

**University of the West of Scotland
Module Descriptor**

Session: 2022/23

Title of Module: Sustainable & Resource-efficient formulation			
Code: CHEM11014	SCQF Level: 11 (Scottish Credit and Qualifications Framework)	Credit Points: 20	ECTS: 10 (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Roderick A Williams		
Summary of Module			
<p>In this module, students will be provided with an insight on how human activities and emerging pollutants such as pharmaceuticals and personal care products (PPCPs) products, heavy and rare earth metals and persistent organic pollutants (POPs) have depleted the earth's natural resources and altered microbial biological processes respectively causing poor health and food insecurities. A case will be made for the need to develop innovative biotechnological sustainable microbial formulations to mitigate these negative effects. Students will be equipped with current knowledge on biotechnological microbial formulations techniques used to recover and recycle scarce non-replenishable resources or convert wastes and into new products within a circular economic. The module will provide students with a sound scientific, theoretical and practical knowledge that underpin the science of microbial formulation which will enable them to confidently and critically evaluate the advantages, disadvantages and ethical issues of microbial formulations as a sustainable biotechnological solution. This module responds in part, to the growing need for personnel in academia and industry who are skilled in the science of formulation.</p> <p>The module will be delivered as lectures, tutorials, student-led and team-based workshops. Case studies, including 'real world' data from industrial contacts and on on-going environmental projects will enable students to demonstrate problem solving and analytical skills. This module offers students with interest in areas such as environmental, medical, food and industrial biotechnology the opportunity to expand their current knowledge on microbial metabolism, hypothesise future areas of research and develop innovative methodology based upon the current "state of the art".</p> <ul style="list-style-type: none"> The graduate attributes relevant to this module are given below: Academic: Critical thinker, analytical, enquiring, knowledgeable, digitally literate, problem solver, autonomous, incisive, innovative Personal: Effective communicator, influential, motivated, team player Professional: Collaborative, research-minded, enterprising, ambitious, driven 			

Module Delivery Method					
Face-To-Face	Blended	Fully Online	HybridC	HybridO	Work-based Learning
✓					
<p>Face-To-Face Term used to describe the traditional classroom environment where the students and the lecturer meet synchronously in the same room for the whole provision.</p>					

Blended

A mode of delivery of a module or a programme that involves online and face-to-face delivery of learning, teaching and assessment activities, student support and feedback. A programme may be considered "blended" if it includes a combination of face-to-face, online and blended modules. If an online programme has any compulsory face-to-face and campus elements it must be described as blended with clearly articulated delivery information to manage student expectations

Fully Online

Instruction that is solely delivered by web-based or internet-based technologies. This term is used to describe the previously used terms distance learning and e learning.

HybridC

Online with mandatory face-to-face learning on Campus

HybridO

Online with optional face-to-face learning on Campus

Work-based Learning

Learning activities where the main location for the learning experience is in the workplace.

Campus(es) for Module Delivery

The module will **normally** be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit)

Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
✓						

Term(s) for Module Delivery

(Provided viable student numbers permit).

Term 1		Term 2		Term 3	
	✓		✓		

Learning Outcomes: (maximum of 5 statements)

On successful completion of this module the student will be able to:

- L1. Critically evaluate the principal effects of the impact of man's activities in the biosphere, knowledge of current approaches for identifying environmentally relevant problems and appreciate the need for a sustainable use and recovery of the resources of the biosphere.
- L2. Demonstrate critical understanding on the selection and development of appropriate biotechnological tools for tackling environmental the problem of emerging contaminants in a green, affordable, safe and sustainable manner
- L3. Evaluate, develop and critique current methodologies used in microbial-based biotechnology and where appropriate, propose new ones.
- L4. Apply knowledge to complex issues when utilizing the principles of environmental management systems and auditing techniques

Employability Skills and Personal Development Planning (PDP) Skills**SCQF Headings**

During completion of this module, there will be an opportunity to achieve core skills in:

<p>Knowledge and Understanding (K and U)</p>	<p>SCQF Level 11.</p> <p>Reasoned and rigorously argued explanation of the drivers for innovations in microbial formulation technologies.</p> <p>Detailed explanation of the principles of concept development of microbial formulation for a wide range of industry and utility sectors.</p> <p>Reasoned and rigorously argued explanation of current practice and the potential for future innovation in microbial formulation technology over a range of common industrial and utility sectors.</p>
<p>Practice: Applied Knowledge and Understanding</p>	<p>SCQF Level 11.</p> <p>Apply the knowledge of microbial physiology and ecology to the principles and design of formulation for providing solutions to real-world problems and the exploitation of entrepreneurial and socially beneficial opportunities.</p> <p>Synthesise information and gain a coherent understanding of principles and practices in framing a biotechnological solution to an environmental problem or opportunity.</p>
<p>Generic Cognitive skills</p>	<p>SCQF Level 11.</p> <p>Effectively conceive, plan and execute a programme of design for a sustainable and resource-efficient microbial product formulation</p> <p>Seek, acquire and synthesise relevant information of microbial physiology, biology and ecology from the primary technical literature in support of the development of a microbial formulation technology and application.</p>
<p>Communication, ICT and Numeracy Skills</p>	<p>SCQF Level 11.</p> <p>Effectively communicate the results of technically complex design and engineering applications to audiences of diverse technical levels as appropriate to the professional setting, using a range of oral, written and graphical media.</p> <p>Comprehend and apply relevant mathematical principles and software systems to the conception, design and development of clean technology applications.</p>
<p>Autonomy, Accountability and Working with others</p>	<p>SCQF Level 11.</p> <p>Work co-operatively as part of a professional team to analyse information, formulate a solution and present it to stake-holders, superiors and the wider population.</p> <p>In both leadership and team-member roles, apply skills in motivation, conflict resolution, mutual respect and collegiate decision-making.</p> <p>Work independently towards a set goal in a timely and efficient manner.</p> <p>Apply safe working practices in the context of appropriately-formulated risk assessment.</p>
<p>Pre-requisites:</p>	<p>Before undertaking this module the student should have undertaken the following:</p>

	Module Code:	Module Title:
	Other:	
Co-requisites	Module Code:	Module Title:

* Indicates that module descriptor is not published.

Learning and Teaching	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	36
Tutorial/Synchronous Support Activity	38
Independent Study	126
	200 Hours Total
**Indicative Resources: (eg. Core text, journals, internet access)	
<p>The following materials form essential underpinning for the module content and ultimately for the learning outcomes:</p> <p>Formulation of Microbial Biopesticides -Beneficial microorganisms, nematodes and seed treatments; Edited by Burges, H.D.; Publishers: Springer Science and Business Media, B.V.</p> <p>Fungi in Bioremediation, edited by Geoffrey M. Gadd; Publisher: Cambridge University Press</p> <p>Formulation of Microbial Biopesticides: Beneficial Microorganisms, Nematodes and Seed Treatments)edited by Denis H. Burges: Publisher:Springer. ISBN-10: 0412625202</p> <p>(**N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)</p>	
Engagement Requirements	
<p>Students are academically engaged if they are regularly engaged with timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time. Please refer to the Academic Engagement and Attendance Procedure at the following link: Academic Engagement and Attendance Procedure</p>	

Supplemental Information

Programme Board	Physical Sciences
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Assessment Results (Pass/Fail)	No
Subject Panel	Physical Sciences
Moderator	Dr Richard Thacker
External Examiner	
Accreditation Details	
Changes/Version Number	1.07 None

Assessment: (also refer to Assessment Outcomes Grids below)
Exam 50%
Written Coursework 50%
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Handbook.)

Assessment Outcome Grids (Footnote A.)

Component 1						
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Unseen closed book (standard)			✓	✓	50	2
Component 2						
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Case study	✓				10	0

Review/ Article/ Critique/ Paper		✓	✓		20	0
Presentation				✓	20	4
Combined Total For All Components					100%	6 hours

Footnotes

A. Referred to within Assessment Section above

B. Identified in the Learning Outcome Section above

Note(s):

1. More than one assessment method can be used to assess individual learning outcomes.
2. Schools are responsible for determining student contact hours. Please refer to University Policy on contact hours (extract contained within section 10 of the Module Descriptor guidance note).
This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

Equality and Diversity

This module is appropriate for any student. In order for the student to complete this module all case study exercises and delivery of seminars will be required to be undertaken. Students with a physical disability can be accommodated with the assistance of a “buddy” or a helper.
[UWS Equality and Diversity Policy](#)

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)