography Techniques and Troubleshooting Course:

- Understand system components, flow dynamics, and key gas chromatography techniques.
- Analyse detector performance and evaluate advanced gas chromatography instrumentation techniques and troubleshooting training requirements.
- Assess method parameters to support gas chromatography method development and troubleshooting.
- Apply corrective actions in gas chromatography troubleshooting for laboratory professionals.
- Perform systematic evaluation of chromatographic issues using advanced GC methods.
- Strengthen decision-making in advanced GC system optimisation and troubleshooting.
- Interpret signals and patterns linked to contamination, leaks, or column degradation.
- Improve readiness to manage operational failures in petrochemical and industrial lab environments.
- Enhance the capability to run hands-on advanced gas chromatography techniques in theoretical contexts.
- Strengthen professional readiness for advanced gas chromatography for analysts.

Targeted Competencies

Participants will gain the following competencies during the Advanced Gas Chromatography Techniques and Troubleshooting program:

- Ability to diagnose GC failures using structured troubleshooting sequences.
- Skill in optimising advanced gas chromatography techniques for diverse sample types.
- Competence in adjusting method variables for high-stability outputs.
- Confidence in recognising system performance indicators and drift.
- Ability to manage gas chromatography instrumentation and troubleshooting tasks.
- Expertise in evaluating chromatographic peaks and separation patterns.
- Capability to improve GC workflow efficiency and reduce recurring issues.
- Strength in applying advanced GC technique and troubleshooting training insights.
- Understanding of industrial GC applications in petrochemical and environmental areas.
- Ability to document and communicate analytical findings effectively.

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Studying Scenarios

In this Advanced Gas Chromatography Techniques and Troubleshooting training, participants will develop their skills through the analysis of the following scenarios:

- Diagnosing unresolved peaks in petrochemical analysis.
- Evaluating retention time drift caused by carrier gas instability.
- Assessing column degradation linked to high-temperature methods.
- Examining sample contamination in environmental testing labs.
- Reviewing abnormal detector baselines in industrial workflows.
- Correcting system leaks detected during routine checks.
- Inspecting peak tailing caused by injection system faults.
- Analysing troubleshooting cases involving advanced GC instrumentation.
- Reviewing method adaptation for complex industrial mixtures.
- Interpreting chromatographic distortions in GC method development and troubleshooting.

Course Content

Unit 1: Fundamentals of Advanced Gas Chromatography Techniques

- Overview of advanced gas chromatography principles and system architecture.
- Introduction to major GC components and their operational interactions.
- Discussion of carrier gas properties and flow control optimisation.
- Explanation of injection systems and advanced sampling strategies.
- Review of column types, stationary phases, and selection criteria.
- Evaluation of oven temperature programming for different matrices.
- Impact of hardware configuration on analytical performance.
- Understanding advanced GC methods for challenging industrial workflows.
- Importance of system stability in long-term GC operations.
- Integration of gas chromatography troubleshooting awareness in routine tasks.

Unit 2: Method Development Using Advanced GC Methods

- Steps for structured gas chromatography method development and troubleshooting.
- Establishing goals for separation efficiency and analytical precision.
- Selection of optimal carrier gas and linear velocity control.
- Setting injection parameters for precision in complex sample analysis.
- Choosing appropriate temperature gradients for sample volatility profiles.
- Adjusting column dimensions to achieve sharper peak separation.
- Evaluating detector suitability for petrochemical, environmental, or pharmaceutical testing.
- Applying advanced gas chromatography methods to multi-component samples.
- Assessing method reproducibility through test injections.
- Incorporating GC troubleshooting training insights into method refinement.

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Unit 3: Gas Chromatography Troubleshooting and Diagnostic Strategies

- Identifying symptoms of system instability and performance loss.
- Recognising retention time shifts linked to carrier gas fluctuations.
- Detecting contamination through peak distortion analysis.
- Differentiating injection-related issues from column-related issues.
- Applying advanced GC system optimisation and troubleshooting techniques.
- Conducting leak tests at key system connection points.
- Diagnosing issues in detectors such as FID, TCD, or ECD.
- Implementing structured troubleshooting gas chromatography systems training.
- Evaluating maintenance logs to support diagnostic accuracy.
- Understanding patterns associated with advanced gas chromatography troubleshooting failures.

Unit 4: Instrumentation, Calibration, and System Optimisation

- Overview of gas chromatography instrumentation and troubleshooting requirements.
- Calibration steps for detectors and system flow controllers.
- Setting proper gas purity levels to reduce baseline noise.
- Adjusting integration parameters for accurate peak measurement.
- Maintaining injection liners and septa to prevent contamination.
- Optimising temperature zones for long-term column stability.
- Applying advanced gas chromatography instrumentation techniques and troubleshooting training insights.
- Establishing best practices for routine hardware maintenance.
- Improving system uptime with preventive GC strategies.
- Reviewing performance benchmarks for advanced GC laboratories.

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Unit 5: Applications of Advanced Gas Chromatography in Industrial and Petrochemical Labs

- Introduction to advanced gas chromatography techniques for petrochemical/industrial labs.
- Approaches for analysing complex hydrocarbon mixtures.
- Evaluating high-temperature GC methods for industrial matrices.
- Monitoring purity specifications in petrochemical feedstock.
- Applying advanced GC technique and troubleshooting training to industrial case studies.
- Understanding environmental sample testing using advanced GC instrumentation.
- Reviewing food safety and pharmaceutical applications involving volatile compounds.
- Linking advanced GC method development and troubleshooting course concepts to real lab operations.
- Assessing compliance requirements in regulated analytical industries.
- Enhancing laboratory efficiency through professional training and advanced GC troubleshooting activities.

Final Insights & Key Takeaways

This course enhances professional mastery of advanced gas chromatography techniques in diverse laboratory environments. It prepares participants to diagnose system failures with confidence and precision. Learners gain the knowledge needed to improve system stability, optimise workflows, and support high-quality analytical outputs. The program strengthens analytical readiness for increasingly complex gas chromatography applications.