UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Materials Characterisation
Module Code	CFS7018-B
Academic Year	2024/5
Credits	20
School	School of Chemistry and Biosciences
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Practical Classes or Workshops	15
Interactive Learning Objects	15
Tutorials	3
Directed Study	164
Laboratories	3

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 2
BDB	University of Bradford / Semester 2

Module Aims

To introduce you to the methods used in modern analysis of macromolecules and non-polymeric materials. To study both the theory behind the full range of techniques as well as basic interpretation of the data. The course aims to provide a general understanding of techniques and will prepare you for advanced research or development of polymer systems in industry. Many chemists work in the analytical sciences in industry or government laboratories (e.g. in forensics, pathology or health and safety labs) and the characterisation of polymers and non-polymeric materials plays a crucial role for many of these areas.

Outline Syllabus
1. Size distributions 2. Materials in solution 3. Viscometric characterisation 4. Distinguishing molecular-particulate radii 5. Colligative properties and osmometry 6. Polymer NMR techniques and data interpretation 7. Mass spectrometry of materials 8. Size exclusion chromatography 9. Scattering and diffraction techniques 10. Mechanical analysis techniques 11. Thermal analysis techniques 12. Surface science/analysis techniques. 13. Spectroscopic ruler

Learning Outcomes	
Outcome Number	Description
01	Analyse molar mass distributions
02	Explore how chemical composition and shape are dispersed and how these factors can be overlayed with distributions in molar mass
03	Evaluate solution behaviour of materials
04	Critically examine how molar mass and shape affect solution viscosity, scattering behaviour and collegiative properties
05	Evaluate how NMR spectroscopy can be used to characterise materials
06	Critically evaluate the theory and application of size exclusion chromatography in the analysis of polymers
07	Evaluate how light, x-ray and neutron scattering can be used to study materials in the solid state and in dispersion
08	Evaluate how mechanical techniques can be used to study materials in the solid state
09	Evaluate the use of mass spectrometry for the analysis of materials
10	Converse using the language of the polymer science
11	Use specialist software packages and spreadsheets to analyse data
12	Critically assess the suitability of methodology choices in materials characterisation
13	Be competent at self-study, be able to quickly assimilate information, think across your own discipline and explore other fields

Learning, Teaching and Assessment Strategy

The module uses a blended approach to support learning and achievement. Students will engage with a series of 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. On-campus lectures, practical sessions and workshops will provide opportunities to apply knowledge and gain experience with techniques. Tutorials will also be used to support learning and monitor progress as students move through the curriculum.

Throughout this module we will look at the impact of molecular-particulate size and how it affects its material properties and choice of analytical techniques. Parallel to this, we will study techniques that examine physical, chemical and mechanical material properties. This will lead to a study of distributions and dispersity in polymers, including dispersity in molar mass composition and shape.

We will build on your earlier studies on the solution behaviour of materials, which forms the basis of many of the characterisation techniques that are in use. We then move onto study the various techniques for providing molar mass, shape and chemical composition, as well as various surface science/analysis tools.

Directed study provides you with the opportunity to undertake guided reading and to develop your own portfolio of learning to enhance transferable skills and knowledge relating to the evaluation of your own role and subject provision.

It is a requirement of the Institution of Engineering and Technology (IET) that students MUST achieve a mark of at least 30% in assessment components weighted above 30% IN ADDITION to achieving a mark of at least 40% in the module overall. This requirement applies ONLY to students on IET accredited programmes, which is the BDA occurrence/version of the module.

Assessments will involve a summative online closed-book examination and a number of assessed workshops involving discussions and problem-solving exercises.

Assessment 1: Problem-solving workshops based on lecture material.

Assessment 2: Summative examination in May to cover the whole module.

It is a requirement of the Institution of Engineering and Technology (IET) that students MUST achieve a mark of at least 30% in BOTH of these assessments, IN ADDITION to achieving a mark of at least 40% in the module overall. [Note: this requirement applies ONLY to students on IET-accredited programmes (MSc Advanced Biomedical Engineering.]

Mode of Assessment

Type	Method	Description	Weighting
Summative	Coursework - Written	Problem based workshop	40%
Summative	Examination - Closed Book	Summative assessment: closed book exam (2 Hrs)	60%

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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