University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Biochemical and Environmental Engineering			
Code: ENGG09053	**SCQF Level: 9 (Scottish Credit and Qualifications Framework)**	**Credit Points: 20**	**ECTS: (European Credit Transfer Scheme) 10**
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Cristina 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					
Face-To-Face	**Blended**	**Fully Online**	**HybridC**	**Hybrid 0**	**Work-Based Learning**

☒	☐	☐	☐	☐	☐
See Guidance Note for details.					

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) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
☒	☐	☐	☐	☐	☐	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	☒	Term 2	☒	Term 3	☐

Learning Outcomes: (maximum of 5 statements) **These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module.** At the end of this module the student will be able to:	
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	Characterization, 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 Level **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.	
Practice: Applied Knowledge and Understanding	SCQF Level **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 Level **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 Level **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 Level **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.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG08022	**Module Title:** Chemical Engineering Fundamentals
	Other:	
Co-requisites	**Module Code:**	**Module Title:**

*Indicates that module descriptor is not published.

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.	
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	18
Tutorial/Synchronous Support Activity	18
Independent Study	164
	200 Hours Total

****Indicative Resources: (eg. Core text, journals, internet access)**

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Gilbert M. Master, Wendell P. Ela. Introduction to Environmental Engineering and Science. Pearson. 2014.

Davis, D.L. and Cornwell, D.A. Introduction to Environmental Engineering. 5th Ed. McGraw-Hill.2013.

Azapagic, A., Perdan, S. & Clift, R. Sustainable development in practice: case studies for engineers andscientists. 2nd Edition. Chichester (England): Wiley & Sons. 2011.

Fogler, H. S. (2016) Elements of Chemical Reaction Engineering. 5th Edition. Prentice Hall.

Hill, C. G. and T W Root (2014) Introduction to Chemical Engineering Kinetics and Reactor Design. 2nd Edition.Hoboken, N.J : John Wiley.

Shuler, M. L. and Kargi, F. (2002) Bioprocess Engineering. Basic Concepts. Prentice Hall.

(**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.

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.

(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
Assessment Results (Pass/Fail)	Yes ☐No ☒
School Assessment Board	Engineering
Moderator	Andy Durrant
External Examiner	R. Ocone
Accreditation Details	This module is part of the BEng(Hons) Chemical Engineering programme accredited by the IChemE.
Changes/Version Number	2.0 Updated module summary and PDP skills. 2.1 Updated Module Delivery Method to Face-to-Face

Assessment: (also refer to Assessment Outcomes Grids below)
Assessment for the module includes both formative and summative assessment. Formative assessment is provided during lectures in the form of class exercise problems, during tutorial sessions, and as part of the preparation for written submissions.
Assessment 1 – Two class tests worth 70% of the final mark.
Assessment 2 - Continuous assessment including an essay (15%) and design assignment (15%).
(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.)

Assessment Outcome Grids (See Guidance Note)

Component 1							
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Learning Outcome (5)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Class test	X	X		X		35	1

Component 2							
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Learning Outcome (5)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Class test	X		X		X	35	1

Component 3							
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Learning Outcome (5)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Design	X	X		X		15	0
Essay	X		X		X	15	0
Combined Total for All Components						**100%**	**2 hours**