PRIFYSGOL glyndŵr UNIVERSITY

MODULE SPECIFICATION FORM

Module Title: **Polymer Chemistry and Formulations**	Level: 6	Credit Value: 20

Module code: SCI614	Cost Centre: GAFS	JACS3 code: F100

Trimester(s) in which to be offered: 1	With effect from: September 2016

Office use only: To be completed by AQSU:	Date approved: July 2014 Date revised: July 2016 (updated to include BSc Chemistry with Education) Version no: 2

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

Originating School:	Applied Science, Computing & Engineering	Module Leader:	Dr Ian Ratcliffe

Module duration (total hours): Scheduled learning & teaching hours Independent study hours	200 50 150	Status: core/option/elective (identify programme where appropriate): Core

Programme(s) in which to be offered: BSc (Hons) Chemistry with Green Nanotechnology BSc (Hons) Chemistry with Education	Pre-requisites per programme (between levels): None

Module Aims:

The module will develop students' existing understanding of materials chemistry to include polymeric systems.
Students will explore the range of chemistry comprising both natural and synthetic polymers and interpret polymer solution behaviour by consideration of polymer physics.
Through consideration of case studies the students will develop a working knowledge of the importance of polymer molecular weight and functionality in determining performance in typical formulated products.
The practical component reinforces the taught content whilst developing students' abilities in data collection and analysis and presentation of experimental data in the context of existing subject-specific literature.

Intended Learning Outcomes:

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

1. Predict the behaviour of a given polymer in solution by consideration of its structure and functionality.
2. Predict compatibility of a given polymer with other components in a formulation, and discuss the molecular basis for such.
3. Critically review model or real formulations and make well-grounded recommendations for improvement in performance. (KS3)
4. Assess the benefit of computer modelling or computer assisted formulation to solving a formulation problem. (KS4)
5. Critically interpret polymer chemistry articles in peer reviewed publications.(KS6)
6. Design and execute investigative experiments in polymer / formulation science and critically appraise results in the context of existing published literature. (KS3)

Key skills for employability

1. Written, oral and media communication skills
2. Leadership, team working and networking skills
3. Opportunity, creativity and problem solving skills
4. Information technology skills and digital literacy
5. Information management skills
6. Research skills
7. Intercultural and sustainability skills
8. Career management skills
9. Learning to learn (managing personal and professional development, self management)
10. Numeracy

Assessment:

Assessment 1. The student presents a case history of a real life formulation problem and by reference to appropriate published literature proposes a plausible strategy for remediation of the problem.

Assessment 2. The student prepares a report detailing an experimental investigation, for example the characterisation of a polymer or its solution properties and critically appraises the results in the context of published literature.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting	Duration (if exam)	Word count (or equivalent if appropriate)
1	1-4	Unseen Examination	50%	-	2 hrs
2	5-6	Report	50%	-	2,000

Learning and Teaching Strategies:

Core theoretical knowledge will be presented by means of lectures, each with associated directed study. Formative assessment will be used at key points in the programme to assist students in the process of monitoring their progress against ILOs. Timetabled seminars will be a significant feature of the module, in which case histories / research articles will be considered and discussed. Programme team members / visitors will introduce students by demonstration to key experimental techniques, to include their exploitation in this field of study and interpretation of results.

Syllabus outline:

- Review / revision of prior knowledge of polymer science
- Topics in polymer physics: ideal and real chains; solution thermodynamics; networks and gelation, polymer dynamics
- Influence of polymer molar mass distribution on performance properties
- Polymer Characterisation techniques
- Polymer Structure – Function relationships
- Overview of major formulation types
- Roles of polymers in formulations
- Troubleshooting formulation problems
- The role of Quality Control in formulation
- Innovation in formulation - new solutions to old problems
- Modelling and Computer-assisted formulation

Bibliography:

Essential reading:

Young, R.J and Lovell, P.A. (2011) *Introduction to Polymers*, 3rd Ed. Boca Raton, FL.: CRC press.

Hargreaves, A.E. (2003) *Chemical Formulation: An Overview of Surfactant Based Chemical Preparations Used in Everyday Life*. Cambridge: The Royal Society of Chemistry.

Other indicative reading:

Rubinstein, M. and Colby, R.H. (2003) Polymer Physics. Oxford: Oxford University Press.

Aulton, M.E. (Author); Taylor, K.M.G. (Ed.) (2007) '*Aulton's Pharmaceutics: The Design and Manufacture of Medicines' (3rd ed.* Oxford*:* Churchill Livingstone – Elsevier.

Coultate, T.P. (2008) '*Food - The Chemistry of its Components'* 5th Edition. Cambridge: The Royal Society of Chemistry.

Tadros, T.F. (2009) *Emulsion Science and Technology*. Weinheim: Wiley-VCH Verlag GmbH & Co.

Online resources:
Journal of Food Engineering Elsevier - online access via Science Direct
Food Research International – Elsevier - online access via Science Direct
Pharmaceutical Research - Springer
International Journal of Pharmaceutics – Elsevier - online access via Science Direct
International Journal of Cosmetic Science - Wiley
European Journal of Pharmaceutics and Biopharmaceutics - Elsevier – online access via Science Direct
Journal of Coatings Technology and Research - Springer