

University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Advanced Analytical Techniques			
Code: CHEM10002	SCQF Level:10 Choose an item. (Scottish Credit and Qualifications Framework)	Credit Points: 20	ECTS: 10 (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Dr Mohammed Yaseen		
Summary of Module			
<p>This module examines a range of modern analytical chromatographic and spectroscopic techniques. Discussion topics will include the quality control in analytical measurement; methods of analysis & validation, Two dimensional NMR Structure elucidation, Raman spectroscopy, Scanning and Transmission electron microscopy, AFM, chromatographic methods and strategy in analytical investigation.</p> <p>Quality Control in Analytical Measurement Laboratory design and method; reference methods; reference materials; traceability; accreditation schemes (NAMAS, VAM etc).</p> <p>Atomic Spectroscopic Techniques Review of atomic absorption spectrometry atomization processes in flame and electrothermal devices (ie the graphite furnace); interferences (chemical and spectral); control of chemical interferences by chemical modification and platform atomization; control of spectral interferences; application areas. Atomic emission spectrometry - influence of temperature; excitation processes; local thermal equilibrium (LTE) conditions and non-LTE conditions, spectral interferences. Principles of inductively coupled plasma mass spectrometry: instrument design and components, sample introduction methods, ion transport and mass spectral interferences, use of alternative sampling techniques and reaction cell technologies. Examples of applications including process, environmental and forensic analysis.</p> <p>Chromatographic Methods Examples and applications of combined spectroscopy-chromatographic techniques – to include GC-MS, and LC-MS. Ionisation techniques. Also IRMS. Spectral manipulation and spectral libraries. Applications to structural elucidation and determination.</p> <p>Strategy in Analytical Investigation Problems of trace analysis. Sampling extraction techniques. A general review of the use and range of techniques for problem-solving in analytical chemistry. The use of a combination of techniques in analytical investigations including approach to chemical speciation of organics and inorganics Graduate Attribute relevant to module as shown;</p> <p>Analytical, problem solver, critical, communication, motivation, thoughtful</p>			

Module Delivery Method					
Face-To-Face	Blended	Fully Online	HybridC	Hybrid 0	Work-Based Learning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
See Guidance Note for details.					

Campus(es) for Module Delivery						
The module will normally be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1		Term 2		Term 3	
	<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

Learning Outcomes: (maximum of 5 statements) These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module. At the end of this module the student will be able to:	
L1	Demonstrate a critical understanding of modern instrumentation and the strategies for analysis of analytes in complex matrices
L2	Demonstrate skills required to tackle complex analytical problems such as those encountered in e.g. forensic and environmental analysis
L3	Show a detailed knowledge of the complementary nature of various techniques and demonstrate the ability to identify the most suitable technique for a particular analysis
L4	Acquire and develop analytical and associated data handling and processing skills in a series of laboratory instrumental chemical analytical experiments

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:

Knowledge and Understanding (K and U)	SCQF Level 10 Gaining knowledge and critical understanding of the analytical techniques which may be employed in the chemical analysis of complex multi-component samples eg in process streams and final products in fine chemical industries, forensic materials etc.	
Practice: Applied Knowledge and Understanding	SCQF Level 10 Apply knowledge of these techniques in the analysis of complex samples taking into account matrix variability.	
Generic Cognitive skills	SCQF Level 10 Undertaking critical analysis of the available methodologies to devise appropriate analytical protocols for sample preparation and analysis. Be able to interpret data information from the examination of instrumental data using current professional approaches.	
Communication, ICT and Numeracy Skills	SCQF Level 10 Use the wide range of skills expected of a professional scientist to present information in written and verbal reports. Using appropriate numerical and analytical skills to interpret and evaluate complex spectro-analytical data generated from laboratory exercises and 'dry- lab' exercises.	
Autonomy, Accountability and Working with others	SCQF Level 10 Working effectively with others in laboratory environment and identifying and addressing individual/personal learning needs in the subject area associated with the module. Exercising autonomy and initiative in practical and problem based learning.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: CHEM09002	Module Title: Analytical Chemistry
	Other:	or equivalent
Co-requisites	Module Code:	Module Title:

*Indicates that module descriptor is not published.

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours

	and hours spent on other learning activities)
Lecture/Core Content Delivery	24
Tutorial/Synchronous Support Activity	12
Laboratory/Practical Demonstration/Workshop	12
Independent Study	152
	Hours Total 200

****Indicative Resources: (eg. Core text, journals, internet access)**

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Egerton R. (2016) Physical Principles of Electron Microscopy: An Introduction to be TEM, SEM, and AEM (Springer) ISBN 978-3-319-39877-8

Santinder, A (2010) Chiral separation methods for pharmaceutical and biotechnological products (Wiley) ISBN 9780470406915

Procházka, M; (2016) Surface-Enhanced Raman Spectroscopy (Springer) ISBN 978-3-319- 23992-7

Please ensure the list is kept short and current. Essential resources should be included, broader resources should be kept for module handbooks / Aula VLE.

Resources should be listed in Right Harvard referencing style or agreed professional body deviation and in alphabetical order.

(*N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the [Student Attendance and Engagement Procedure](#): Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

Free Text – to add detail

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: [UWS Equality, Diversity and Human Rights Code](#).

Please ensure any specific requirements are detailed in this section. Module Co-ordinators should consider the accessibility of their module for groups with protected characteristics..

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	Physical Sciences
Assessment Results (Pass/Fail)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
School Assessment Board	Physical Sciences
Moderator	Dr Callum McHugh
External Examiner	M Paterson
Accreditation Details	This module is accredited by the Royal Society of Chemistry (RSC) as part of the BSc (Hons) Chemistry Programme.
Changes/Version Number	2.16 Change to Module Delivery (Section 9), to include some compulsory face-to-face session

Assessment: (also refer to Assessment Outcomes Grids below)

Assessment 1 - Formal Written Examination (60%)

Assessment 2 – Coursework laboratory reports (2x15%), Short test (10%)

(N.B. (i) **Assessment Outcomes Grids** for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed.

(ii) An **indicative schedule** listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Assessment Outcome Grids (See Guidance Note)

Component 1

Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Unseen open book	✓	✓	✓			60	2

Component 2							
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Essay Laboratory/ notebook Class test (written)	✓	✓	✓	✓		40	13
Combined Total for All Components						100%	15 hours