

Module Details	
Module Title:	Advanced Methods in Analytical Science
Module Code:	CFS7029-B
Academic Year:	2019-20
Credit Rating:	20
School:	School of Chemistry and Biosciences
Subject Area:	Chemistry
FHEQ Level:	FHEQ Level 7 (Masters)
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	24
Seminar	3
Laboratory	4
Directed Study	169

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

Module Aims
This module provides fundamental knowledge concerning strategies for sampling, data analysis, reporting, quality assurance and quality control, numerical, statistical, information technology, reporting and safety in relation to analytical science.

Outline Syllabus
Experimental design, sampling, sample preparation.
Calculations, dilutions, final concentrations from a given experimental method.

Health and Safety for chemical and biological samples (including human material). Reporting styles.

Method validation. International Council on Harmonisation (ICH) requirements. ISO. Selectivity/specificity, robustness, stability, precision, sensitivity, accuracy (SRMs). Quantification: External Standards, linearity. Internal Standards (quantification, drift). Blanks. Calibration curve uncertainty. LOD, LOQ, LOL: Dynamic Range.

Data analysis (Quality assurance and Quality control, Chemometrics). Selection of appropriate statistical methods. Numerical and IT skills. Descriptive methods. Frequency distributions. Cluster, trends, correlations. Multivariate analysis; Hierarchical, Principal Component Analysis. Outliers, Grubbs test.

Method Validation. Significance testing. Hypothesis testing. Samples and Populations. Confidence interval. T-test, F-tests, interpreting P values. Data presentation and visualisation.

Learning Outcomes

1	Critically understand experimental design; from selection, preparation, instrumental analysis of samples, to data analysis and reporting.
2	To select and use appropriate statistical and reporting methods.
3	Apply descriptive, significance testing and hypothesis testing statistical methods to analytical data and problems.
4	Critically analyse, interpret and apply method validation, quality assurance and quality control methods.
5	Critically review experimental data.
6	Apply advanced analytical and problem-solving skills.
7	Apply safety legislation and best practice with regards to chemical and biological samples.
8	Manipulate and present analytical data using numerical, statistical and IT skills.
9	Be familiar with different formats for reporting scientific methods and results (including group working).

Learning, Teaching and Assessment Strategy

This module will be presented as a series of lectures, structured workshop and laboratory sessions. Lectures will be used to introduce key principles and generic skills. These will be followed by laboratory and workshop sessions which will be used to develop case studies and apply problem solving skills.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Examination - closed book	A formal exam covering the whole	2 hours	50%

		syllabus. Short questions followed by longer essay type questions.		
Summative	Coursework	Problem solving exercises (2000 words equivalent)	-2000 words	50%

Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>.

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.