

Module Details	
Module Title	Advanced Methods in Analytical Science
Module Code	CFS7029-B
Academic Year	2020/1
Credits	20
School	School of Chemistry and Biosciences
Subject Area	Chemistry
FHEQ Level	FHEQ Level 7
Pre-requisites	N/A
Co-requisites	N/A

Contact Hours	
Type	Hours
Learning Objects Interaction	12
Online Tutorials (Synchronous)	3
Laboratories	4
Directed Study	169
Practical Classes or Workshops	12 (online workshops)

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1

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	
Outcome Number	Description
01	Critically understand experimental design; from selection, preparation, instrumental analysis of samples, to data analysis and reporting.
02	To select and use appropriate statistical and reporting methods.
03	Apply descriptive, significance testing and hypothesis testing statistical methods to analytical data and problems.
04	Critically analyse, interpret and apply method validation, quality assurance and quality control methods.
05	Critically review experimental data.
06	Apply advanced analytical and problem-solving skills.
07	Apply safety legislation and best practice with regards to chemical and biological samples.
08	Manipulate and present analytical data using numerical, statistical and IT skills.
09	Be familiar with different formats for reporting scientific methods and results (including group working).

Learning, Teaching and Assessment Strategy
The module uses a blended approach to support learning and achievement. Students will engage with a series of weekly online learning packages. These will include short videos that address key concepts, a set of structured activities (reading, online discussions etc.) that 'scaffold' the learning, and a range of formative tasks that generate feedback on progress. Online and on-campus practical sessions and workshops will provide opportunity to apply knowledge and gain experience with instrumentation. Online tutorials will also be used to support learning and monitor progress as students move through the curriculum.

Mode of Assessment				
Type	Method	Description	Length	Weighting
Summative	Examination - Open Book	A formal open book exam covering the taught syllabus. Short questions followed by longer essay type questions.	2 hour	50%
Summative	Coursework	Problem solving (2000 words equivalent)	N/A	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.

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