

Module Specification

Module Title	Advanced Analytical Chemistry & Spectroscopy	Module Code	CHE308U			
Credit Value	15	Level	6	Mode of Delivery	On Campus	Semester B

Pre-requisite modules	Co-requisite modules	Overlapping modules
CHE104 Fundamentals of Spectroscopy		

1) Content Description

Provide a description of the module, as it will appear in the Module Directory and on the Student Information System (approx. 70-80 words).

This module provides advanced coverage of topics in instrumental analysis, with illustrations of the applications of such techniques. Topics to be covered include: atomic spectroscopy, molecular spectroscopy, separation sciences - gas and liquid chromatography, mass spectrometry and "hyphenated" techniques e.g. GC-MS, LC-MS-MS, ICP-MS, that combine two or more methods to provide improved detection of analytes. There will a strong emphasis on problem-solving in analytical chemistry.

2) Module Aims

Specify the aims of the module, i.e. the broad educational purposes for offering this module.

The aim of this module is to introduce and expand upon the techniques of analytical chemistry, with coverage of the underlying principles, practical implementation and illustrative applications. Advanced methods found in a modern analytical laboratory will be covered, including hyphenated techniques (such as GC-MS) where two different techniques are linked to provide better characterisation and sensitivities. At the end of this module students should appreciate the importance of the techniques used in order to provide detailed and accurate chemical analyses in several key areas and be able to discuss the principles and merits of different experimental techniques when faced with analytical problems.

3) Learning Outcomes

Identify the learning outcomes for this module, i.e. knowledge, skills and attributes to be developed through completion of this module. Outcomes should be referenced to the relevant [QAA benchmark statements](#) and the [Framework for Higher Education Qualifications in England, Wales and Northern Ireland \(2008\)](#). The [SEEC Credit Level Descriptors for Further and Higher Education 2003](#) and [Queen Mary Statement of Graduate Attributes](#) should also be used as a guiding framework for curriculum design.

Academic Content:	
A1	Chemical Analysis • Principles, overview of techniques and the importance of chemical analysis to the modern chemical and pharmaceutical industries.
A2	Analytical Atomic Spectroscopy • Absorption and emission methods, including Inductively-Coupled Plasma (ICP) emission spectroscopy and ICP-MS. Comparison of different methods based on detection limits and cost. • Spectrometer design (sources, monochromator, detector etc.). Comparison of flame and electrothermal methods of sample atomisation.
A3	Comparative Quantitative Analytical Methods • Calibration and standard addition (single and multi)

A4	Analytical Electrochemistry <ul style="list-style-type: none"> • Potentiometry: reference and ion-selective electrodes • Voltametry: polarography; stripping analysis; cyclic voltametry.
A5	Chromatography and Mass Spectrometry <ul style="list-style-type: none"> • Principles and theory of chromatography • Gas chromatography (GC); high-performance liquid chromatography (HPLC). • Advanced techniques of mass spectrometry • Hyphenated techniques such as GC-MS, LC-MS-MS.
A6	Magnetic Resonance Spectroscopy - selected topics such as: <ul style="list-style-type: none"> • Advanced techniques in multi-dimensional NMR spectroscopy • Electron paramagnetic resonance (EPR) spectroscopy

Disciplinary skills - able to:

B1	Comprehend and explain the importance and role of chemical analysis in a range of applications.
B2	Describe a variety of specialised instrumental techniques used in chemical analysis.
B3	Rationalise the importance of hyphenated techniques (GC-MS, LC-MS-MS, ICP-MS etc) in modern analytical chemistry.
B4	Select appropriate experimental techniques for investigation of specific chemical analyses, and be able assess the strengths and weaknesses of individual techniques.
B5	Tackle advanced analytical problems, including: consideration of issues of calibration and the appropriate use of standards; statistical analysis in relation to chromatography and data from other analytical techniques.

Attributes:

C1	Acquire and apply knowledge relating to the art of analytical/applied chemistry.
C2	Produce analyses which are grounded in experimental evidence (e.g. spectroscopic data).
C3	Apply existing knowledge and skills to investigate unfamiliar problems.

4) Reading List

Provide an indicative reading list for the module. This should include key texts and/or journals but **should not** be an exhaustive list of materials.

D. A. Skoog, D.M. West, F.J. Holler, Analytical Chemistry - An Introduction, 7th Ed., Saunders College Publishing, 2000.

D. C. Harris, Quantitative Chemical Analysis, 8th Edition, WH Freeman & Co., 2010.

5) Teaching and Learning Profile

Provide details of the method of delivery (lectures, seminars, fieldwork, practical classes, etc.) used to enable the achievement of learning outcomes and an indicative number of hours for each activity to give an overall picture of the workload a student taking the module would be expected to undertake. This information will form the Key Information Set for each undergraduate programme and will be used to populate the KIS widget found on the QMUL programme information pages. More information can be found [online](#) about KIS. You may also wish to refer to the [QAA guidance on contact hours](#) when completing this section.

Activity Type	KIS Category	Time Spent (in hours)
Lecture	Scheduled	22
Practical Classes and Workshops	Scheduled	8

Total	150
-------	-----

Specify the total module notional study hours. This should be a total of the hours given for each activity. The notional study hours for each academic credit point is 10. A 15 credit point module therefore represents 150 notional study hours.

Activity Type	Total Time Spent (in hours)	Percentage of Time Spent
Scheduled learning and teaching	30	20
Placement	0	0
Independent Study	120	80
Total	150	100

Use the information provided in the box above to specify the total time spent and the percentage time spent in each category of teaching and learning activity.

6) Assessment Profile

Provide details of the assessment methods used to assess the achievement of learning outcomes.

Description of Assessment	Assessment Type	KIS Category	Duration/Length	Percentage Weighting	Final element of assessment	Qualifying Mark
Coursework	Written Assignment, inc Essay	Coursework		10%	No	
Examination	Written Exam	Written	2.5 Hours	90%	Yes	

Final element of assessment: The assessment that takes place last. **There should normally be only one element of assessment marked as final unless two assessment or submission dates occur on the same day.**

Qualifying mark: A specified minimum mark that must be obtained in one or more elements of assessment in order to pass a module. **This is in addition to, and distinct from, the requirement to achieve a pass in the module mark to pass the module.**

Reassessment

Provide details of the reassessment methods used, specifying whether reassessment is either standard reassessment or synoptic reassessment.

- Standard Reassessment
 Synoptic Reassessment

Synoptic reassessment details (if you have indicated synoptic reassessment above, please give details)		
Brief Description of Assessment	Assessment Type	Duration/Length of Examination/ Coursework
Resit Examination	Written Exam	2.5 Hours