

**MODULE SPECIFICATION FORM**

Module Title: <b>Product Formulation Case Study</b>	Level: 7	Credit Value: 20
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Module code: SCI716	Cost Centre: GAWS	JACS3.0 code: F111
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Trimester(s) in which to be offered: 2	With effect from: September 2013
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<b>Office use only:</b> To be completed by AQSU:	Date approved: September 2013 Date revised: - Version no: 1
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Existing/New: New	Title of module being replaced (if any):
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Originating Academic Department: Chemistry	Module Leader: Ian Ratcliffe
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Module duration (total hours): 200 hrs Scheduled learning & teaching hours: 42 hrs Independent study hours: 158 hrs	Status: core/option/elective Core (identify programme where appropriate):
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Programme(s) in which to be offered: MSc Formulation Science	Pre-requisites per programme (between levels): None
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**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 formulation scenarios.

The specific aims of the module are to:

- train the students in the processes necessary to critically assess complex industrial

formulation problems.

- enhance students ability to conceive plausible solutions to formulation problems.
- explore the wider issues of successful teamwork in a manufacturing environment.

### **Expected Learning Outcomes:**

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

Knowledge and Understanding:

1. Resolve a complex formulation problem by identification of the key polymer and colloid chemistry underpinning the formulation.
2. Identify typical challenges faced by formulation scientists on a daily basis and suggest plausible strategies to overcome them.
3. Understand the role of the formulator in the development, scale up, manufacture and QC testing of formulated products.
4. Define the role played by the formulator in a team in relation to individuals representing marketing, finance, process engineers, production managers etc
5. Apply formulation knowledge gained 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 is designed to simulate the experience faced by a formulation chemist when called to solve a formulation problem in a typical research and development or manufacturing scenario. The assessment comprises:

Assessment (1):

Following a role-playing exercise enacting a typical scenario of an unfolding formulation problem on a manufacturing plant, the student will write an account summarising the diverse motives of different team members and how this may affect the ability of the formulator to undertake his job.

Assessment (2):

Presented with an actual formulation challenge originating from industry, the student will write a report comprising critical assessment of the 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	2 - 4	Simulation	30%	N/A	1500
2	1,2,3,5	Report	70%	N/A	2500

### 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 Polymer Characterisation 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. Recognising old problems in new formulations
2. Analytical techniques for characterising formulation problems
3. innovative approaches to problem solving
4. manufacturing at scale
5. performing well in a team
6. quality control and documentation
7. recycling, reworking and disposal
8. ingredient substitution
9. sector specific issues
10. constraints on formulation

### Bibliography:

#### Essential reading:

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

CLARKE, C. (2012). *The Science of Ice Cream*. 2<sup>nd</sup> ed. Cambridge: The Royal Society of Chemistry.

BECKETT, S.T. (2008). *The Science of Chocolate*. 2<sup>nd</sup> ed. Cambridge: The Royal Society of Chemistry.

KIRK, R.E. and OTHMER, F. (eds.) (2013). *Kirk-Othmer Chemical Technology of Cosmetics* 2013. Hoboken, New Jersey: John Wiley and Sons Inc.

**Other indicative reading:**

COULTATE, T.P. (2009). *Food: The Chemistry of Its Components*. 5<sup>th</sup> ed. Cambridge: The Royal Society of Chemistry.

FLICK, E.W. (2001). *Cosmetic and Toiletry Formulations: v. 8 (Cosmetic & Toiletry Formulations)*. 2<sup>nd</sup> ed. Norwich, New York: William Andrew Publishing.

STEEN, D. and ASHURST, P.R. (Eds.) (2006). *Carbonated Soft Drinks: Formulation and Manufacture* Oxford: Blackwell Publishing.

**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

<http://chemistscorner.com/>

Formulatory - A Forum for Formulation Professionals:

<http://www.linkedin.com/groups/Formulatory-Forum-Formulation-Professionals-2411840>

<http://www.intelligentformulation.org/>