University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Chemical Reactor Engineering			
Code: ENGG10033	**SCQF Level: 10 (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

This module addresses the major step(s) at the heart of most chemical processes, i.e. chemical reactor design.

The module reviews the fundamental concepts of thermodynamics and kinetics relevant to chemical reactors design and the different types of reactors that are likely to be encountered in the course of designing a chemical process. The students are then introduced to the digital techniques required to carry out mass and energy balances for reactors other than ideal ones.

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The subject of catalysis is covered in depth and topics such as mechanisms and kinetics of catalytic reactions, catalysts classification, formulation, preparation, structure, surface area, pore size distribution, adsorption, mass and heat transfer in catalytic reactors, resistances, diffusion, pore models, effectiveness factor, catalyst deactivation and regeneration are discussed. Fluidization is also covered.

Mass transfer with chemical reaction in multiphase systems will provide the introduction to the discussion of the design of fixed-bed catalytic reactors and transport reactors as well as other types of multiphase reactors.

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	Identify the details of the necessary reaction step(s) of a chemical process and select the type(s) of reactor(s) to be used for different processes,
L2	Show a critical understanding of the role of catalysis in chemical processing.
L3	Carry out design calculations of chemical reactors integrating theories, concepts and principles.
L4	Demonstrate a critical understanding of the reasons why the safety, environmental and economic constraints make the reaction step a crucial part of the overall process

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 **10** Develop a deep understanding of issues related to the reaction step(s) in a chemical process and important role it plays in the success of the process both economically and environmentally. Master the ability to make appropriate choices regarding the reaction step(s) of a chemical process.
Practice: Applied Knowledge and Understanding	SCQF Level **10** Carry out detailed calculation for the design of chemical reactors and associated facilities.

	Carry out practical experiments to analyse the performance of chemical reactors.	
Generic Cognitive skills	SCQF Level **10** The ability to gather information from different sources and in different formats and its use in making sound judgement about the design, operation and monitoring of chemical reactors.	
Communication, ICT and Numeracy Skills	SCQF Level **10** Use of both general purpose and specialist chemical engineering software to analyse and specify reactor equipment details. Communicate results of laboratory investigation in report format.	
Autonomy, Accountability and Working with others	SCQF Level **10** Working effectively with others in team in laboratory sessions. Identifying and addressing individual learning needs in the subject area associated with the module.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG0937	**Module Title:** Chemical Process Principles
	Other:	Or, any other suitable prior learning
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	12
Tutorial/Synchronous Support Activity	24
Laboratory/Practical Demonstration/Workshop	12
Independent Study	152

	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: H. Scott Fogler, Essentials of Chemical Reaction Engineering, Pearson Education, 5th Edition ,2016. O. Levenspiel, Chemical Reaction Engineering (3rd edition), John Wiley & Sons 1999. S.J.Thomson and G. Webb, Heterogeneous Catalysis, Edinburgh : Oliver & Boyd, 1968. B. Gates, Catalytic chemistry, New York : Wiley, 1992. Hill, C. G. and T W Root, Introduction to Chemical Engineering Kinetics and Reactor Design, 2nd Edition, Wiley, 2014
(**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	Li Sun

External Examiner	R. Ocone
Accreditation Details	This module is part of the BEng(Hons) Chemical Engineering programme accredited by the IChemE.
Changes/Version Number	3.1 Updated module summary 3.2 Updated Module Delivery Method to Face-to-Face

Assessment: (also refer to Assessment Outcomes Grids below)
Assessment will be based on the following:
Assessment 1 - final written class test worth 70% of the final mark
Assessment 2 - continuous assessment worth 30% of the final mark and consists of written assignment(s)/report(s), laboratory exercises and design problem(s).
(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)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Unseen open book		X	X	X	70	3

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**
Design	X		X		10	0
Laboratory	X		X		10	3
Review/ Article/ Critique/ Paper		X		X	10	0
Combined Total for All Components					**100%**	**6 hours**