



AL127: Advanced of Gas Chromatography/Mass Spectrometry (GC/MS)



Training Description:

The purpose of this course is to provide training and insight in advanced applications and techniques of Gas Chromatography, along with their application to practical industry and laboratory problems. The course will include classroom instruction along with a question and answer session for problems encountered by the participants in the class as well as a one-day hands on workshop to actively demonstrate the concepts covered in the theoretical seminar. All participants are encouraged to bring issues and concerns to the seminar for discussion.

Gas chromatography-Mass spectrometry (GC/MS) combines the fine separating power of GC with the uniquely powerful detection capabilities of MS. The GC/MS has been widely heralded as the "gold standard" in scientific analysis as Gas Chromatography/Mass Spectrometry combines the strengths of the two powerful analytical techniques. The GC/MS instrument is made up of two parts. The gas chromatography (GC) portion separates the chemical mixture into pulses of pure chemicals and the mass spectrometer (MS) identifies and quantifies the chemicals.

This powerful technique is particularly suitable for the analysis of mixtures of volatile and low relative molecular mass compounds (<800) such as hydrocarbons, fragrances, essential oils and relatively non-polar drugs. Chemical derivatisation, e.g. trimethylsilylation, can often be employed to increase the volatility of compounds containing polar functional groups (-OH, -COOH, -NH₂, etc.) thereby extending the range of suitable analytes to such compounds as steroids, polar drugs, prostaglandins, bile acids, organic acids, amino acids and small peptides.

The course will introduce participants to the advanced principles and practices of gas chromatography and determine how the individual elements interrelate. Participants will be able to competently use and develop methods on a gas chromatograph to produce robust and valid analytical data.

The intensive training course **combines lecture, laboratory, and problem-solving sessions** that use actual GC/MS experimental data acquired by the participants. Through the analysis of these data, you will learn important fundamental operational techniques and will solve common problems that require you to hone your interpretational and experimental skills

Training Objective:

By the end of the training, participants will be able to:

- ✓ Apply and gain an advanced knowledge on advanced of gas chromatography/mass spectrometry (GC/MS)
- ✓ Review chromatography applications that includes signal to noise, detection limits, resolution and the van deemter equation, multimode inlet systems and new developments in column technology
- ✓ Determine capillarity flow technology consisting of unions, splitters, solvent venting, backflushing and heart cutting
- ✓ Discuss multidimensional GC including LTM, the deans switch and modulation GC
- ✓ Identify and use hyphenated techniques with spectral (20) detectors including atomic emission detectors, ICP-MS-GC and GC-MS
- ✓ Apply the correct procedure for GC/MS sample preparation which includes extraction techniques, solid phase micro extraction, supercritical fluid extraction, static and dynamic headspace sampling, purge and trap sampling, adsorption, pyrolysis and sample derivatization



- ✓ Enumerate the different GC/MS system comprising of GC/MS inlet systems, parallel detectors for GC/MS and MS capillary columns
- ✓ Explain the uses of vacuum systems, mass analysers and mass fragment detection in GC/MS hardware
- ✓ Acquire knowledge on the mass spectrometry in relation to mass resolution, ionization techniques, measuring techniques, tandem MS and mass calibration
- ✓ Discuss the principle of GC-FID and how it work?
- ✓ Explain the advantage and disadvantage of FID detector including the composition of FID detector
- ✓ Describe generic detector and detect ignitable liquid residues at fire scenes, hydrocarbon fingerprinting and immobilized cells
- ✓ Illustrate the correct method of GC/MS analysis evaluation which includes total ion and mass chromatographs, MS libraries, spectral interpretation and isotopes
- ✓ Recognize the MS features of substance classes and carryout proper calibration and quantitation
- ✓ Validate QC methods and employ system maintenance and troubleshooting

Training Designed for:

This course provides an overview of all significant aspects and considerations of advanced of gas chromatography/mass spectrometry (GC/MS) for analytical chemists, chromatographers, mass spectrometrists, operators, researchers, biochemists and biotechnologists, specifically for those who work with gas chromatography and find that their future responsibilities combine gas chromatographic techniques with mass spectrometry and those who wish to expand their technical expertise by learning gas chromatography/mass spectrometry.

Training Program:

DAY ONE:

- ❖ PRE-TEST
- ❖ Introduction
- ❖ **Chromatography Theon; & Applications**
 - Signal to Noise, Detection Limits, Resolution
 - The Van Deemter Equation, Multimode Inlet System
 - New Developments in Column Technology
- ❖ **Capillary Flow Technology**
 - Union, Splitters, Solvent Venting
 - Backflushing, Heart Cutting
- ❖ **Multidimensional GC**
 - LTM, The Deans Switch
 - Modulation GC
- ❖ **Hyphenated Techniques with Spectral (2D) Detectors**
 - Atomic Emission Detector
 - ICP-MS-GC, GC-MS

DAY TWO:

- ❖ **GC/MS System**
 - Why use GC/MS, Systems and Costs





- Competitive Analytical Systems
- ❖ **GC/MS Sample Preparation**
 - Extraction Techniques, Solid Phase Micro Extraction
 - Supercritical Fluid Extraction, Static & Dynamic Headspace Sampling
 - Purge & Trap Sampling, Adsorption
 - Pyrolysis, Sample Derivatisation
- ❖ **GC/MS Sample Preparation**
 - GC/MS Inlet System, Parallel Detectors for GC/MS
 - MS Capillary Columns
- ❖ **GC/MS Hardware**
 - Vacuum Systems, Mass Analysers
 - Mass Fragment Detection

DAY THREE:

- ❖ **Mass Spectrometry**
 - Mass Resolution, Ionisation Techniques
 - Measuring Techniques, Tandem MS
 - Mass Calibration
- ❖ **GC/MS Analysis Evaluation**
 - Total Ion Chromatographs
 - Mass Chromatography, MS Libraries
 - Spectral Interpretation, Isotopes
- ❖ **MS Features of Substance Classes**
 - Volatile Organic Compounds
 - BTEX, Alkylaromatics
 - Polyaromatic, Hydrocarbons
 - Phenols, Pesticides, PCB's
- ❖ **Calibration & Quantitation**
 - Quantitation, Decision Limit, Level of Detection
 - Level of Quantitation
- ❖ **GC-FID**
 - Principle of GC-FID, how does FID Detector Work?
 - Advantage and Disadvantage of FID Detector
 - Composition of FID Detector, Description of Generic Detector
 - Detection of Ignitable Liquid Residues at Fire Scenes, Hydrocarbon Fingerprinting, Immobilised Cells

DAY FOUR:

- ❖ Travel Laboratory
- ❖ Laboratory Session
- ❖ Travel Back to the Course Venue
- ❖ Practical Sessions/Site Visit

DAY FIVE:

- ❖ **Validation of GC Methods**
 - Installation Qualification (IQ)
 - Operational Qualification (OQ)





- Performance Qualification (PQ)
- Method Validation, Sample Tracking and Chain of Custody
- ❖ **System Maintenance and Troubleshooting**
 - Gas Chromatograph Maintenance, Mass Spectrometer Maintenance
- ❖ Course Conclusion
- ❖ POST-TEST and EVALUATION

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

As per the course location - This rate includes participant’s manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

For training registrations or in-house enquiries, please contact:

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Training & Career Development Department

