MODULE SPECIFICATION PROFORMA

Module Code:	SCI627

Module Title:	Polymer Chemistry and Formulations

Level:	6	**Credit Value:**	20

Cost Centre(s):	GAFS	JACS3 **code**:	F100

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

Scheduled learning and teaching hours	36 hrs
Guided independent study	164 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
BSc (Hons) Chemistry	✓	☐

Pre-requisites
None

Office use only
Initial approval: **Mar 18 – validation of BSc Chemistry** **Version no: 1**
With effect from: **Sept 18**
Date and details of revision: **Version no:**

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

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

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

Transferable skills and other attributes

Derogations

N/A

Assessment:

Indicative Assessment Tasks:

Assessment 1. Unseen examination

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	1,2,3,4	Examination	50	2 hrs	
2	5,6	Report	50		2000

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

Indicative 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. and Taylor, K.M.G. (eds). (2017), *Aulton's Pharmaceutics: The Design and Manufacture of Medicines*. 5th ed. Amsterdam: Elsevier.

Coultate, T.P. (2016), *Food – The Chemistry of its Components*. 6th ed. Cambridge: The Royal Society of Chemistry.

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

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
European Journal of Pharmaceutics and Biopharmaceutics - Elsevier – online access via Science Direct