UNIVERSITY of BRADFORD

Module Descriptor

Introduction to Polymer and Colloid Science

Module Code:	CFS6015-B
Academic Year:	2018-19
Credit Rating:	20
School:	School of Chemistry and Biosciences
Subject Area:	Chemistry and Forensic Science (ceases 2016)
FHEQ Level:	FHEQ Level 6

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	34
Tutorials	2
Directed Study	164

Availability Periods

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

Module Aims

This module will introduce you to the Chemistry and Physics of polymers and colloids. No previous knowledge of Polymer Science is assumed but a good background in organic and physical chemistry or chemical engineering is essential. The purpose of the module is to provide students with a good background with structures and principles required to both synthesise and understand the properties of polymers and colloids. The module will prepare you for either advanced studies in the area or will give you the essential concepts required to work in this important industrial area.

Outline Syllabus

1. Fundamentals of colloid science; interfaces and the colloidal state
2. Surface energy
3. Surfactants and interfacial agents
4. Structure, architecture, nomenclature and classification of polymers
5. Mechanisms of Polymerisation: chain growth and step growth
6. Kinetics of polymerisation: chain growth and step growth
7. Structure and polymerisability
8. Industrial synthesis of polymers: bulk, solution, emulsion and other dispersion methods
9. Molar mass and its distribution
10. The solid state
11. The solution state
12. Size exclusion chromatography

Module Learning Outcomes

On successful completion of this module, students will be able to...

1	Understand and evaluate the colloidal state of materials and describe mechanism for providing colloidal stability.
10	Have an understanding of the descriptions of molar mass distributions; understand how these distributions can be predicted from the various techniques.
11	Understand the crystalline, semi-crystalline & amorphous states of solid polymers; including the melt and glass transition temperatures.
12	Fully understand the Flory Huggins treatment of polymer solutions. Introduction to size exclusion chromatography.
13	Converse using the language of the polymer sciences and be able to communicate with chemists, physicists and engineers using the appropriate concepts.
14	Be competent at self study and be able to quickly assimilate information.
15	Be able to think across your own discipline and explore other fields.
2	Evaluate the energies of interfaces-Youngs equation. Examine how surface energy arises from a molecular perspective.
3	Present accurate drawings of polymers using the full range of representation methods of use to chemists and physicists.
4	Be fully aware of the languages of polymer science including both IUPAC recommendations and other language in common use.
5	Classify polymerisation methods
6	Rationalise the mechanisms that produce polymers by radical, anionic, cationic and step growth polymerisation and be able to predict the structures of monomers suitable for each process.
7	Describe and understand the kinetics of radical polymerisation.
8	Have a basic understanding of insertion & ring opening polymerisations.
9	Describe and understand industrial polymerisation methods.

Learning, Teaching and Assessment Strategy

Lectures will deliver core content; providing you with the opportunity to acquire the information to enhance your knowledge and understanding of the basic undergraduate aspects of polymer science. This will be complemented by seminars, group discussions and tutorials to allow you to apply this learning to specific exemplar problems.

You will study the major classes of both synthetic and natural polymers and colloids and learn how to specifically describe their structure. We will then turn our attention to the synthesis of synthetic polymers and we will illustrate both chemically and mathematically how the various techniques lead to different types of polymer. Our studies will extend into examining the structural factors that dictate if monomers can be polymerised and the concepts of copolymerisation. Industrial methods of carrying out polymerisations will then be described. Molar mass and the distributions of molar mass will be studied and we will show how various synthetic methods produce different molar mass distributions.

In the second half of this module we study the physical chemistry of polymers and concepts discussed here are equally important in other areas of macromolecular science; eg proteins and nucleic acid behaviour. We will discuss the solid state including important concepts for both crystalline and amorphous polymers. We will then study the solution state; both developing theory and showing how these concepts lead to useful characterisation methods.

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 evaluation of own role and subject provision.

The VLE will be used to provide access to online resources, lecture notes and external links to websites of interest.

Assessment 1: Workshops covering examples of key calculations
Assessment 2: Summative examination in May to cover the whole module.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Examination - closed book	Closed book exam	2 hours	70%	Yes
Summative	Coursework	Worksheets on calculation	-2000 words	30%	No

Legacy Code (if applicable)

CT-3510D

Reading List

To view Reading List, please go to **rebus:list**.