Analytical Training & Consultancy

Independent training for industry and academia

Scheduled – Tailored – Bespoke – Onsite – Offsite – Our Training Facility
Theoretical – Hands-on – Hardware – Software – Technique
Method Development – Application – Maintenance – Troubleshooting – Validation – Data Analysis

Improve your skills & knowledge and further your professional development

ROYAL SOCIETY OF CHEMISTRY | APPROVED TRAINING

UK & Worldwide

AnthiasConsulting Ltd
Bridging the Gap

Contents

Introducing

Anthias Consulting Ltd, based in Cambridgeshire in the UK, are experts in the analytical sciences; sharing specialist knowledge, experience and unbiased advice since 2005.

Providing training across all applications and industries for laboratory analysts, technicians, suppliers and manufacturers, PhD students and researchers, engineers and consultants at all levels of experience.

Everything we do centres around sharing our knowledge, through our training courses and our range of consultancy services including method and application support and troubleshooting. We can help lead the way to a robust, accurate and effective solution for your analyses.

Working with both the analysts who use the instrumentation and the instrument manufacturers themselves, we provide training to "bridge the gap", enabling you to get the best out of your analytical systems.

Our consultants are practising analytical scientists with current skills, applying our expertise on multidisciplinary projects in industry and research.

We also work with external consultants for their knowledge and expertise in their specialist fields.

Our training programmes cover a range of analytical techniques including;

• Gas Chromatography (GC, GCxGC)

• Liquid Chromatography (HPLC, UHPLC, LCxLC)

• Inductively Coupled Plasma - Optical Emission Spectroscopy (ICP-OES or ICP-AES)

• Mass Spectrometry (GC-MS, LC-MS, ICP-MS, MALDI-TOF, Mass Spectrometry Imaging)

• Spectroscopy (FTIR, NIR, UV-Vis, AA)

• Physical & Structural Properties of Molecules (DSC, TGA, KF, XRD, LDA) and all their related techniques.

This list isn't exhaustive and our knowledge and experience can be applied to any scientific instrument.

Our focus includes Methods (Development, Optimisation, Validation, Accreditation, Maintenance, Troubleshooting), Applications (including SIM, E&L and OOS), Interpretation and Data Analysis (including Statistical techniques or methods, Chemometrics and Metabolomics).

Dr. Diane Turner
BSc (Hons) MSc PhD FRSC

Diane Turner is the Founder and Director of Anthias Consulting. A Warwick University Graduate, Diane completed her Masters in analytical chemistry working on LC-MS and GC-MS. Diane started her career in environmental chemistry, later gaining significant experience as an Applications Chemist.

Diane has developed methods for, given support and high-quality training for companies in most industries around the world for more than 20 years. Diane is a visiting Fellow & Consultant at The Open University.

In 2016, Diane was elected as a member of the Royal Society of Chemistry Analytical Science Community Council and in 2019 was elected as the President to serve from 2020-2023. Alongside this role, she serves on numerous committees both inside and outside of the RSC, including as a member of the Government Chemist Programme Expert Group, the Analytical Methods Committee and scientific organising committees for the Analytical Research Forum and Solutions in Science (SinS).

Diane is a trustee and the current Chair of the Analytical Chemistry Trust Fund (ACTF) serving until 2023. Diane is also a trustee of the Recycling Organisation for Research Opportunities (RORO).

Dr. Giles Edwards
MChem PhD MRSC

Giles obtained his master of chemistry degree from Liverpool John Moores University concentrating on analytical chemistry and his PhD from the University of Manchester.

Giles has more than 20 years' experience within the fields of mass spectrometry and the separation sciences working in industry, academia, for charities and non-profit organisations. Past roles have included working as director of a multidisciplinary scientific research centre and also working around the world as a mass spectrometry escalation engineer troubleshooting issues with both instrumentation and application method development. Giles also works part-time in the nuclear physics group at the University of Manchester developing novel mass spectrometry instrumentation for ultra-trace analysis of radionuclides.

Giles is Technical Director & Founder Trustee of the Recycling Organisation for Research Opportunities (RORO), connecting decommissioned scientific analytical instrumentation with academic institutions in developing nations to provide research opportunities. Giles is Chief Scientific Officer of Artemis Analytical Ltd.

Dr. Simon Thain
BSc (Hons) MSc PhD

Dr Simon Thain is owner and director of TL Science Ltd and an independent collaborator, specialising in analytical techniques for Metabolomics and structural elucidation studies applied to biology, natural product discovery and Biomarker discovery.

Simon has over 25 years' experience in biochemical and chemical analysis including techniques such as HPLC, GC, UV-Vis, FTIR, and Mass Spectrometry, and applying these to metabolomics and proteomics. He is fluent in the analysis of large data sets by classical statistics, multivariate modelling and machine learning.

Simon obtained his MSc in Biochemistry & Genetics at Newcastle University and gained his PhD in 2000, in circadian clocks and the regulation of plant gene expression at Warwick University.

Dr. Imran Janmohamed
BEng (Hons) PhD MRSC

Imran is an experienced consultant and trainer with over 15 years of operational knowledge utilising a range of analytical techniques including GC, GC-MS, GCxGC and UPLC/HPLC & LC-MS, FTIR and UV-Vis within academia, food, medical devices and pharmaceutical industries.

Imran has a PhD in Analytical Chemistry on the development, validation and application of analytical methods of trace-level contaminants in the environment, and a bachelor's degree in Chemical with Biochemical Engineering from the University of Birmingham.

Imran's past roles included analytical lead on R&D product development and analytical testing to cGMP guidelines on the quality and performance of new products under development, as well as the laboratory management of the operation, maintenance and budgeting of analytical equipment. Imran is a consultant and delivered hands-on GC-MS workshops for the Royal Society of Chemistry's Pan Africa Chemistry Network (PACN) training programme. Imran is Director of Analyzd Ltd working with clients in developing methodologies for analytical challenges.

Dr. Mark Wyatt
CChem MRSC

Mark is founder and director of Wyatt Analytical Ltd., where he shares his knowledge and over 20 years' experience working in analytical labs

Prior to starting his own business, Mark held a range of roles at Swansea University for more than 18 years, joining as a Research Officer at the UK National Mass Spectrometry Facility (NMSF) to develop the MALDI-TOF service, and later promoted to Senior Research Officer. From 2018-2021, Mark headed up NMSF at Swansea, involving laboratory management, commercial contract negotiation, service and research analyses, education and training, publicity and outreach activities.

Mark holds a BSc (Hons) in Chemistry with Industrial Chemistry from the University of Liverpool, which included a year at the Chemical Services laboratory at the BNFL Springfields site. Mark completed his PhD in the analysis of acrylic polymers by MALDI-TOF mass spectrometry in 2002 from the IRC in Polymer Science and Technology at Durham University.

John Points
BSc, MRSC, MIFST

John is a UK-based analytical chemist with over 25 years' experience. As an independent consultant, he has designed, implemented, and trained-out laboratory Quality Management Systems that are suited to clients as diverse as large international pharmaceutical companies and small government laboratories in developing countries.

John has built Quality Management Systems from scratch and has simplified or improved existing systems. He has experience designing and auditing systems to comply with GMP, GLP and ISO 17025.

John's technical background is in the analysis of trace organics using chromatographic and mass spectrometric techniques, and, he is a member of the UK Expert Advisory Committee on Pesticide Residues in Food.

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Professional Memberships

Royal Society of Chemistry

We work closely with the Royal Society of Chemistry (RSC) in multiple ways.

In 2019, Dr Diane Turner was elected as President of the Royal Society of Chemistry's Analytical Science Community Council, serving from 2020 - 2023.

We have collaborated on a book, titled: Gas Chromatography-Mass Spectrometry: How Do I Get the Best Results? available from the RSC book shop.

We are proud to have been part of a 5-year partnership to develop analytical chemistry skills across Africa from 2015 to 2020, working with the Royal Society of Chemistry's Pan Africa Chemistry Network (PACN) and GSK. In 2016, we facilitated at the first GC-MS training course in Nigeria. In 2017, Dr Giles Edwards delivered the first training course in liquid chromatography in Kenya, with course material written by Anthias Consulting. Courses have been held at hubs in Kenya, Ghana, Nigeria and Ethiopia along with a programme to train local chemical scientists to continue the training into the future.

We are pleased to support the Analytical Science Network (ASN), the early career members branch of the Analytical Division of the Royal Society of Chemistry and regularly present at ASN events.

The majority of our training courses are approved by the Royal Society of Chemistry for Continuing Professional Development (CPD). RSC members receive a discount on our training courses, see Anthias website for details.

Community for Analytical Measurement Science (CAMS)

We are delighted to be a member of CAMS, an industry-led initiative which aims to raise the profile of analytical measurement science and provide a focal point for the analytical community to connect and access world-class education and training, research and innovation.

CAMS members receive a discount on our training courses, see Anthias website for details.

The Chromatographic Society (ChromSoc)

An international organisation founded to promote and share knowledge in the field of chromatography and related separation techniques. The Chromatographic Society organises a biennial meeting to showcase work from industry, academia and the instrument companies.

British Mass Spectrometry Society

Promoting knowledge and advancement in the field of mass spectrometry.

Cambridge Network

Connecting business and academia and encouraging collaboration and partnership for shared success.

WEConnect International

Anthias Consulting is a WEConnect International certified women-owned business, helping our corporate clients who are committed to global supplier inclusion and diversity to meet their policies.
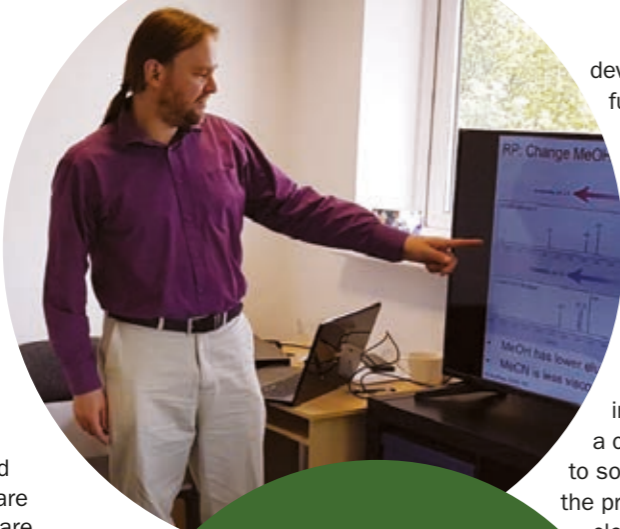
Consultancy Services

Through our range of consultancy services, we can support you at every stage of analysis with independent advice and expertise, leading the way to more productive methods, enhanced throughput and high-quality sample analyses.

Method Development

We can help you with method development, wherever you are in the process; whether you are designing a new method and need help with selecting the techniques and instrumentation, looking for guidance on how to optimise or validate a method, or need help with troubleshooting a problem.

Applications Support

If you are looking to purchase a new instrument or upgrade your existing system, or want to ensure you are using all the available tools in your current system, we offer independent advice to help you get the most from your instrumentation. Our consultants can help you to optimise your workflow and reduce bottlenecks, or support you with further method development and optimisation advice to further improve your method.

Troubleshooting

We can apply our expertise to troubleshoot instrument or software problems, chemical or physical problems, or problems with your application or method. Our consultants bring a unique insight gained from their experience working across multiple industries and applications and can provide a chemistry and applications perspective to solve the most difficult problems. Once the problem has been identified, we will work closely with you to correct it and can also provide training to improve your knowledge in that area for the future.

Data Analysis

We can help with all aspects of data analysis. Whether you lack the time, knowledge, or software to process your data, we can help; with analysing your data, developing and optimising your data analysis method and providing chemometrics consultancy support to fully explore your data.

Whatever your application, we can help you to meet your goals. We offer a full range of consultancy services including technical authoring and expert witness services.

"Having previously collaborated with Diane on chromatography applications, I had no hesitation in appointing Anthias Consulting to create two White Papers focused on using H_2 as a carrier gas for GC-MS. Her in-depth practical knowledge and experience provided excellent and professional results."

Gerard Catchpole, Global Sales & Marketing Manager, Gas Generator Division, VICI AG International

To find out more about our consultancy services, visit our website: www.anthias.co.uk/consultancy.

"Diane and Anthias took our team from basic knowledge of chemistry to a firm foundation in gas chromatography and mass spectrometry through a combination of structured tuition, advice on equipment purchase, and on-the-job training. The training session was interesting and engaging, but more importantly made a complex topic comprehensible to people from different backgrounds. Her deep experience setting up and running laboratories allowed us to speed up deployment and avoid mistakes and inefficiencies that we would have inevitably otherwise made. The approach is always helpful and flexible, and I couldn't recommend more strongly."

Nick Molden, Founder & CEO, Emissions Analytics

Course Approval

The majority of our training courses have been approved by the Royal Society of Chemistry (RSC) for continuing professional development (CPD) under their training course approval scheme.

ROYAL SOCIETY OF CHEMISTRY | APPROVED TRAINING

According to Dr Alice Barker, the Royal Society of Chemistry's Accreditation Development Specialist:

"The objectives of course approval are to highlight good quality training available to the community and encourage members' continuing professional development while also supporting trainers to promote their courses globally. The approval process is one of peer review, involving assessment against set criteria by members that are experts in their field."

The Royal Society of Chemistry's CPD approval process is one of peer review, involving assessment to a set of criteria by experts in their field. The course content must adhere to rigorous quality standards, provide relevant course content and must demonstrate the continual appraisal and improvement of the course.

Many analysts attend Anthias' training courses for their own professional development and we have trained individuals looking to improve their knowledge for a variety of reasons including to enhance their CVs to further their career.

"Being able to hear from an expert in the field and see some practical examples. I was given a lot of base knowledge and loads of helpful tips that I would never have thought about."

Hollie Gillespie, QC Lab Analyst, NextGEN360

Virtual Classroom: Applied Maintenance for GC & GC-MS, May 2020.

Royal Society of Chemistry members receive a discount on our training courses, see the Anthias website for details: www.anthias.co.uk

All of our approved courses can be found on the Royal Society of Chemistry's searchable database: www.rsc.org/cpd/training

Training Courses

Training Venues

The Open University

The Open University have hosted our courses for more than a decade and we are very proud of our partnership. Our training facility is hosted by Dr Geraint (Taff) Morgan within the School of Physical Sciences along with Dr Mike Batham within the School of Life, Health and Chemical Sciences at The Open University in Milton Keynes, in the UK. The laboratory is at the cutting edge of world-leading research, boasting a wide range of world-class analytical instrumentation from multiple manufacturers covering a wide range of analytical techniques.

Partner venues

Anthias Consulting works closely with our partners to offer scheduled training courses around the UK and worldwide.

- Ellutia - Cambridgeshire UK
- Providion - Manchester, UK

Universities around the UK regularly host our training courses. See our website for full details of our partner venues and previous hosting venues around the world.

We have taught delegates on the Pittcon Short Courses programme in the US over several years and we look forward to being part of future Pittcon conferences.

Virtual Classroom

Since April 2020, we have been teaching our classroom-based courses online, in our Virtual Classroom using Adobe Connect. This live training offers a fully interactive experience, with the trainer streamed live through a high-definition video feed and the presentation slides all in one view. Delegates can ask questions at any time, either by using a microphone or typing into the chat box. Interactive tools enable the delegate to control their view of the classroom, such as to maximise the window of the trainer when they are demonstrating instrument parts and consumables.

An interactions area features a virtual whiteboard where both the trainer and the delegate can use drawings to aid in their understanding, or to ask questions. For software courses, the screenshare area enables the trainer to demonstrate and carry out the practical exercises live, whilst maintaining a view of the trainer.

Many of the virtual classroom courses are also available to attend On-Demand at any time. This is ideal for those who can't make the scheduled date or time, or don't have the necessary amount of time available to attend a full course at once.

Host an Anthias Consulting course

We work with a range of prestigious academic and corporate venues in hosting our courses. Our delegates frequently travel from international locations and work for government laboratories, large public companies or universities. We have seen many collaborations and important strategic relationships develop between the host and course participants as a result of hosting one of our training courses. Contact us to find out more about hosting opportunities.

Our training courses run on multiple dates throughout the year, providing a convenient and affordable way to train. For the latest calendar and venue details, please visit

www.anthias.co.uk

Bespoke & Tailored Training

If you have several members of staff requiring training, we can teach one of our courses just for your organisation. Or, we can tailor one or more courses to match your training requirements.

Tailored training

We can tailor our course materials to put together a programme that is flexible in the length of time, level and depth of topics covered to meet the needs of your organisation, your current or future instrumentation and the knowledge of your analysts.

Bespoke training

Our courses provide training that covers all analytical techniques and our Comprehensive, manufacturer-specific courses provide training on a broad range of manufacturers' hardware and software. However, we are frequently asked to provide training that is beyond the scope of our current offerings for which we can put together a bespoke course. This can include applications training as well as theory, hardware or software on very specific techniques and instrumentation.

Training delivery methods

Whatever your training requirements are, we can deliver off-the-shelf, tailored or bespoke training:

- **Onsite:** taught using your instrument, samples, methods and data

Register online to reserve your place or contact us to find out more including to request a course outline

courses@anthias.co.uk

- **Offsite:** delivered at our partner venues, just for your organisation!
- **Online:** in our Virtual Classroom

Onsite training

We can deliver in-house training at your location, enabling the practical exercises to be taught on your instrumentation and using your data. Onsite training can be tailored to meet the needs and experience level of your analysts, or one of our off-the-shelf training courses. Onsite training is ideal if you have multiple members of staff who require training or have multiple techniques or instruments to be trained upon, or you would like us to deliver completely bespoke material for you.

Offsite training

We can provide dedicated training just for your organisation at our training facilities across the UK. It could be that your laboratory instruments run 24/7 and you don't have the capacity for onsite training, or maybe you would prefer your staff to focus completely on the training, with no distractions. Or perhaps you have multiple sites and require a central meeting place for delegates from around the country, or around the world! Whatever the reason, we can organise training just for your staff at a time that suits you.

Blended learning

We offer a hybrid programme of online training followed by onsite training. The first part of the training takes place in the virtual classroom, covering all the essential theory.

> **"Demonstrating maintenance and letting scientists have a go themselves."**
>
> Chloe Dormer, Scientist, Concept Life Sciences
>
> Onsite Method Development training, September 2020.

Following this, the knowledge is put into practice through hands-on practical exercises on the hardware and software in your laboratory. The onsite training is organised so that the hands-on element of the training quickly follows on from the virtual classroom training, to maximise knowledge retention.

Types of Training

Universal classroom-based courses

Our universal classroom courses are applicable to all makes and models of instrumentation, helping improve your knowledge in the base technique. The training has a strong focus on the practical side of the techniques, rather than purely theoretical, which can be applied the instant you return to your laboratory.

These courses demonstrate instrument parts and consumables and you'll be presented with lots of practical tips on using the techniques. Although there will be no laboratory-based practical exercises within these courses, there will be questions, tasks, case studies or demonstrations throughout the course to help you think through and use what you are learning.

Courses can be attended as face-to-face training ranging from 1 – 5 days, or via virtual classroom (live and on-demand). You can attend individual days (or modules for virtual classroom training) to focus on a particular area or attend an entire course to fully understand the technique(s).

Our **Absolute Basics** courses provide an ideal introduction for those who are completely new to a technique, who have hands-on experience but little theoretical knowledge, or who would like a refresher. We have successfully trained delegates on these courses from a wide range of technical and non-technical roles from sales, business development, marketing, finance and administration, to analysts, technicians and engineers.

Our **Complete** courses provide a complete training solution for analysts with intermediate level experience who wish learn the techniques and then continue on to develop methods and troubleshoot instruments.

Universal laboratory-based, hands-on courses

These courses combine a mixture of classroom-based presentations covering the essential theory then putting the knowledge into practice in the laboratory with hands-on exercises on instrument set-up, method development, maintenance and troubleshooting.

Our "hands-on" courses all have 50% of the time spent in the laboratory using the instrumentation. You will benefit from learning in a small group with focused support.

Applied courses

These courses combine the essential theory of the technique or method, along with classroom-based exercises or case studies to reinforce the knowledge and apply the topics learned. The training is universal, meaning it can be applied to any manufacturers' instrument or software, however there will be no hands-on aspects in the laboratory. Applied courses can be attended either face-to-face or online via virtual classroom (live and on-demand).

Comprehensive manufacturer and software-specific courses

These are practical hardware and software courses which are based both within the classroom and laboratory environment to practice and re-enforce the theoretical knowledge learned. They have a strong practical focus on a specific manufacturer's hardware and software.

You will learn about the function and operation of the individual components of the hardware, the logical steps of instrument troubleshooting, method development and how to perform maintenance. Then learn how to navigate the software to set-up methods, sequences and analyse data using the specific software.

You can choose to combine hardware and software training into a full course or, attend an individual course to focus on the hardware or software only.

Many of our Comprehensive software courses are available as virtual classroom training (live and on-demand) and the full course can be as blended learning.
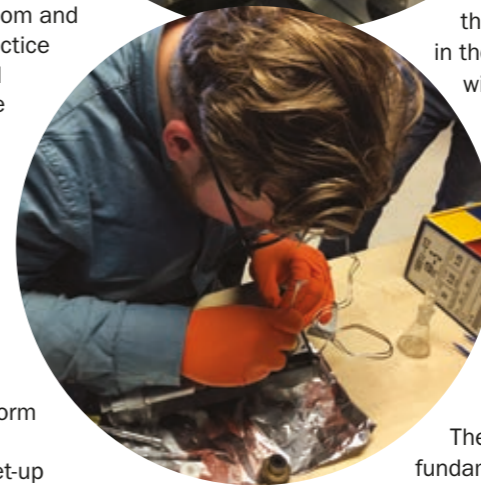
Experience level

Beginner

Our Absolute Basics courses are for complete beginners to these analytical techniques. To attend these courses you do not need to have any background in the technique, chemistry or even in science. People wishing to have a refresher course also frequently attend these courses.

Intermediate

These courses are aimed at those with some knowledge of the analytical technique, for example who have had some practical experience but don't know the theory or those who have briefly covered it at university.
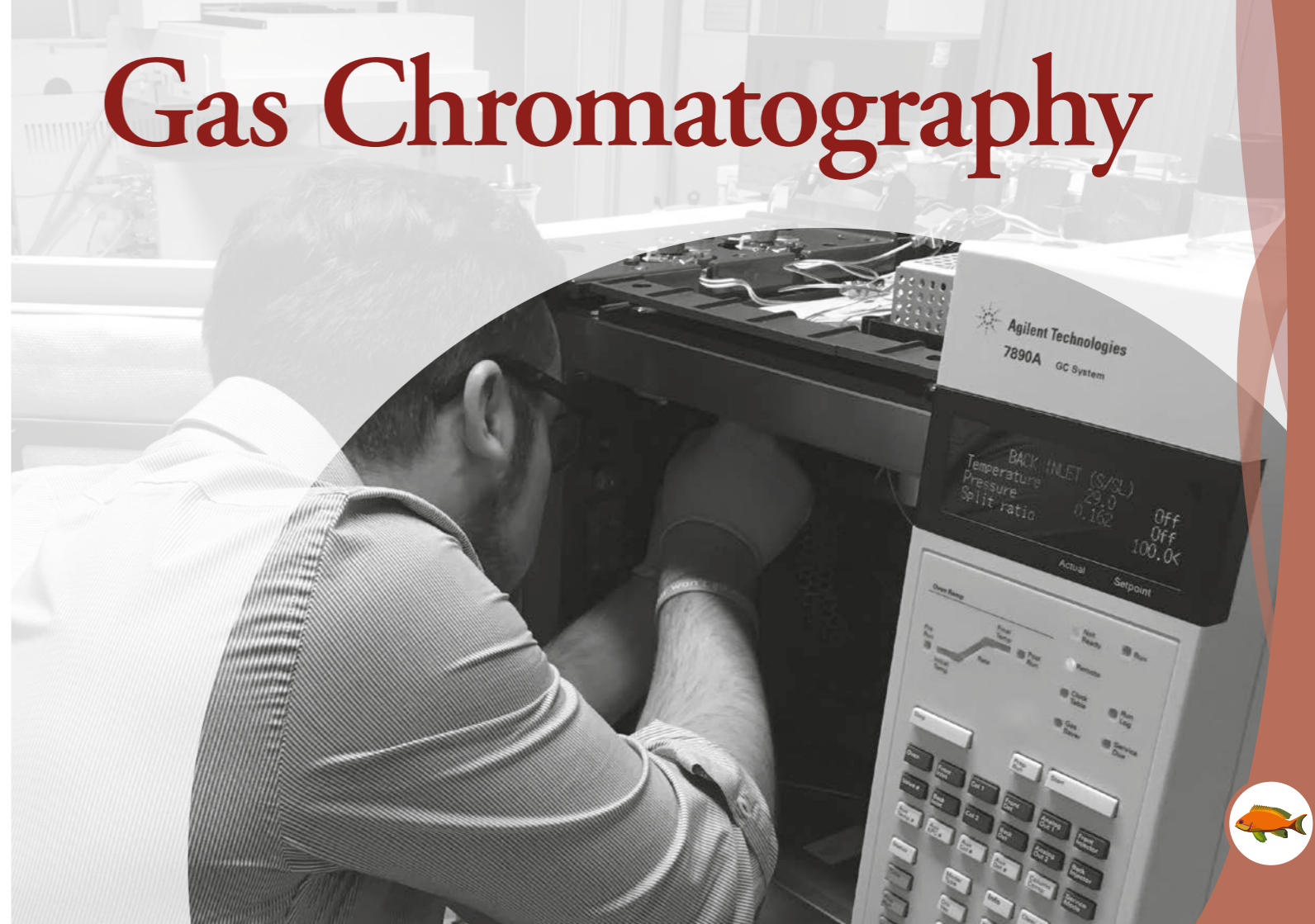
Advanced

These courses cover advanced techniques and require fundamental knowledge of the relevant base technique, whether that is gas chromatography, liquid chromatography, mass spectrometry or inductively couple plasma.

Course Progression

AnthiasConsulting Ltd
Bridging the Gap

BEGINNER

- Absolute Basics of GC & GC-MS
- Absolute Basics of Deconvolution
- Absolute Basics of Chemometrics, Metabolomics

INTERMEDIATE

- Comprehensive GC
  Agilent, Shimadzu, Thermo, Scion/Bruker/Varian & SRI
- Complete GC & GC-MS
- Hands-on Complete GC & GC-MS
- Comprehensive GC-MS
  Agilent, Shimadzu, Thermo, Leco, Scion/Bruker/Varian, Markes, PerkinElmer

ADVANCED

- Hands-on Sample Prepration
  HS, SPE, SPME, TD, Py, P&T, Derivatisation
- Hands-on Advanced Injection Techniques
  LVI & PTV/MMI
- Hands-on GCxGC
  Flow & Thermal Modulation
- Hands-on Heart-cutting, Hands-on Splitters & Backflushing
- Comprehensive Advanced GC & GC-MS
  Agilent

- Advanced Method Validation
- Applied Interpretation of GC-MS Mass Spectra
- Comprehensive Deconvolution
  AMDIS, DRS, TargetView™
- Comprehensive GCxGC Software
  GC Image, ChromaTOF®, ChromSpace®
- Comprehensive Data Analysis
  Chemometrics, Metabolomics

Gas Chromatography

Gas Chromatography

We offer instrument-independent training in Gas Chromatography (GC, GCxGC), Mass Spectrometry (SQMS, QQQMS, ITMS, TOFMS) and related techniques, including: Large Volume Injection (LVI), Multi-Mode Inlets (MMIs) & Programmable Temperature Vapourisers (PTVs), Selective Discrimination, Sample preparation courses for GC including Thermal Desorption (TD), Pyrolysis (Py), Headspace (HS), Purge-and-Trap (P&T), Solid Phase Extraction (SPE), Solid Phase Micro-Extraction (SPME), Liquid-Liquid Extraction (LLE), Derivatisation and automated sample preparation. See the 'Sample Preparation' section for details of these courses.

Any of our courses can be delivered onsite and tailored to meet the needs and experience level of your analysts. We also offer a range of Comprehensive GC & GC-MS courses for training on a specific manufacturer's instrument and/or software.

Universal classroom-based training courses

Absolute Basics of GC & GC-MS

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Absolute beginners in gas chromatography and GC-MS. The course is ideal either as stand-alone or prior to attending our Practical Essentials, Complete, Hands-on Complete or Comprehensive manufacturer-specific courses.

Topics: The course introduces the techniques and the instrumentation used and covers the what, why, where, when and how of GC & GC-MS. It explains the terminology used and details how the techniques work and the types of instruments available. The types of samples which can be analysed are discussed and the course looks at the stages of analysing a sample, outlining the principles and components of the gas chromatograph and mass spectrometer. Beyond the instrumentation, data analysis and the sorts of questions which the techniques can answer is also explored, giving you a full picture at a basic level.

Absolute Basics of Deconvolution

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: For those who have some knowledge of mass spectrometry, but are new to deconvolution.

Topics: This course teaches you about analytical resolution in mass spectrometry and how to use deconvolution to find co-eluting peaks and peaks below the baseline, using GC-MS data in the examples.

Complete GC & GC-MS

Duration: 5 days face-to-face / 32.5 hours virtual classroom

Audience: Intermediate level GC or GC-MS. Beginners are advised to first attend the Absolute Basics of GC & GC-MS.

Topics: This course enables you to understand your gas chromatograph or GC-MS instrument, develop applications, troubleshoot and maintain it. The course is built from the Practical Essentials of GC & GC-MS and The GC & GC-MS Clinic courses. Analysts can choose to attend both courses at once or, alternatively, go away and implement the Practical Essentials and come back to attend the Clinic at a later date.

Individual days/modules: You can also choose to attend a single day, or individual modules (for virtual classroom training), to focus on a particular topic.

Complete GC & GC-MS				
Practical Essentials of GC & GC-MS			**GC & GC-MS Clinic**	
Audience: Intermediate level, some experience of GC or GC-MS is required, or participants have attended the Absolute Basics of GC & GC-MS course. Topics covered include:			Audience: Advanced level, good knowledge of GC or GC-MS is required, or participants have attended the Practical Essentials of GC & GC-MS course. Topics covered include:	
Day 1 (Modules 1 – 3)	**Day 2 (Modules 4 – 6)**	**Day 3 (Module 7 – 8)**	**Day 4 (Modules 9 - 10)**	**Day 5 (Modules 11 - 12)**
Introduction to GC & MS	Analytical columns & column flow	Data analysis: integration, libraries, calibration methods	Method development and optimisation	Maintenance: from septa to liners to pumps & detectors to MS tuning to contamination
Carrier, detector & cooling gases	Pre-columns & backflushing	Qualitative, Quantitative & Semi-quantitative data analysis	Case studies: Choosing instrumentation & techniques, developing methods	Identifying when maintenance is required
Gas supply & plumbing	Detectors: FID, TCD, ECD, plus a brief introduction to others.	Sampling, automation & derivatisation	Validation & accreditation	Practical: trimming capillary columns
Sample introduction: hot & cold injections	Mass Spectrometry principles	Thermal desorption, Pyrolysis	Introduction to advanced techniques	Troubleshooting: Preparing for problems
On-column, split & splitless injections	Vacuum, ionisation, mass analysers & ion detectors	Headspace – static & dynamic, Purge & Trap	Interpretation of Mass Spectra, Deconvolution	Identifying problems
Large volume injection (LVI)	Quadrupole, ion trap, TOF, QQQ, magnetic sector	Solid-Phase Extraction, SPME, SBSE	Multi-dimensional GC: heartcutting & GCxGC	The troubleshooting process
Gas sampling valves	Scan, SIM, SIR & MS/MS	Liquid-Liquid Extraction	Selective discrimination, Chemometrics	Exercises: troubleshooting chromatograms

Practical Essentials of Advanced Injection for GC & GC-MS

Duration: 6.5 hours virtual classroom

Audience: Delegates who have good knowledge of GC or GC-MS or have attended the Practical Essentials of GC & GC-MS or the Hands-on GC & GC-MS courses. This course will enable you to learn about some advanced and powerful GC techniques which could be very useful for your analysis.

Topics: This virtual classroom course takes all the classroom-based practical theory from the Hands-on advanced Injection for GC & GC-MS course on Multi-Mode Inlets (MMIs) & Programmable Temperature Vapourisers (PTVs) and Large Volume Injection (LVI). The course looks at how to select the best techniques for your samples and analytes and the various parameters which can be optimised and guides you through how to develop a method. The course also explores examples of applications using the techniques.

Sample Preparation

For our training courses in sample preparation for GC & GC-MS, see the section on Sample Preparation.

Applied Interpretation of GC-MS Mass Spectra

Duration: 3 days face-to-face / 20 hours virtual classroom

Audience: Advanced level, for those who have a good background in organic chemistry and at least six months experience in using GC-MS.

Topics: You will learn the fundamentals of mass spectral interpretation for the identification of unknowns or to enhance your understanding of fragmentation patterns produced from GC-MS analysis to aid in accurate identification when using library search programs. The course includes a large proportion of practical exercises interpreting mass spectra.

Universal laboratory-based, hands-on courses

Hands-on Complete GC & GC-MS

Duration: 5 days face-to-face

Audience: Intermediate level, this course is suitable for all levels of knowledge; however for complete beginners it is advisable to attend the Absolute Basics of GC & GC-MS first to get a good basic overview of gas chromatography and GC-MS.

Topics: This course is made up of 5 individual days which, taken all together, provide you with a complete overview of Gas Chromatography and GC-MS theory, methods, maintenance and troubleshooting, with 50% of the time spent in the laboratory using the instrumentation. You can also take a 2-day or 3-day course focusing on just the GC, or just the GC-MS.

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction to gas chromatography (GC)	GC maintenance: when required?	Introduction to mass spectrometry (MS)	Routine MS maintenance	How to identify problems
Gases & plumbing	Gas supply maintenance	Vacuum system	Leak checks, tuning & calibration	Problem areas: samples, gases, plumbing, inlets & autosamplers
Practical: familiarity with GC components	*Practical:* identify maintenance areas	*Practical:* familiarity with MS components	*Practical:* leak check, tuning & tune reports	*Practical:* problems then identify a plumbing leak
Autosamplers, inlets, split & splitless injections	Autosampler & inlet maintenance	Ionisation, mass analysers & detectors	Vacuum system maintenance	*Practical:* perform an inlet leak test
Practical: creating injection methods	*Practical:* replacing liners & septa	Mass analysers: Scan, SIM, Ion trap, ToF, IRM, MS/MS, SRM, MRM	*Practical:* venting the MS	Problem areas: columns, oven & detectors
Analytical columns	Column maintenance	Data analysis with MS	Ion source maintenance	*Practical:* column & detector problems
Practical: oven temperatures	*Practical:* replacing a column	*Practical:* MS Data analysis	*Practical:* cleaning the ion source	Problem areas: MS & vacuums
GC detectors: FID & ECD	FID & ECD maintenance	GC-MS method parameters	Mass analyser maintenance & assembly	*Practical:* troubleshooting leaks, contamination & sensitivity
Practical: sample analysis	*Practical:* cleaning an FID	*Practical:* create methods, analyse samples & compare results	Ion trap, quadrupole, detector & PC maintenance	Troubleshooting computers & data system
Data analysis: qualitative & quantitative	Typical problems and signs maintenance needed	*Practical:* changing MS parameters	MS maintenance schedules	*Practical:* diagnosing from tune reports then fixing
Practical: analysing data	GC maintenance schedules	*Practical:* data analysis	*Practical:* reassembling & pumping down the MS, leak tests	*Practical:* final bug exam

Day 1: Hands-on GC Theory & Methods

Spend the first part of the day learning the theory of gas chromatography and then use this knowledge to create split and splitless methods, perform manual and liquid autosampler injections and change oven temperature programs to optimise the separation of analytes detected with an FID

Day 2: Hands-on GC Maintenance

Learn the reasons why maintenance is required, what happens if maintenance isn't performed and the signs of when maintenance is needed, along with practicals in carrying out maintenance on a gas chromatograph.

Day 3: Hands-on GC-MS Theory & Methods

Spend the first part of the day learning the theory of mass spectrometry and then use this knowledge to create GC-MS methods, perform injections and change MS parameters to see the effects.

Day 4: Hands-on GC-MS Maintenance

Learn the reasons why maintenance is required, what happens if maintenance isn't performed and the signs of when maintenance is needed along with practicals carrying out maintenance on mass spectrometers.

Day 5: Hands-on GC & GC-MS Troubleshooting

This course combines learning how to go about troubleshooting a GC or GC-MS instrument and what problems can occur, with real problem solving on the instruments and data analysis software.

The course concludes with a final troubleshooting test.

Hands-on Advanced Injection for GC & GC-MS

Duration: 2 days

Audience: Delegates with good knowledge of GC or GC-MS or have attended the Practical Essentials, Hands-on Complete or Comprehensive GC courses.

Topics: This course combines the 2 advanced GC courses on Hands-on Multi-Mode Inlets (MMIs) & Programmable Temperature Vapourisers (PTVs) and Large Volume Injection (LVI). This course will enable you to learn about and practice some advanced and powerful GC techniques which could be very useful for your analysis.

Day 1: Hands-on Multi-Mode Inlets (MMIs) & Programmable Temperature Vapourisers (PTVs)

This course focuses on the different sample introduction and injection techniques that can be used with Programmable Temperature Vapourisers (PTVs), Multi-Mode Inlets (MMIs), Cooled and Universal Injection Systems. The course will cover hot versus cold split and splitless injections; cool on-column injection (COC); large volume injection (LVI); thermal desorption (TD); pyrolysis; and in-liner derivatisation injection techniques. This is a universal course for these advanced inlets that is applicable to many different manufacturers, including GL Sciences OPTIC, GERSTEL CIS, Thermo PTVs, Varian/Bruker/Scion PTVs, Agilent PTV & MMI, Shimadzu OCI/PTV and JAS UNIS.

Day 2: Hands-on Large Volume Injection

This course combines the theory and advantages behind the different large volume injection techniques with hands-on practicals to create, use and optimise LVI methods in the laboratory, covering rapid (at once), speed-controlled and multiple large volume injection (LVI) techniques.

Hands-on GCxGC

Duration: 2 days face-to-face

Audience: This advanced course is for those with a high level of knowledge of GC. It is aimed at those with difficult and complex samples looking to explore improving the resolution of their work through two-dimensional gas chromatography.

Topics: This course introduces the fundamental concepts of GCxGC using thermal or flow modulation, focusing on the hardware rather than the software aspects of GCxGC. It includes selection and installation of the column set into the modulator; how to maintain a GCxGC hardware set-up; creation of GCxGC methods; optimisation of a sample using a particular set-up; common troubleshooting problems and the basic analysis of the data.

Hands-on Heart-cutting

Duration: 1 day face-to-face

Audience: This course is for those experienced in gas chromatography, with difficult and complex samples and looking to explore improving the resolution of their analysis through heart-cutting.

Topics: This course includes an introduction to the fundamental concepts of heart-cutting gas chromatography (GC+GC) covering selection and installation of the column set into the heart-cutting device; development of the method and analysis of the data.

Hands-on Splitters & Backflushing

Duration: 1 day face-to-face

Audience: This course is aimed at those with good experience of GC or GC-MS system and who want to enhance their skills in the use of splitters and devices to manage their carrier gas flow through the GC system.

Topics: Applications include splitting to multiple detectors, using multiple columns into a single detector, back flushing through the pre-column or analytical column or changing the column without venting the mass spectrometer. The course includes the selection of columns & restrictors, installation of columns into these devices, system configuration, method optimisation and the development of backflushing skills.

Hands-on Gas Supply Health Check

Duration: 1 day onsite

Audience: Intermediate, those with some knowledge of GC.

Topics: This practical course provides an onsite gas health check along with training on where gases flow from and to in your instruments, how to carry out leak checks, maintenance and 'gas saver' techniques, providing long-term cost savings.

"Learning functionality which will enhance my work productivity."

Tahir Ozkan, Chemist, Alcohols Ltd.

Comprehensive GC Software Training (Agilent GC with OpenLAB ChemStation), 2018

Comprehensive manufacturer-specific hardware & software courses

Audience: Intermediate level, analysts and technicians responsible for the operation and/or maintenance of instrument hardware and software. Beginners are advised to first attend the Absolute Basics of GC & GC-MS.

Topics: These courses introduce the fundamental theory of gas chromatography or mass spectrometry along with how to operate, maintain and troubleshoot the instrument, including installation, set-up and operation of the software for sample analysis, data acquisition, data analysis and reporting.

Comprehensive GC training courses

Duration: 2 – 4 days face-to-face / from 13 hours for virtual classroom software courses.

Topics: These courses can take place on a range of different manufacturers' instrumentation including:

- Agilent GC hardware with OpenLAB CDS, OpenLAB ChemStation or OpenLAB EZChrom software
- Scion/Bruker/Varian GC hardware with Bruker/Varian Star or Galaxie, or Scion CompassCDS software
- Shimadzu GC hardware with LabSolutions or GCsolution
- PerkinElmer GC hardware with TotalChrom® software
- SRI GC hardware with PeakSimple software
- Thermo GC hardware with Xcalibur™ or Chromeleon™ software

Comprehensive GC-MS training courses

Duration: 2 – 5 days face-to-face / from 13 hours for virtual classroom software courses.

Topics: This course can take place on a range of different manufacturers' instrumentation including:

- Agilent SQMS with MassHunter or MSD ChemStation software
- Agilent QQQMS with MassHunter software
- Agilent TOFMS with MassHunter software
- Agilent Q-TOFMS with MassHunter software
- Leco Pegasus® or Pegasus® BT including 4D with ChromaTOF® software
- SepSolve Analytical BenchTOF with TOF-DS™, TargetView™, ChromSpace® or ChromCompare® software
- PerkinElmer SQMS with TurboMass software
- Scion/Bruker/Varian GC-MS with MSWorkstation or CompassCDS software
- Shimadzu LabSolutions or GCMSsolution software
- Thermo GC-MS with Xcalibur™ or Chromeleon™ CDS software

Comprehensive Deconvolution Software Training (NIST AMDIS)

Duration: 2 days face-to-face / 13 hours virtual classroom

Audience: Advanced level, this course requires fundamental knowledge of GC-MS and some background in understanding mass spectra.

Topics: Learn the fundamentals of analytical resolution in mass spectrometry and how to operate the Automated Mass Spectral Deconvolution and Identification System (AMDIS) software for the processing of complex spectra. You will learn how deconvolution works with the software and gain practical experience in performing deconvolution to obtain cleaned-up mass spectra.

We can also deliver deconvolution training on other software including:

- Comprehensive Deconvolution Software Training (Agilent DRS)
- Comprehensive Deconvolution Software Training (Markes TargetView™)

Our Comprehensive GC-MS Software training on Agilent MassHunter and Leco ChromaTOF® software software also includes training in deconvolution.

"Really excellent to be shown worked examples and to apply the information immediately after introduction. Very comprehensive overview of how AMDIS works, with the information being presented in a very accessible and often visual way."

Virtual Classroom: Comprehensive Deconvolution Software Training (NIST AMDIS), June 2020.

Email: sales@anthias.co.uk **Phone:** +44 (0)1480 831262

Liquid Chromatography
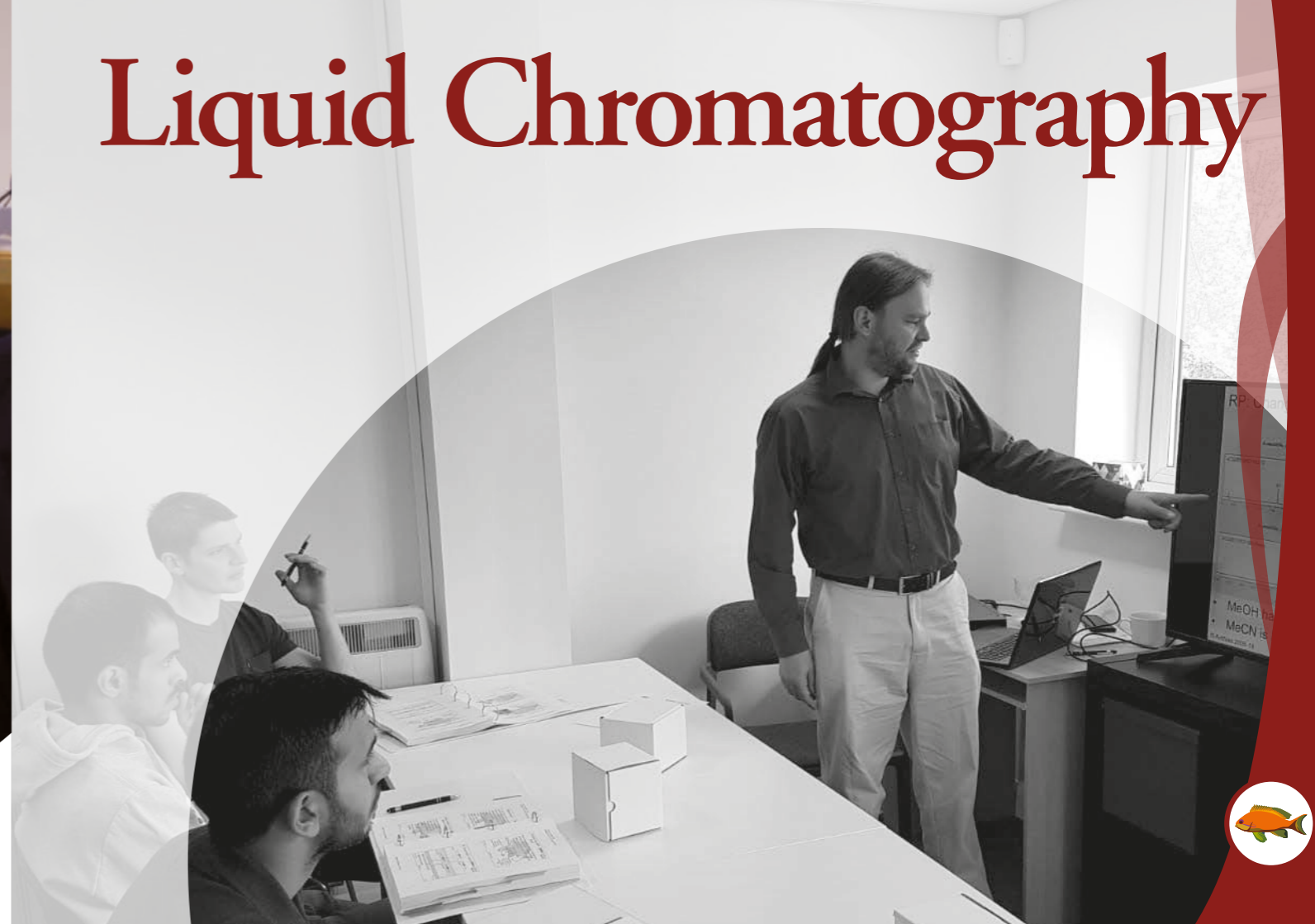
Liquid Chromatography

We offer instrument-independent training in Liquid Chromatography (HPLC, LCxLC), Mass Spectrometry (LC-MS) and related techniques, including: Anion Exchange Chromatography (AEC), Ion Chromatography (IC) and Size Exclusion Chromatography (SEC), Ultra-High Performance Liquid Chromatography (UHPLC), Sample preparation courses for LC including Solid Phase Extraction (SPE), Liquid-Liquid Extraction (LLE), Derivatisation and automated sample preparation - see the 'Sample Preparation' section for details of these courses.

Any of these courses can be delivered onsite and tailored to meet the needs and experience level of your analysts. We also offer a range of Comprehensive courses for training on a specific manufacturer's instrument and/or software.

Universal classroom-based training courses

Absolute Basics of HPLC & LC-MS

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Absolute beginners in liquid chromatography and LC-MS. The course is ideal either as stand-alone or prior to attending our Practical Essentials, Complete, Hands-on Complete or Comprehensive manufacturer-specific courses.

Topics: The course introduces the techniques and the instrumentation used and covers the what, why, where, when and how of LC & LC-MS. It explains the terminology used and details how the techniques work and the types of instruments available. The types of samples which can be analysed are discussed and the course looks at the stages of analysing a sample, outlining the principles and components of the

liquid chromatograph and mass spectrometer. Beyond the instrumentation, data analysis and the sorts of questions which the techniques can answer is also explored, giving you a full picture at a basic level..

Complete HPLC & LC-MS

Duration: 5 days face-to-face / 32.5 hours virtual classroom

Audience: Intermediate level HPLC or LC-MS. Beginners are advised to first attend the Absolute Basics of HPLC & LC-MS.

Topics: This course enables you to understand your liquid chromatograph or LC-MS instrument, application method development, troubleshooting and maintenance. The course is built from the Practical Essentials of HPLC & LC-MS and The HPLC & LC-MS Clinic courses. Analysts can choose to attend both courses at once or, alternatively, go away and implement the Practical Essentials and come back to attend the Clinic at a later date.

Individual days/modules: You can also choose to attend a single day, or individual modules (for virtual classroom training), to focus on a particular topic.

To find out more about our courses, visit our website: www.anthias.co.uk

Practical Essentials of HPLC & LC-MS			HPLC & LC-MS Clinic	
Audience: Intermediate level, some experience of HPLC or LC-MS is required, or participants have attended the Absolute Basics of HPLC & LC-MS course. Topics covered include:			Audience: Advanced level, good knowledge of HPLC or LC-MS is required, or participants have attended the Practical Essentials of HPLC & LC-MS course. Topics covered include:	
Day 1 (Modules 1 – 3)	**Day 2 (Modules 4 – 6)**	**Day 3 (Module 7 – 8)**	**Day 4 (Modules 9 - 10)**	**Day 5 (Modules 11 - 12)**
Introduction to LC & LC-MS	LC classification	Mass Spectrometry principles	Method development: column selection, mobile phase selection	Maintenance: from injectors to valves and seals, detectors to vacuum systems
Mobile phase solvents	Analytical columns	Vacuum & ionisation: ESI, APCI, APPI	System optimisation & configuration	Identifying when maintenance is required
Mobile phase preparation	Column heaters	Mass analysers: quadrupole, ion trap, TOF, IM-QTOF	Case studies: Choosing instrumentation & techniques, developing methods	Maintenance schedules
Buffers	Column flow splitters	SIM, MRM, MS/MS & ion detectors	Validation & accreditation	Troubleshooting, preparing for problems
LC pumps	Column care	Sample preparation: derivatisation, Solid-Phase Extraction, SPME, Liquid-Liquid Extraction, QuEChERS	Migrating methods from HPLC to UHPLC	Identifying problems
Isocratic elution, gradient elution	Detectors: UV-Vis, fluorescence, refractive index, PDA, ELSD, etc	Protein Purification	Introduction to advanced techniques: Mass spectral interpretation Deconvolution, Chemometrics	HPLC troubleshooting
Sample introduction: injectors	Data analysis: integration, libraries & calibration methods	Calibration Standards	Multi-dimensional (LCxLC, heartcutting), Ion Pairing, Size Exclusion & Ion Chromatography	LC-MS troubleshooting
Autosamplers	Qualitative, Quantitative & Semi-quantitative data analysis	Sample Properties	Interpretation of mass spectra, deconvolution, chemometrics	Exercises: troubleshooting chromatograms

Day 1: Solvents, Pumps, Plumbing & Sample Introduction for HPLC & LC-MS

This course looks at the types of solvents used as the mobile phase and their respective properties, examining these in detail. This is followed by information on gradient elution (high or low pressure mixing and solvent dwell times); along with problems that are frequently encountered in this area. Strategies for how to optimise your LC system will be discussed, including the necessity to minimise system void volume to increase performance. Sample introduction techniques are taught in detail, including theory, optimisation and applications. Your troubleshooting and maintenance skills will greatly benefit from having a thorough knowledge of inlet systems and how they work.

Day 2: HPLC Columns, HPLC Detectors & Data Analysis

This course looks in detail at the analytical columns used in liquid chromatography including the various separation mechanisms at play, normal phase, reverse phase and HILIC. The course covers a brief introduction into the types of detectors used in liquid chromatography both universal and selective, their relative sensitivities and linear dynamic ranges are discussed. Ultraviolet – Visible absorbance (UV-Vis), Fluorescence (FL), Refractive Index (RI) and Photo Diode Array absorbance (PDA or DAD) detectors are covered in detail. The final part of this course looks at data analysis and the reasons for performing the analysis, including measures to ensure repeatability and reproducibility. This will cover qualitative analysis, identification, quantitation and semi-quantitation.

Day 3: HPLC & LC-MS Sample Preparation, Calibration Standards, Sample Properties & Mass Spectrometry

A whole range of sample preparation techniques are covered in detail on this course, including their theory, optimisation and applications. The techniques include filtration; enrichment & dilution; standards prepared in matrix; Solid-Phase Extraction (SPE); Liquid-Liquid Extraction (LLE); QuECHERS and protein precipitation methods. This is followed by information on calibration standards and the incorporation of quality control samples for quantitation methods. The course goes on to look at mass spectrometry with atmospheric pressure inlets. Electrospray, APCI and APPI ionisation techniques are discussed, mass analysers and tandem mass spectrometry are also covered. The final part of the course covers targeted or non-targeted analysis including applications that require data dependant acquisition (DDA).

Day 4: HPLC & LC-MS Method Development, Optimisation & Advanced Techniques

First, the course examines the method development process in detail; covering the objectives of the analytical method, how many components are to be separated and the required sensitivity, selectivity, specificity and the speed of analysis. This is followed by system optimisation and configuration for LC and LC-MS. All of this knowledge is then put to the test in case studies. The course goes on to look at method validation protocols, system suitability and outlines the steps required for analytical method accreditation. The last part of the course provides a brief introduction to some advanced techniques that can be used for difficult or complex samples.

Day 5: HPLC & LC-MS Troubleshooting & Maintenance

This course first looks at clean-up procedures for difficult samples. The parts of the LC & MS system requiring maintenance, how often and how to identify when maintenance is required are then covered in detail. Following on from this the course looks at preparing for problems, how to identify problems and the troubleshooting process. This knowledge, along with the basic knowledge of HPLC & LC-MS acquired in days 1-3 (the Practical Essentials of HPLC & LC-MS), are then put to the test in practical exercises on troubleshooting problematic chromatograms.

Other Absolute Basics courses

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: These courses are ideal for those with experience of HPLC analysis who are completely new to these techniques. The course looks at the types of analytes and samples each technique can be used for, along with the purpose and principles of data analysis. The course will review the instrumentation available and provide examples of applications of the technique in a number of industries.

· Absolute Basics of Size Exclusion Chromatography (SEC/GPC)

· Absolute Basics of Anion Exchange Chromatography (AEC)

· Absolute Basics of Ion Chromatography (IC)

Applied Method Migration

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Intermediate level, users with experience of HPLC analysis who are new to UHPLC.

Topics: This course looks at the migration of methods from HPLC to UHPLC (UPLC). The course will cover the easiest methods to migrate from HPLC to UHPLC, the reasons behind method migration and the purpose and principles of data analysis. You will learn about the different instrumentation required for UHPLC and a number of industries and their application of method migration.

Applied Interpretation of LC-MS Mass Spectra

Duration: 3 days face-to-face / 20 hours virtual classroom

Audience: Advanced level, for those who have a good background in organic chemistry and at least six months experience in using LC-MS.

Topics: You will learn the fundamentals of mass spectral interpretation for the identification of unknowns and enhance your understanding of fragmentation patterns produced from LC-MS analysis to aid in accurate identification when using library search programs. This course includes a high proportion of practical exercises interpreting mass spectra to reinforce your understanding.

Hands-on Complete HPLC & LC-MS

Duration: 5 days

Audience: This course is suitable for all levels of knowledge; however for complete beginners it is advisable to attend the Absolute Basics of HPLC & LC-MS first to get a good basic overview of liquid chromatography and LC-MS.

Topics: This course course is made up of 5 individual days which, taken all together, provide you with a Hands-on Complete overview of Liquid Chromatography and Liquid Chromatography-Mass Spectrometry (LC-MS) theory, methods, maintenance and troubleshooting. You can also take a 2-day or 3-day course focusing on just the LC or just the LC-MS.

Sample Preparation

For our training courses in sample preparation for HPLC & LC-MS, see the section on Sample Preparation.

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction to liquid chromatography (LC)	LC maintenance: when required?	Introduction to mass spectrometry (MS)	Routine MS maintenance	How to identify problems
Mobile phase: solvents & buffers	HPLC pump maintenance	Vacuum system	HPLC maintenance overview	Preparing for problems
Practical: familiarity with LC components	*Practical:* prime pump & perform static leak test	*Practical:* familiarity with MS components	Leak checks, tuning & calibration	Problem areas: samples, sample preparation & HPLC
Isocratic & gradient elution	Injector & autosampler maintenance	Ionisation	*Practicals:* leak check, tuning & tune reports	Problems areas: HPLC
Injectors & autosamplers	*Practical:* replace needle & service injector	*Practical:* automatic & manual compound tuning	Vacuum system maintenance	*Practical:* solvent leaks
Practical: creating isocratic & gradient methods	Column maintenance	*Practical:* create a full scan method	*Practical:* pump maintenance	Problem areas: columns
Analytical columns	Minimising system void volume	*Practical:* changing MS parameters	*Practical:* venting the MS	Problem areas: MS & vacuums
Practical: development of gradient methods	*Practical:* replace a column	Mass analysers	Ion source maintenance	*Practical:* vacuum system
Detectors: UV-Vis, FLD, RI, PDA	Detectors: care for UV-Vis detector & data system	Ion detection	*Practical:* clean the ion source, replace probe tip & capillary	*Practical:* unstable ion beam
Practical: sample analysis	*Practical:* replacing lamp in UV-Vis detector	*Practical:* create a SIM method	Mass analyser maintenance	*Practical:* tandem mass spectrometry performance
Data analysis: qualitative & quantitative	HPLC maintenance schedules	*Practical:* create an MRM method	Detectors, post-maintenance & data system	*Problem chromatograms:* leaks, sensitivity & contamination
Practical: analysing data	HPLC system maintenance	*Practical:* analyse samples using all methods & compare results	*Practical:* Mass analyser maintenance	*Practical:* final bug exam

Day 1: Hands-on HPLC Theory and Methods

Learn the theory of liquid chromatography and then use this knowledge to create isocratic and gradient methods, program detectors and analyse data. After an introduction to liquid chromatography, this course addresses solvents & buffers (the mobile phase), pumps, isocratic and gradient elution, sample introduction, analytical columns, HPLC detectors. You will gain practical experience of adjusting the parameters for each HPLC component and practical experience of analysing data.

Day 2: Hands-on HPLC Maintenance

This course combines learning the reasons why maintenance is required, what happens if maintenance isn't performed and the signs of when maintenance is needed along with practicals carrying out maintenance on a liquid chromatograph. This course will cover maintenance of the autosampler, injector, columns and detectors.

Day 3: Hands-on LC-MS Theory & Methods

Learn the theory of mass-spectrometry and then use this knowledge to create LC-MS methods, perform injections and change MS parameters to see the effects. This course covers MS theory, the importance of tuning, the vacuum system, ionisation, mass analysers, ion detection, data analysis, LC-MS methods and acquisition rate.

Day 4: Hands-on LC-MS Maintenance

Learn the reasons why maintenance is required, what happens if maintenance isn't performed and the signs of when maintenance is needed, along with practicals on leak checks, tuning and calibration; pump maintenance; cleaning the ion source and maintenance of the mass analyser.

Day 5: Hands-on HPLC & LC-MS Troubleshooting

Learn the logical steps of troubleshooting HPLC and LC-MS instruments and what problems can occur, with real problem solving on the instruments and data analysis software.

Combine individual courses to focus on just the LC or just the LC-MS to meet your needs.

Comprehensive manufacturer-specific hardware & software courses

Audience: Intermediate level, analysts and technicians responsible for the operation and/or maintenance of instrument hardware and software. Beginners are advised to first attend the Absolute Basics of HPLC & LC-MS.

Topics: These courses introduce the fundamental theory of liquid chromatography and mass spectrometry along with how to operate, maintain and troubleshoot the instrument; including the installation, set-up and operation of the software for sample analysis, data acquisition, data analysis and reporting.

Comprehensive HPLC training courses

Duration: 2 – 4 days face-to-face / from 13 hours for virtual classroom software courses

Audience: Intermediate level, analysts and technicians responsible for the operation and/or maintenance of instrument hardware and software.

Topics: These courses can take place on a range of different manufacturers' instrumentation including:

- Agilent HPLC with OpenLAB ChemStation or CDS software
- Shimadzu HPLC with LabSolutions or LCsolution software
- Thermo HPLC with Xcalibur software Xcalibur™ or Chromeleon™ CDS software
- Waters HPLC with Empower™ software

Comprehensive LC-MS training courses

Duration: 2 – 5 days face-to-face / from 13 hours for virtual classroom software courses

Topics: These courses can take place on a range of different manufacturers' instrumentation including:

- Agilent SQMS with MassHunter or OpenLab CDS or ChemStation software
- Agilent QQQMS with MassHunter software
- Agilent TOFMS with MassHunter software
- Agilent QTOFMS with MassHunter software
- Thermo LC-MS with Xcalibur™ or Chromeleon™ CDS software
- Waters LC-MS with MassLynx software
- Sciex LC-MS with Analyst® or SCIEX OS software.

Sample Preparation

Universal laboratory-based courses

These training courses provide both the knowledge and practice of using each technique to start developing methods and analysing samples using each of the sample preparation techniques. The training covers method development, optimisation, instrument set-up, maintenance and troubleshooting. The courses combine 50% theory and 50% practical in a lab environment with a small class size, to ensure focused support.

On these hands-on courses you will learn about and gain practical experience in how to use these sample preparation techniques in great detail. The format of the course enables you to learn about an aspect of the technique and then go into the lab to apply the knowledge learned and reinforce the learning process through practical exercises.

Hands-on Sample Preparation

Duration: Each technique is a 1-day course covering each individual technique

Audience: Advanced level - delegates should have good knowledge of the appropriate sample analysis technique, e.g. GC or HPLC.

- Learn the theory of the technique and the types of samples that can be analysed
- Learn the individual steps and processes of each technique
- Gain practical experience in creating methods, preparing and analysing a sample and adjusting parameters for optimisation
- Learn how to set up and maintain the technique on a live instrument
- Learn the frequent maintenance and common troubleshooting problems
- Learn the tips and tricks of each technique
- Learn about the benefits of each technique for the analysis of your samples

Hands-on Liquid-Liquid Extraction (LLE)

This course covers all the practical theory of solvent extraction, partitioning, solubility, miscibility, sample preparation, matrix modification including pH adjustment and the choice of relevant apparatus.

Hands-on Derivatisation

This course covers all the essential theory about analytical derivatisation and will review the different types of derivatisation techniques including Acylation, Silylation, Alkylation & Esterification, along with the various reagents used in each of the types. It will look at how to select a suitable derivatisation agent and provide hands-on experience in the process of derivatisation.

Hands-on Solid-Phase Extraction (SPE)

This course will review the different types of SPE processes used for sample extraction including non-polar SPE, polar SPE and ion exchange SPE and the different sorbents used for each process.

This knowledge will be used to determine suitable sorbents for the extraction of a suitable sample, understand the extraction process and how to analyse the extracts using GC-MS or LC-MS.

Hands-on SPME

Spend part of the day learning the theory behind Solid-Phase Micro-Extraction and how to modify samples to improve results, then use this knowledge to create SPME methods, analyse samples and experiment with parameters to see the effects.

Hands-on Headspace

Spend part of the day learning the theory of static and dynamic headspace and how to modify samples to improve results, then use this knowledge to create HS methods, analyse samples and experiment with parameters to see the effects.

Hands-on Purge & Trap

This course teaches the theory of purge-and-trap (P&T) and how to modify samples to improve results, then using this knowledge to create P&T methods, analyse samples and experiment with parameters to see the effects.

Hands-on Thermal Desorption

This course begins with the theory of thermal desorption, types of samples that can be analysed using this technique, types of tube packing materials and how to collect samples. This knowledge is then used to create TD methods, collect and analyse samples and experiment with parameters to see the effects.

Hands-on Pyrolysis

Spend part of the day learning the theory behind the different pyrolysis techniques and then put this knowledge into practice in the laboratory, creating pyrolysis methods, analysing samples and changing parameters to see the effects.

Universal Classroom-based training courses

Practical Essentials of Sample Preparation

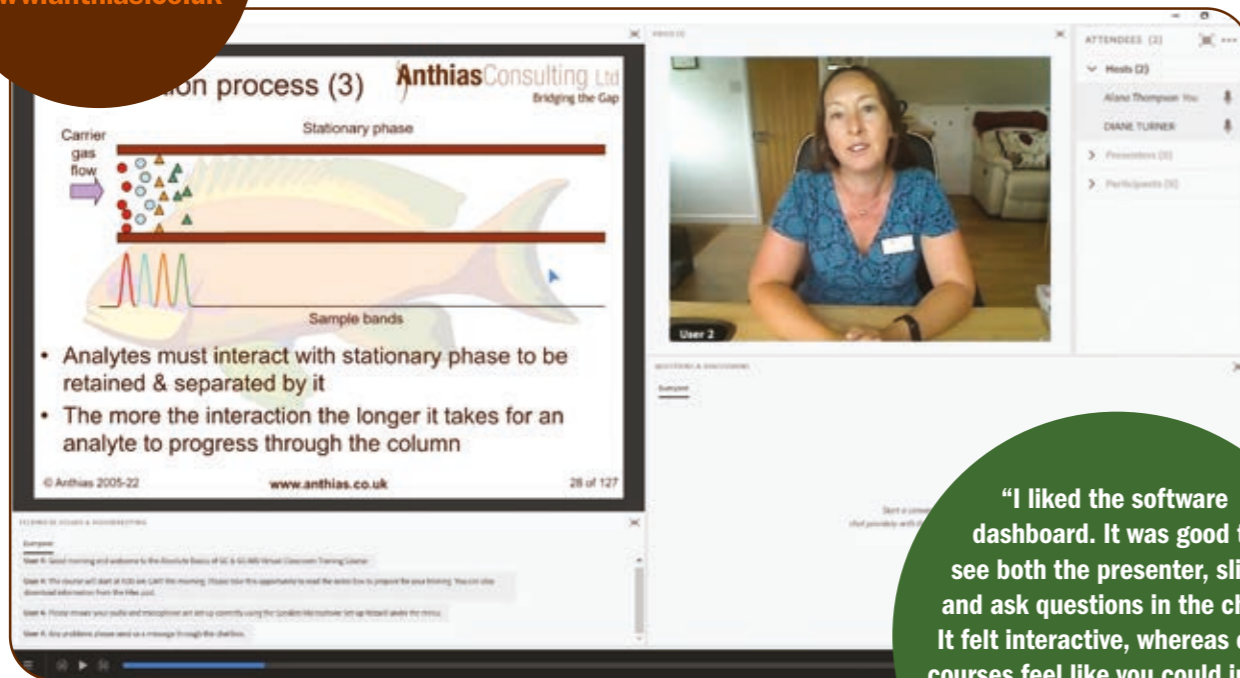**Duration:** Each course module is 3.25 hours.

Audience: Advanced level - delegates should have good knowledge of GC or GC-MS or LC or LC-MS

Topics: These Virtual Classroom courses take the practical theory from the Hands-on Sample Preparation courses, covering each technique in high detail.

- Practical Essentials of Liquid-Liquid Extraction (LLE)
- Practical Essentials of Derivatisation
- Practical Essentials of Solid-Phase Extraction (SPE)
- Practical Essentials of Solid-Phase Micro-Extraction (SPME)
- Practical Essentials of Headspace
- Practical Essentials of Purge-and-Trap (P&T)
- Practical Essentials of Thermal Desorption (TD)
- Practical Essentials of Pyrolysis (Py)

> **"Getting the knowledge of several sample preparation techniques in one week, plus having the opportunity of practical exercises. Technical discussions with Diane were amazing."**
>
> Andrea Rangel, Research Technologist, Nova Chemicals. Hands-on Sample Preparation for GC & GC-MS, 2018.

"I liked the software dashboard. It was good to see both the presenter, slides and ask questions in the chats. It felt interactive, whereas other courses feel like you could just be watching a video."

Virtual Classroom: Absolute Basics of GC & GC-MS, October 2021.

Spectroscopy

These courses are universal, applicable to all makes and models of instrumentation.

Any of these courses can be delivered onsite and tailored to meet the needs and experience level of your analysts.

Universal classroom-based training courses

Absolute Basics of AAS

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Beginners

Topics: This course engenders a holistic approach to Atomic Absorption Spectroscopy (AAS), from the initial choice of analytical set-up through to designing a robust methodology including sample preparation and sample introduction and finishing with calibration.

Absolute Basics of ICP-OES & ICP-MS

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Details: see Inductively Coupled Plasma section

Complete Spectroscopy

Duration: 5 days / 32.5 hours virtual classroom

Audience: Intermediate, suitable for all levels of knowledge and experience

Topics: This course covers the practical theory of spectroscopy techniques including FTIR, NIR and UV-Vis, from how to choose the techniques for an application, how to set-up the instrument, how to develop & optimise methods and then finally how to maintain & troubleshoot the instrument, techniques and method.

Applied FTIR

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Intemediate, suitable for all levels of knowledge and experience

Topics: This course covers all the practical theory of Fourier Transform InfraRed spectroscopy (FTIR) with case studies to work through to apply the knowledge learned.

Applied NIR

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Intermediate, suitable for all levels of knowledge and experience

Topics: This course covers all the practical theory of Near InfraRed spectroscopy (NIR), examining the characteristic absorption spectra of various compounds, components of the instrumentation and explores different applications of the technique.

Applied UV-Vis

Duration: 1 day face-to-face

Audience: Suitable for all levels of knowledge and experience

Topics: This course covers all the practical theory of UV-Vis spectroscopy; characteristics of the absorption, and reviewing various different common applications of the technique. Worked examples will be used to reinforce method development, operation and interpretation of the spectra.

Applied ICP-OES

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Details: see Inductively Coupled Plasma section

Universal laboratory-based courses

Hands-on FTIR

Duration: 1 day face-to-face

Audience: Intermediate, suitable for all levels of knowledge and experience

Topics: Learn all the practical theory about Fourier Transform InfraRed spectroscopy, characteristics of the absorption of various compounds and review the different components of FTIR. The hands-on practicals will include the analysis of pharmaceutical and food samples by FTIR and analysis of the data.

Hands-on UV-Vis

Duration: 1 day face-to-face

Audience: Suitable for all levels of knowledge and experience

Topics: Learn all the practical theory of UV-Vis spectroscopy and gain practical, hands-on experience in method creation, sample analysis and data analysis

"I enjoyed the practical aspects of the course, such as information around testing the samples and the different methods and variables that can arise."

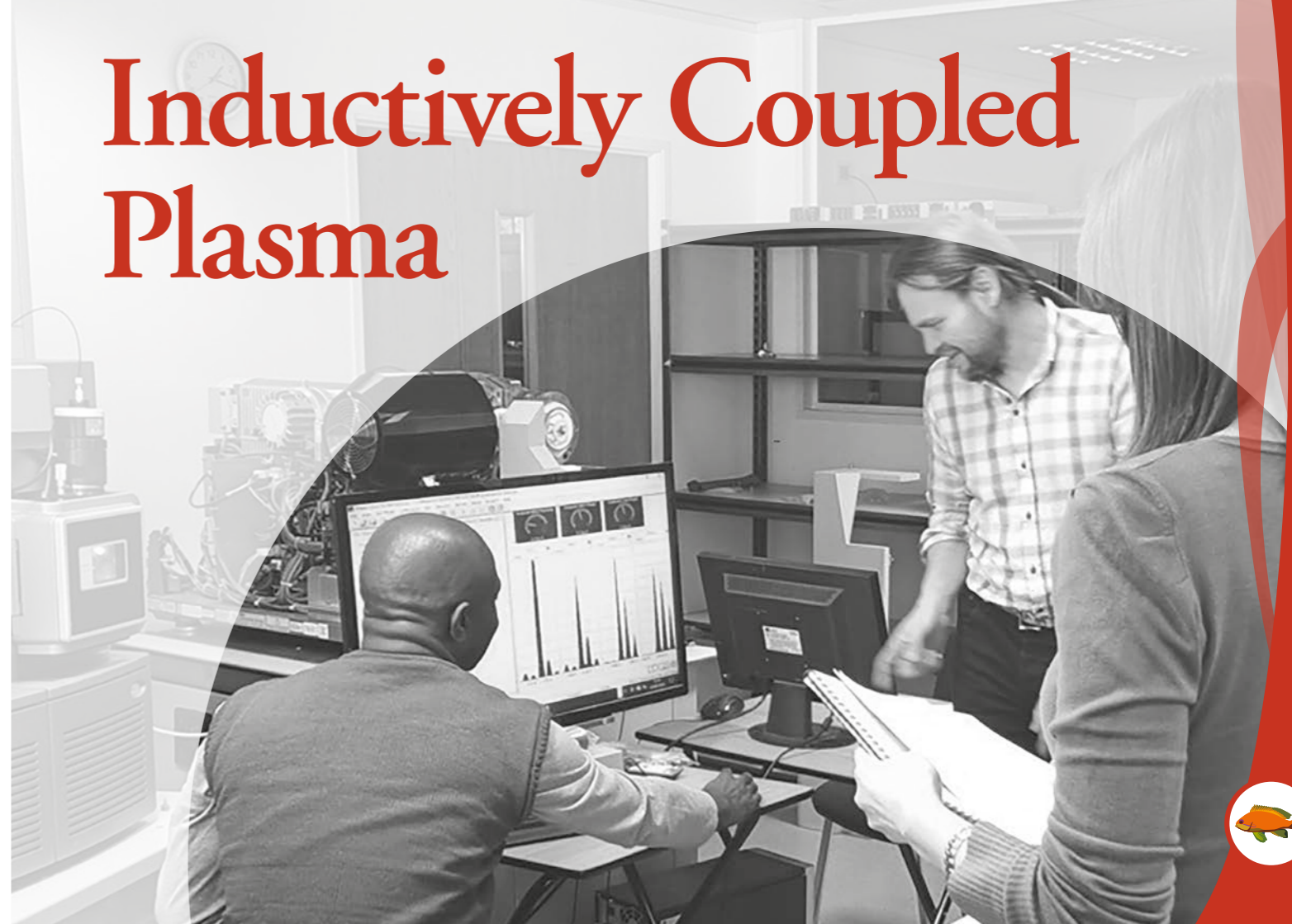Virtual Classroom: Applied FTIR, July 2022.

Inductively Coupled Plasma

Absolute Basics of ICP-OES & ICP-MS

Duration: 1 day face-to-face / 6.5 hours virtual classroom
Audience: Beginners
Topics: This course provides an introduction to inductively coupled plasma - optical emission spectroscopy (ICP-OES) & mass spectrometry (ICP-MS). The course explores a number of industries and their application of the techniques. You will learn about the types of samples, analytes and standards used and the components of the system. The course covers the purpose and principles of data analysis and covers the different sampling techniques for ICP-OES and ICP-MS.

Applied ICP-OES

Duration: 1 day face-to-face / 6.5 hours virtual classroom
Audience: Intermediate, suitable for all levels of knowledge and experience
Topics: This course looks at the technique of Inductively Coupled Plasma - Optical Emission Spectroscopy (ICP-OES) looking at the theory of the technique and the required troubleshooting and maintenance of each facet, the different components of the instrumentation and how they are effected by problematic samples and what can be done to reduce interferences using matrix modification and background correction, along with method development and optimisation, with case studies to apply the knowledge.

Applied ICP-MS

Duration: 1 day face-to-face / 6.5 hours virtual classroom
Audience: Intermediate, suitable for all levels of knowledge and experience
Topics: This course looks at the technique of Inductively-Coupled Plasma - Mass Spectrometry (ICP-MS) looking at the theory of the technique and the required troubleshooting and maintenance of each facet, the different components of the instrumentation

and how they are effected by problematic samples and what can be done to reduce plasma and isobaric interferences, along with method development and optimisation, with case studies to apply the knowledge.

Hands-on ICP-MS

Duration: 2 days face-to-face
Audience: Intermediate,
Topics: This course covers all the practical theory of Inductively Coupled Plasma-Mass Spectrometry, then using this knowledge to prepare and analyse a sample, develop an ICP-MS/MS method, and change MS parameters to see the effects. The course covers which areas of the instrument require maintenance, and practicals to carry out maintenance, followed by learning about data analysis and interpreting results. The final part combines learning how to go about troubleshooting ICP-MS instruments and what problems can occur, with real problem solving on the instruments.

Comprehensive manufacturer-specific ICP-MS training courses

Comprehensive ICP-MS Software Training (Agilent MassHunter for SQMS)

Duration: 2 days face-to-face / 13 hours virtual classroom
Audience: Intermediate, analysts and technicians responsible for the operation of Agilent single quadrupole ICP-MS instruments and data analysis using MassHunter software.
Topics: This course introduces the Agilent MassHunter software for instrument control, data acquisition and data analysis focusing on single quadrupole ICP-MS. The course covers PC and data system set-up and maintenance; an overview of MassHunter software; tuning methods; creating batches, methods and sequences; quantitative data analysis and reports.
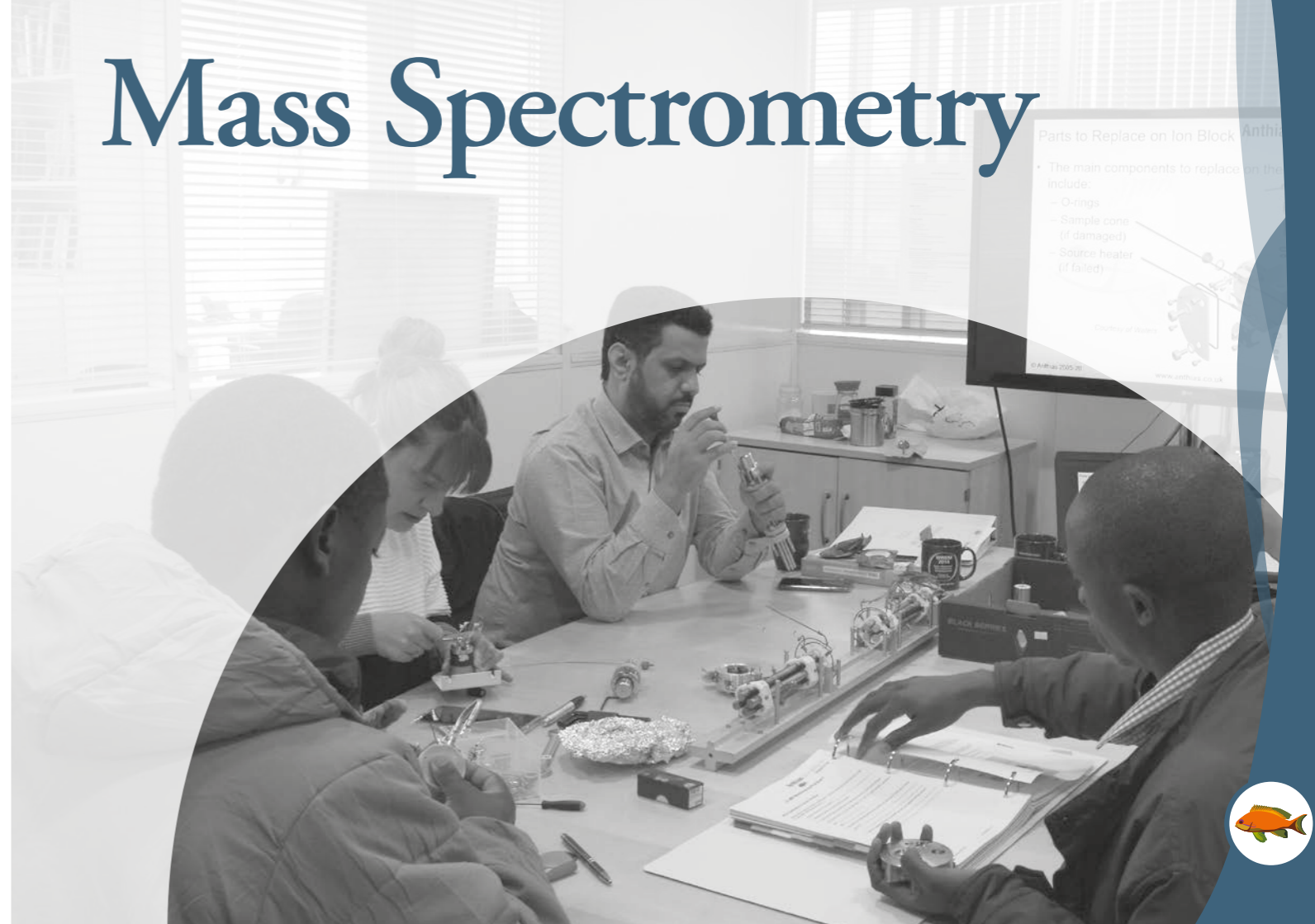
Mass Spectrometry

We offer a range of classroom-based and hands-on training courses in mass spectrometry techniques. These courses are universal, applicable to all makes and models of instrumentation. Any of these courses can be delivered onsite and tailored to meet the needs and experience level of your analysts.

- See the **'Gas Chromatography'** section for details of courses in GC-MS techniques, interpretation of mass spectra and deconvolution courses
- See the **'Liquid Chromatography'** section for details of courses in LC-MS techniques, interpretation of mass spectra
- See the **'Inductively Coupled Plasma'** section for details of courses in ICP-MS.

Universal classroom-based training courses

Absolute Basics of MALDI-TOF

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Absolute beginners in MALDI-TOF.

Topics: This course introduces the different types of MALDI, the definitions of MALDI-TOF and the principles and components of the mass spectrometer. The types of samples which can be analysed are covered, along with the different sampling techniques available.

Beyond the instrumentation, the course discusses why the technique is used and the answers it can give, looking at qualitative and quantitative data analysis, to give you a full picture, to a basic level. The course reviews different industries and their applications of MALDI and MALDI-TOF,

using each as a case study to apply knowledge learned throughout the course.

Absolute Basics of Mass Spectrometry Imaging (MSI)

Duration: 1 day face-to-face / 6.5 hours virtual classroom

Audience: Absolute beginners in Mass Spectrometry Imaging (MSI).

Topics: This course explains the different types of MSI (DESI, MALDI & SIMS) and the principles of these techniques, along with some of the industries which use them and their applications.

You will learn about the components of Mass Spectrometry Imaging instrumentation, the purpose and principles of data analysis and the different sampling techniques that can be used.

> **"The presenter was super knowledgeable. [Most useful topic:] The top tips for preparing a plate."**
>
> Sarah Hutchison, Team Leader, Scottish Water. Virtual Classroom: Absolute Basics of MALDI-TOF, July 2022.

Physical & Structural Properties of Molecules

Methods

We off a range of introductory training courses in techniques used in the determination of physical and structural properties of molecules.

Any of our courses can be delivered onsite and tailored to meet the needs and experience level of your analysts.

Universal classroom-based training courses

These courses are available as face-to-face training or virtual classroom.

Absolute Basics of Techniques for Determination of Physical & Structural Properties of Molecules

Duration: 1 - 3 days face-to-face / 1.5 - 20 hours virtual classroom

Audience: Beginner level

- Absolute Basics of Karl Fischer Titration (KF)
- Absolute Basics of Thermal Gravimetric Analysis (TGA)
- Absolute Basics of Differential Scanning Calorimetry (DSC)
- Absolute Basics of Laser Diffraction Analysis (LDA)
- Absolute Basics of Powder X-ray Diffraction (PXRD)
- Absolute Basics of Absolute Basics of Mass Spectrometry Imaging (MSI)

Topics: These courses introduce each of the techniques, explaining how they work, the types of samples that can be analysed and the data that is produced. You will learn about the components of the instrumentation and considerations for sample preparation. The courses discuss the sorts of questions which each technique can be used to help answer, including data analysis and library searching. When the techniques are used is also explored, discussing some of the industries which use the techniques and their applications. giving you a full picture, at a basic level.

"I liked that it really was what it said it would be - absolute basics!.. Really well paced and good for someone like me who has never done the techniques - I have only every heard of it. So the thorough introduction and explanations were really helpful to me..."

William Andrews, Lecturer of Chemistry, Belfast Metropolitan College. Virtual Classroom: Absolute Basics of Karl Fischer Titration, June 2021.

To find out more about our courses, visit our website: www.anthias.co.uk

We off a range of training courses in analysis methods. We can create bespoke training solutions in a wide range of method areas, tailored to your industry and application.

Applied Extractables & Leachables (E&L)

Duration: 1 day face-to-face, 6.5 hours Virtual Classroom

Audience: Intermediate level - analysts, technicians, engineers or those have some experience in the pharmaceutical industry.

Topics: This course provides an introduction to Extractables & Leachables (E&L) methods exploring the different methods of analysis, the types of analytes and samples E&L can be used to analyse along with the instrumentation used and different sampling techniques available. The course will include case studies to reinforce the knowledge and apply the topics learned.

Applied Stability Indicating Methods (SIM)

Duration: 1 day face-to-face, 6.5 hours Virtual Classroom

Audience: Beginner level - analysts, technicians, engineers or those have some experience in the pharmaceutical industry.

Topics: This course provides an introduction to stability indicating methods and looks at when we use these methods and the types of analytes and samples SIM can be used for and the instrumentation used. The course also explores a number of industries and their application of SIM. The course will include case studies to reinforce the knowledge and apply the topics learned.

Applied Method Validation

Duration: 1 day face-to-face, 6.5 hours Virtual Classroom

Audience: Advanced level - delegates with good knowledge of a base technique e.g. GC (or GC-MS) or LC (or LC-MS) and would like to learn more about method validation.

Topics: This course engenders a holistic approach to method validation, applicable to all techniques, from start (initial planning) to finish (on-going tracking of performance statistics), including explanations of each important facet, initial data reduction, design of control charts plus on-going monitoring and appraisal. Delegates will have a chance to apply the knowledge learned through practical exercises, including using previously acquired data to design a brand-new Shewhart control chart. The training is applicable to all instrumentation and disciplines.

Applied Out of Specification (OOS) Results Investigation

Duration: 1 day face-to-face, 6.5 hours Virtual Classroom

Audience: Advanced - ideal for laboratory analysts who are interested in practical ways to comply with GMP requirements, or for compliance managers who want a broad understanding of laboratory QA systems. Although this course is not technique-specific, it assumes knowledge of the principles of gas or liquid chromatography and familiarity with common laboratory terminology. Previous experience of working to GMP is an advantage, but not essential.

Topics: This course is a pragmatic and practical guide to the process of investigating atypical and out-of-specification results in a GMP-compliant laboratory. The course covers how to systematically investigate Out of Specification results, guiding you on how to investigate a hypothesis, assign a root cause, and propose and implement appropriate corrective and preventative actions.

Statistical Analysis

We off a range of training courses in statistical analysis. Any of our courses can be delivered onsite and tailored to meet the needs and experience level of your analysts.

Universal classroom-based training courses with practical focus

Absolute Basics of Chemometrics
Absolute Basics of Metabolomics

Duration: 1 day face-to-face, 6.5 hours Virtual Classroom

Audience: Beginners

Topics: These courses provide an introduction to data processing and statistical analysis, giving an overview of the history, development and current uses of the technique in fields such as clinical, environmental, flavour and fragrance and biotechnology applications and the technique's use in method development. There will be a demonstration of a summary of the workflows in a Metabolomics or Chemometrics study and outline the considerations when designing an experiment or study including sampling and quality control, metadata and sample preparation techniques. The course provides an overview of different Mass Spectrometry-based instrumentation and other techniques (such as NMR and Infrared) that produce data used in these areas.

The course covers data processing and statistical analysis including worked examples using data analysis software, covering processing and preparation of mass spectrometry data. It will outline the different techniques, methods and tools used for creating and mapping data and includes an overview of the various commercial and freeware software tools available.

Comprehensive manufacturer-specific software courses

· Comprehensive Chemometrics Software Training (Agilent MassHunter with GeneSpring Mass Profiler Professional)

· Comprehensive Metabolomics Software Training (Agilent MassHunter with GeneSpring Mass Profiler Professional)

Duration: 4 day face-to-face, 26 hours Virtual Classroom

Audience: Intermediate level - analysts performing Metabolomic studies using Agilent mass spectrometry instrumentation and requires familiarity with MassHunter for simple off-line data working. The course also requires an understanding of basic statistical principles for significance testing or analysis of variance (i.e. t-test, ANOVA etc.).

Topics: These courses introduce the integrated set of software packages available to analysts performing Metabolomic or Chemometric studies using Agilent based mass spectrometry platforms.Through a combination of classroom-based presentations and practical hands-on data analysis exercises, the course will provide a working knowledge for Agilent instrument users for either Discovery or Targeted analysis. The course will cover how to use the available tools to process raw data; identify compounds; undertake statistical analysis and map pathways.

We can provide training using other software packages, please contact us with your requirements.

We can help you with all aspects of data analysis, from optimising your data analysis methods for improved results, through to chemometrics consultancy support to develop and validate models of your data.
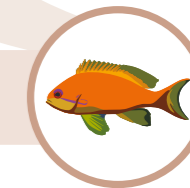
Anthias Consulting Ltd are...

...experts in the analytical science fields of:

· **Gas Chromatography** (GC, GCxGC),

· **Liquid Chromatography** (HPLC, UHPLC, LCxLC),

· **Mass Spectrometry** (GC-MS, LC-MS, ICP-MS, MALDI-TOF),

· **Spectroscopy** (FTIR, UV-Vis, AA, ICP-OES),

· **Physical & Structural Properties of Molecules** (MSI, DSC, TGA, KF, PXRD, LDA) and all their related techniques.

Focus includes: Methods (Development, Optimisation, Validation, Accreditation, Maintenance, Troubleshooting), Applications (including SIM, E&L, OOS), Interpretation & Data Analysis (including Statistical techniques or methods, Chemometrics, Metabolomics).

We provide training and consultancy across all applications and industries; to laboratory analysts & technicians, suppliers & manufacturers, PhD students & researchers, engineers & consultants; for all levels of experience.

www.anthias.co.uk