Module Descriptor

Title	Biochemical and Environmental Engineering		
Session	2025/26	**Status**	Published
Code	ENGG09053	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	C Rodriguez		

Summary of Module

The module brings together the scientific principles of several disciplines for the development of various applications in biochemical and environmental processes. The module discusses basic biochemical engineering concepts such as the biological definition of cells and enzymes; types of cells and enzymes; enzyme kinetics; microbial growth; and introduction to bioreactors and their industrial applications.

The module enables the students to acquire basic knowledge about biocatalysts, whether they are enzymes or cells, their manipulation and their applications in the different industrial applications and the potential that future research can bring in these sectors and their different fields of applications. The module also addresses environmental problems, covering pollution in its different forms and the theoretical and practical knowledge of environmental pollution of anthropogenic origin. This module provides the students with the skills to address environmental issues from a chemical engineering point of view using process engineering to deal with the resulting problems with the purpose of using best technology available for emissions minimisation and abatement. The module shows how chemical engineering interfaces with other engineering disciplines on multiple chemical, physical and biochemical processes. The module will allow students to adopt a holistic approach on biochemical and environmental processes including the commercial, social and economic context as well as be aware of the legal and industry standards. The module also apply an engineering management approach recognising the importance of an inclusive approach to engineering practice.

The module will build on students' prior knowledge of unit operations, reaction engineering and biotechnology to enable them to choose and design systems and processes for emissions minimisation and treatment.

Module Delivery Method	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☐	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☒	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Understand the basic concepts of biochemical and environmental engineering and its components.
L2	Develop the skills to differentiate between the diverse types of biochemical operations available and make the proper choices regarding the type of equipment to use for each type of operation.
L3	Develop critical understanding of sustainability, preservation of resources, minimisation of waste, greenhouse effect, the use of clean technology and the importance of green processing.
L4	Understand safety and environmental impacts and ethical considerations of bioprocessing.
L5	Characterisation, management and treatment of waste in a wide range of geographical and socioeconomic environments.

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:**
Knowledge and Understanding (K and U)	**SCQF 9** Demonstrating a broad and integrated knowledge and understanding of the main areas of environmental pollution, waste and biochemical processes. Demonstrating a critical understanding of a selection of the principal theories, principles, concepts and terminology.

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Practice: Applied Knowledge and Understanding	**SCQF 9** Use a selection of the principal skills, techniques, practices and/or materials associated with industrial application of environmental and biochemical engineering. Practice routine searches for data on pollutants, waste and biocatalysts.
Generic Cognitive skills	**SCQF 9** Be able to critically evaluate and analysis worked problems and their suggested solutions and compare them with experimental and measured values.
Communication, ICT and Numeracy Skills	**SCQF 9** Use a range of IT applications to facilitate calculations and provision of report and presentations. Interpret, use and evaluate numerical and graphical data to aid sizing and design of equipment. Make formal presentations on research finding to an audience of peers.
Autonomy, Accountability and Working with Others	**SCQF 9** Take some responsibility for use of appropriate data resources Practice in ways which take account of own role and responsibilities Work under guidance with qualified practitioners. Undertake critical analysis, evaluation and synthesis of ideas, concepts, information and issues in the discipline.

Prerequisites	**Module Code** ENGG08022	**Module Title** Chemical Engineering Fundamentals
	Other Any other suitable prior learning.	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours. The learning and teaching for this module comprises a series of lectures and tutorials.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	18
Tutorial / Synchronous Support Activity	18
Independent Study	164
n/a	0
n/a	0
n/a	0

TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: Michael L. Shuler, Fikret Kargi, Matthew DeLisa (2017) Bioprocess engineering: basic concepts. Boston : Prentice Hall, 3rd ed. Hill, Charles G., Root, Thatcher W. (2014) An introduction to chemical engineering kinetics & reactor design. Hoboken, N.J. : John Wiley, 2nd ed. Mackenzie L. Davis, David A. Cornwell (2023) Introduction to environmental engineering. New York, NY : McGraw Hill LLC, 6th ed.
(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)

Attendance and Engagement Requirements
In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time. **For the purposes of this module, academic engagement equates to the following:** The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will login to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify the Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

Equality and Diversity
The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code. Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. Specialist assistive equipment, support provision and adjustment to assessment practice in accordance with the University's policies and regulations.
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**

Module Eligible for Compensation	☒ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Design
Moderator	A Durrant
External Examiner	P Weston
Accreditation Details	This module is part of the BEng(Hons) Chemical Engineering programme accredited by the IChemE.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	V2.1 Updated Indicatives Resources, Attendance and Engagement Procedure, Equality and Diversity, and Assessment sections.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class test Term 1 worth 35%.
Assessment 2
Class test Term 2 worth 35%.
Assessment 3
Coursework: Essay (15%): LO1, LO3, LO5 Design report (15%): LO1, LO2, LO4
(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 Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen closed book class test	☒	☒	☐	☒	☐	35	1

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen closed book class test	☒	☐	☒	☐	☐	35	1

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☒	☒	☒	☒	☐	30	0
Combined total for all components						100%	2 hours

Change Control

What	When	Who
Updated Indicatives Resources, Attendance and Engagement Procedure, Equality and Diversity, and Assessment sections.	March 2025	Cristina Rodriguez