UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Nature of Matter and Instrumental Analysis
Module Code	ARC7045-B
Academic Year	2024/5
Credits	20
School	School of Archaeological and Forensic Sciences
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Tutorials	4
Practical Classes or Workshops	8
Directed Study	156
Lectures	32

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year

Module Aims

SEMESTER 1:- To develop critical awareness of the relationship between physical and chemical properties and their links to underlying atomic interactions. To provide insight into the relationships between macroscopic measurements and microscopic properties encountered in the archaeological sciences, with particular emphasis on the physical sciences. These insights will also aid the student's understanding of scientific techniques introduced in other modules.

SEMESTER 2:- This semester covers the fundamental physical and chemical principles of instrumental analytical techniques, the operational requirements and interpretative methods of the techniques of importance to archaeological and forensic science applications.

Outline Syllabus

SEMESTER 1:- Introduction. The scientific method. e.g. The structure of the atom. Atomic Structure. Nuclear chemistry. Stable Light isotopes. Electromagnetic Radiation: Waves / Particles? Calculations using waves. A more complicated atom: The quantum atom. Orbitals. Absorption and Emission
Spectra. Colour. Chemical Bonding. Introduction to Organic Chemistry: Nomenclature, Isomers. Introduction to Biochemistry. Lewis Structures and Organic Molecules. The Elements: The Periodic Table. Moles and Molarity, ppm/ppb. Magnetism. Environmental chemistry. Preservation in situ. Exam revision.

SEMESTER 2:- Principles of analytical sciences. Microscopy techniques and instruments. Vibrational spectroscopy including Infra-Red and Raman spectroscopy. Trace element techniques. X-ray techniques. Separation science techniques including gas chromatography and mass spectrometry. Isotope mass spectrometry. Data analysis.

Learning Outcomes

Outcome Number	Description
01	Master the understanding of the relationships between macroscopic measurements and microscopic properties.
02	They will have gained critical awareness of the relationship between physical and chemical properties and their link to underlying atomic interactions.
03	Review the principles, operational requirements and applications of a range of analytical techniques.
04	Evaluate and compare different instrumental methods in a research context.
05	Develop scientific thinking and improve confidence when dealing with scientific formulae and calculations.
06	Students will have gained knowledge of a variety of scientific concepts that they can apply to different areas of archaeological sciences.
07	Choose appropriate instrumental techniques and critically evaluate data within the disciplinary context.
08	Demonstrate acquired and refined analytical, numerical and problem solving skills. Display powers of logical reasoning and interpretation of scientific data used in publications.
09	Employ critical skills in analysis and synthesis.

Learning, Teaching and Assessment Strategy

Assessment of Semester 1 is by open book exam (2 hr). Supported by prior exam revision and advice session.

Assessment of Semester 2 is coursework which is a 2000 word critical analysis. Supported by 4 tutorials throughout semester 2. Opportunity for formative feedback. Feedback of assessed work is within 4 working weeks.

Assessment of semester 2 is by open book exam. Preparation is given in the tutorials for the assessment in Semester 3, which is a written proposal of 2000 words for analysis. Written feedback is given on the assessment. Feedback of assessed work within 4 working weeks: opportunity to consult marked work and discuss comments.

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Examination - Open Book	Midterm covering the taught syllabus in semester 1: Short questions followed by longer essay-type questions.	50%
Summative	Coursework - Written	Detailed proposal for critical analysis	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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