Module Descriptor

Title	Analytical Chemistry		
Session	2025/26	**Status**	Published
Code	CHEM09002	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Callum McHugh		

Summary of Module

The following topic materials will be presented:

Chromatography: A more extended treatment of sorption mechanisms and fundamental concepts in chromatography - plate theory, Van Deemter treatment and capacity factor as applicable to Gas Chromatography (GC) and High-Performance Liquid Chromatography (HPLC) will be presented together with coverage of the principles of operation of detectors, types, and selection of stationary phase; capillary columns and instrumental requirements. Quantitative procedures as applicable to chromatographic methods in general will be detailed. Atomic Spectroscopy: instrumentation, sample vaporisation, quantitative measurements, and interferences. Molecular absorption spectrometry; UV/visible and infrared. Quantitative methods, internal standards. Fluorescence analysis; principles and applications. Voltammetry: electrode systems; DC polarography, characteristics, pulse polarography normal and differential, detection limits and resolution. Stripping voltammetry, cathodic and anodic, linear sweep, and differential pulse; applications, limitations, and interferences. Potentiometry; ion-selective electrodes, calibration and selectivity, detection limits and response times; theory and construction of electrodes, glass, liquid ion-exchange, neutral carrier, and insoluble salt types; applications and limitations of ion-selective electrodes. Introduction to electrochemical sensors. Gas sensors e.g. Clark cell (oxygen sensor), CO2, NH3. The use of carbon and proton NMR spectroscopy for structure identification.

A series of laboratory exercises designed to reinforce and complement the lecture material.

The Graduate Attributes relevant to this module are:

- Academic: critical thinker, analytical problem solving, autonomy, group work
- Personal: motivation, time keeping
- Vocational: collaboration, research, analytical techniques
- This module will be prefaced with a review of the scope and philosophy of analytical chemistry. Choice of method, sampling collection and preparation. A series of laboratory exercises designed to reinforce and complement the lecture material by application of instrumental techniques to “real” samples as far as practicable will be completed.

Module Delivery Method	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☐	Term 2	☒	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Display knowledge of modern instrumental analysis, particularly chromatography, spectroscopy, and electrochemistry
L2	Show critical understanding of importance of sampling, pretreatment, calibration and data handling for the significance and reliability of derived results
L3	Acquire and develop analytical and associated data handling and processing skills in a series of laboratory instrumental chemical analytical experiments
L4	
L5	

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 9** Broad integrated knowledge of the fundamental techniques of chromatography, spectroscopy, and electrochemistry available to the analytical scientist
Practice: Applied Knowledge and Understanding	**SCQF 9** Undertake a series of experiments featuring the above techniques in both a qualitative and quantitative context in the analysis of 'real' samples
Generic Cognitive skills	**SCQF 9**

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

	Undertaking critical analysis of the available methodologies to devise appropriate analytical protocols
Communication, ICT and Numeracy Skills	**SCQF 9** Bringing information together from a variety of sources, using information retrieval systems and appropriate IT skills, to produce written reports for assignments and laboratory exercises. Using appropriate numerical and mathematical skills to evaluate analytical data generated from laboratory exercises and 'dry lab' exercises
Autonomy, Accountability and Working with Others	**SCQF 9** Working effectively with others in laboratory environment and identifying and addressing individual/personal learning needs in the subject area associated with the module

Prerequisites	**Module Code** CHEM08004	**Module Title** Chemical Analysis and Evaluation
	Other Or, suitable appropriate background	
Co-requisites	**Module Code**	**Module Title**

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. This module covers a wide variety of theoretical, conceptual, and practical areas, which require a range of knowledge and skills to be displayed and exercised. Delivery of its syllabus content therefore involves a diversity of teaching and assessment methods suitable to the learning outcomes of the module; these include formal lectures, structured tutorials (work closely integrated with the lecture material), practical exercises to develop skills in the interpretation of spectroscopic information and in incident investigation, completion and submission of written coursework making use of appropriate forms of IT and VLE, and independent study	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	20
Tutorial / Synchronous Support Activity	8
Laboratory / Practical Demonstration / Workshop	20
Independent Study	152
Please select	
Please select	
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: D A Skoog, D A West, F J Holler and S R Crouch "Fundamentals of Analytical Chemistry" 9th Edition Robinson, J.W., Frame, E.M.S. and Frame, G.M. (2014) "Undergraduate instrumental anaysis" CRC Press NMR Self Learning Text, G. L. Patrick Lundanes, E., Reubaset, L. and Greibrokk, T. "Chromatography: basic principles, sample preparations and related methods" Wiley VCH Miller, J. N., and Miller, J. C., “Statistics and Chemometrics for Analytical Chemistry”, 5th Edition, Pearson Education Limited 2005
(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:** The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will login to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify the Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

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. Aligned with the University’s commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University’s policies and regulations.
(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	**Engineering Physical Sciences**

Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Physical Sciences
Moderator	Alastair Marr
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 and the Chartered Society of Forensic Sciences (CSFS) as part of the BSc (Hons) Forensic Science programme
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.21 Attendance and Engagement statements updated Equality statement updated

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen class test (50 %)
Assessment 2
Continuous assessment: laboratory work/reports and written tutorial work (50%)
Assessment 3
(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.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen class test	☒	☒	☒	☐	☐	50	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Workbook/Laboratory notebook/diary/training log/learning log	☒	☒	☒	☐	☐	50	36

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	38 hours

Change Control

What	**When**	**Who**
Attendance and engagement statements updated	March 2025	C. McHugh
Equality statement updated	March 205	C. McHugh