Module Descriptor

Title	Chemical Reactor Engineering		
Session	2025/26	**Status**	Published
Code	ENGG10033	**SCQF Level**	10
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	C 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	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	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.
L5	N/A

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 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 10** Carry out detailed calculation for the design of chemical reactors and associated facilities.

[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

	Carry out practical experiments to analyse the performance of chemical reactors
Generic Cognitive skills	**SCQF 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 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 10** Working effectively with others in team in laboratory sessions. Identifying and addressing individual learning needs in the subject area associated with the module.

Prerequisites	**Module Code** ENGG0937	**Module Title** Chemical Process Principles
	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, laboratories 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	12
Tutorial / Synchronous Support Activity	24
Laboratory / Practical Demonstration / Workshop	12
Independent Study	154
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:

H. Scott Fogler (2020) Elements of chemical reaction engineering. Prentice Hall, 5th ed.

O. Levenspiel (1999) Chemical Reaction Engineering (3rd edition), John Wiley & Sons.

Julian R.H. Ross (2012) Heterogeneous catalysis: fundamentals and applications. Amsterdam : Elsevier.

Hill, Charles G., Root, Thatcher W. (2014) An introduction to chemical engineering kinetics & reactor design. Hoboken, N.J. : John Wiley, 2nd 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. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, 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	Engineering
Moderator	L Sun
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	V3.3 Updated Indicatives Resources, Attendance and Engagement Procedure, Equality and Diversity, and Assessment sections. Apperars in CPD catalogue Unseen Closed Book Class Test replaces Unseen Open Book Examination.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen Closed Book class test worth 70% of the final mark
Assessment 2
Coursework: worth 30% of the final mark and consists of: FBCR design report (10%): LO1, LO3 Laboratory reports and proformas (10%): LO1, LO3 Catalysis essay (10%): LO2, LO4
Assessment 3
N/A
(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	☒	☒	☒	☒	☐	70	3

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☒	☒	☒	☒	☐	30	3

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
N/A	☐	☐	☐	☐	☐		
Combined total for all components						100%	6 hours

Change Control

What	When	Who
Updated Indicatives Resources, Attendance and Engagement Procedure, Equality and Diversity, and Assessment sections. Apperars in CPD catalogue Unseen Closed Book Class Test replaces Unseen Open Book Examination.	March 2025	Cristina Rodriguez