PRIFYSGOL glyndŵr UNIVERSITY

MODULE SPECIFICATION FORM

Module Title: **Polymer Characterisation / Application Case Study**	Level: 7	Credit Value: 20

Module code: SCI715	Cost Centre: GAWS	JACS3.0 code: J410

Trimester(s) in which to be offered: 2	With effect from: September 2013

Office use only: To be completed by AQSU:	Date approved: September 2013 Date revised: - Version no: 1

Existing/New: New	Title of module being replaced (if any): N/A

Originating Academic Department: Chemistry	Module Leader: Dr. Ian Ratcliffe

Module duration (total hours): 200 hrs Scheduled learning & teaching hours 42 hrs Independent study hours 158 hrs	Status: core/option/elective (identify programme where appropriate): Core

Programme(s) in which to be offered: MSc Polymer and Biopolymer Science	Pre-requisites per programme (between levels): None

Module Aims:

This module concerns the application of knowledge of polymer and colloid chemistry acquired in *Structure and Function of Industrial Biopolymers*, *Chemistry and Technology of Water Soluble Polymers* and *Formulation Science* modules to real life polymer characterisation scenarios.

The specific aims of the module are to:

- train students in assessing a complex polymer/biopolymer characterisation challenge
- develop students' ability to devise appropriate step-wise analytical strategies.
- introduce to the student an investigative approach which relies upon use of published literature, electronic resources and discussion with peers.

Expected Learning Outcomes:

At the end of this module, students will be able to:

Knowledge and Understanding:

1. Resolve a complex polymer/biopolymer characterisation problem by identification of the key polymer and colloid chemistry at work.
2. Identify typical challenges faced by polymer/biopolymer scientists on a daily basis and suggest plausible strategies to overcome them.
3. Understand the role of the polymer/biopolymer analyst in the development, scale up, manufacture and QC testing of polymer/biopolymer products.
4. Amend – with sound reasoning – polymer/biopolymer characterisation strategies developed in a discrete market sector e.g. foods to an apparently unrelated sector e.g. metal coatings.

Transferable/Key Skills:

Exhibit trouble shooting and problem solving skills, team working and workplace communication, patent and literature searching.

Assessment: please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%). ***Details of indicative assessment tasks must be included.***

Assessment of the learning outcomes will be by means of:

Assessment (1) an essay based upon critical review of appropriate scientific literature and Assessment (2) a report based upon an actual polymer/biopolymer characterisation challenge originating from industry.

The essay entails illustrating the importance of a chosen biopolymer characterisation technique in an applied context, citing examples from a diverse range of industrial sectors.

For the report the student will write an account comprising critical assessment of the chosen polymer/biopolymer characterisation problem and a well-reasoned strategy for solving it. The account must cite appropriate and adequate evidence drawn from course material and independent review of pertinent journal articles and patents.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting	Duration (if exam)	Word count (or equivalent if appropriate)
1	4	Essay	30%	N/A	1500
2	1 – 3	Report	70%	N/A	3000

Learning and Teaching Strategies:

This is one of two parallel 'case study' modules in the Formulation Science / Polymer and Biopolymer Science programme and where appropriate certain delivery may be shared with the Formulation Science Case Study module.

This module commences with a number of illustrative lectures given by programme team members and visiting industrialists, and videos. A tutor-led discussion session held after each lecture will facilitate group reflection, and reinforcement of the key points raised and gives the students familiarity with verbally communicating technical information in a mixed group.

Students are further able to develop their knowledge and understanding by reading additional course material and attempting problem sets and quizzes on Moodle VLE. Independent student-directed learning enables students to further explore the subject material, enhancing their learning, while developing their IT skills.

Syllabus outline:

Through a varied programme the following themes will be explored:

1. Commercial sources of biopolymers
2. Extraction / separation strategies for complex polymer and biopolymer samples
3. Purification and preservation techniques
4. Method development in analytical techniques
5. Innovative approaches to polymer and biopolymer analysis
6. Manufacturing with polymers and biopolymers
7. Standard operating procedures
8. Quality control and documentation

Bibliography:

Essential reading:

KASAPIS, S., NORTON, I.T. and UBBINK, J.B. (eds.) (2009) *Modern Biopolymer Science: Bridging the Divide between Fundamental Treatise and Industrial Application*. London: Academic Press.

PODZIMEK, S. (2011) *Light Scattering, Size Exclusion Chromatography and Asymmetric Flow Field Flow Fractionation: Powerful Tools for the Characterisation of Polymers, Proteins and Nanoparticles*. Hoboken: John Wiley and Sons Inc.

WILLIAMS, P.A. (ed.) (2007) *Handbook of Industrial Water Soluble Polymers*. Oxford: Blackwell Publishing Ltd.

Other indicative reading:

CLAVIER, R. (2008) *Characterisation and Analysis of Polymers*. Hoboken: John Wiley and Sons Inc.

ENDRES, H.J. and SIEBERT-RATHS, A. (2011) *Engineering Biopolymers: Markets, Manufacturing, Properties and Applications*. Munich: Carl Hanser Verlag GmbH & Co.

GALAEV, I and MATTIASSON,B. (Eds.) (2007) *Smart Polymers: Applications in Biotechnology and Biomedicine* (2nd Ed.) Boca Raton: CRC Press.

SHARMA, S.K. and MUDHOO, A. (2011) *A Handbook of Applied Biopolymer Technology: Synthesis, Degradation and Application*. Cambridge: Royal Society of Chemistry.

WILLIAMS, P.A. (Ed.) (2011) Renewable Resources for Functional Polymers and Biomaterials: Polysaccharides, Proteins and Polyesters. Cambridge: Royal Society of Chemistry.

Online resources:

Biomacromolecules – ACS
Industrial Crops and Products – Elsevier
International Journal of Polymer Analysis and Characterisation – Taylor and Francis
Macromolecules – ACS
Progress in Polymer Science - Elsevier