MODULE SPECIFICATION

Part 1: Information			
Module Title	Advanced Analytical Science		
Module Code	USSKBQ-30-3	Level	Level 6
For implementation from	2020-21		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Health & Applied Sciences	Field	Applied Sciences
Department	HAS Dept of Applied Sciences		
Module type:	Standard		
Pre-requisites	Instrumental Analytical Science 2020-21		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Overview: Pre-requisites: Students must have taken Instrumental Analytical Science USSKB9-15-2

Educational Aims: See Learning Outcomes

Outline Syllabus: Gas chromatography
Instrumental requirements for capillary GC. Sample injection using split, splitless and on-column methods-a critique of different approaches. "Dead-volume" requirements of the system. Backflushing column switching and 2-dimensional methods. Theory of chromatography. Retention factor, separation factor, phase ratio. Column efficiency and resolution. The Van Deemter equation.

High Performance Liquid Chromatography
A detailed consideration of instrumentation for HPLC. Comparison with technique and applications of GC, classical column liquid chromatography and TLC. Separation mechanisms especially bonded phase chromatography with octadecylsilyl columns. Gradient elution in HPLC; theory and instrumental requirements. Ion chromatography and ion-pair chromatography. Optimisation of HPLC mobile phase. Current research in the analysis of drugs.

Coupled Techniques

Coupled chromatographic and spectroscopic techniques (especially GC-MS and HPLC-MS). The electrospray and atmospheric chemical ionisation interfaces in LC-MS. Collision-induced ion decomposition.

Electrochemical Methods
New electrode materials eg chemically modified carbon electrodes, surface modification with immobilised enzymes. Amperometric sensors and biosensors. Applications in pharmaceutical, environmental and biomedical analysis. Effect of capacity current on sensitivity, normal and differential pulse polarography. Applications. Stripping voltammetry. Preconcentration of metals by amalgam formation and of organics by adsorption at electrode surfaces. Applications.

Spectroscopy
Aspects of atomic spectroscopy: scope and application of absorption, emission and mass spectrometry to Forensic and Pharmaceutical Science for the investigation of various evidence types e.g. glass, paint, soils and gunshot residues. The wider applications of these techniques in chemical analysis laboratories will also be considered.
NMR spectroscopy; principles of the technique and applications.

High Energy Techniques
X-Ray fluorescence and X-Ray Diffraction. Theoretical background. Generation of X-rays. Preparation of samples. Electron spectroscopy for chemical analysis (ESCA). Scanning electron microscopy, EDAX methods.

Teaching and Learning Methods: Scheduled Learning
Scheduled learning will include interactive lectures, problem-solving classes (for example in the interpretation of mass spectra and infra-red spectra) and practical classes. Practical classes will aim to emphasise the fundamental principles of various analytical techniques that are important in forensic science, and the effect of various instrumental parameters on the results.
Lectures will be supported by additional reading material posted on Blackboard and the use of handouts. Case studies will be used to introduce some procedures .

Independent Learning
Students will be expected to spend a significant amount of time in private study consulting relevant text books, journal articles and recommended web sites. The possibilities and limitations of internet site use will be emphasised. Independent study will make up the total number of hours of study for this module to the notional 300 hours.

Part 3: Assessment

Component A
Examination: 3 hours.
This online seen examination carried out over a 24 hour period will examine a broad area of the module material. The examination will consist of a mixture of calculation questions, essay-type questions and short answer questions. The paper will be formulated such that it is not possible for students to avoid completely a particular subject area of the module material. The duration of the examination will be 3 hours
Preparation for the exam will be encouraged by the provision of workshops and problem-solving classes, supported by material from Blackboard.

Component B.
This assessment will involve the submission of two detailed practical reports chosen from the suite of practicals that students will perform. Marks will be allocated for researching the background of the practical, for the experimental results obtained, for the discussion of these results, and for answering questions at the end of the report. Thus, a wide variety of different skills will be assessed.

All work is marked in line with the Department's Generic Assessment Criteria and will conform with university policies for the setting, collection, marking and return of student work. Assessments are described in the Module handbook that is supplied at the start of module and detailed marking schemes for elements of coursework, where appropriate, are provided in advance.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Report - Component B		40 %	Practical report
Examination (Online) - Component A	✓	60 %	Online examination (24 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Report - Component B		40 %	Practical report supported by questions from the practical sessions
Examination (Online) - Component A	✓	60 %	Online Examination (24 hours)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will achieve the following learning outcomes:

Module Learning Outcomes	**Reference**
Appreciate both the theoretical principles and applications of advanced analytical techniques.	MO1
Be familiar with the operation and uses of advanced equipment such as gas-chromatography/mass spectrometry.	MO2
Understand the use of sophisticated databases and library searching as performed in mass spectrometry.	MO3
Be prepared for a career if desired in analytical science in industry or in a research environment.	MO4
Have some appreciation of novel research methods (such as in sensors) in the analytical field and their potential impact in forensic science and related areas.	MO5
Compare and contrast different analytical approaches for the solution of a given analytical problem.	MO6

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	234
Total Independent Study Hours:	234
Scheduled Learning and Teaching Hours:	
Face-to-face learning	66
Total Scheduled Learning and Teaching Hours:	66
Hours to be allocated	300
Allocated Hours	300

Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/modules/usskbq-30-3.html

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Forensic Science [Sep][FT][Frenchay][3yrs] BSc (Hons) 2018-19 Forensic Science [Sep][FT][Frenchay][4yrs] MSci 2018-19