University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Chemical Engineering Design Study			
Code: ENGG10031	**SCQF Level: 10 (Scottish Credit and Qualifications Framework)**	**Credit Points: 40**	**ECTS: (European Credit Transfer Scheme) 20**
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Cristina Rodriguez		

Summary of Module

This double module develops a student's ability to design multi-step chemical processes, the ability to work with limited data the exploration of innovative and challenging designs and their use according to the commercial, economic and social demands placed on industry wherever in the world it may be.

This module will supplement students' knowledge of chemical engineering gained at levels 8 and 9 of the Chemical Engineering programme and take in concepts from level 10 during the course of two terms, acting as a capstone module to the degree up to this point.

In addition to the independent work undertaken by the students, the module is augmented with two hours formal scheduled weekly group project supervision meetings, outwith which students may request additional support from the supervisor . In addition to this a programme of formal lectures, practical sessions and workshops on topics and techniques relevant to the design process is delivered, including:

Plant location and layout; systematic approach with considerations of plant siting, safety and hazardous area classification, environmental and social impact, operation, transport and storage of raw materials and products. Statutory requirements; outline of planning methods, project management, regulations and approvals required. Introduction to the design of pressure vessels and piping systems. Using stress analysis to investigate stress concentrations. Selection of materials of construction for process piping, vessels and equipment. Role of Design Codes including those for pressure vessels, storage tanks, piping and composite structures. Design for fabrication; examination of designs to simplify/optimise fabrication and minimise costs, Inspection and in-service observations. Use of computer software packages in design, simulation and modelling using process simulation packages. Economic costing and project evaluation.

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	Produce a design of a chemical plant to meet a specific industrial requirement in a safe and economical operational manner while minimising environmental impact over the plant life cycle.
L2	To apply process engineering principles to the design of a chemical plant and to demonstrate both creative and critical thinking in design synthesis and the ability to use judgement with design problems in situations where either novel processes or of limited information on existing technology leads to published intellectual property and technical literature not giving full coverage.
L3	To work as part of a design team, participating in team meetings, and producing work to the schedule decided by the team.
L4	To use available process design, simulation, and modelling computer software packages where relevant to improve/optimise the design.
L5	To appreciate the wider aspects of mechanical engineering practice and design as well as economics and marketing, along with consideration of the needs and pressures of a business in modern industrial society.
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)	Develop a broad knowledge and understanding of the myriad issues involved in the design of a chemical process.	
Practice: Applied Knowledge and Understanding	SCQF Level **10** Integrate the use of chemical engineering knowledge and understanding to design chemical processes.	
Generic Cognitive skills	SCQF Level **10** Use of information retrieval techniques to access and critically use published information/data in design studies.	
Communication, ICT and Numeracy Skills	SCQF Level **10** Develop verbal and written communication skills and group working skills by members of the design studies team. Use available computer software packages (described above) in design studies and presentation of final reports.	
Autonomy, Accountability and Working with others	SCQF Level **10** Participate in group meetings and in efficient work scheduling for members of the design studies team. Take turns in playing leading roles within the team to collate meeting minutes and publish its findings	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG09037 ENGG09036	**Module Title:** Chemical Process Principles Process Design, Control and Safety
	Other:	Or, suitable appropriate background
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	24
Tutorial/Synchronous Support Activity	48
Independent Study	328
	400 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:

Seider, W. D., Lewin D. R., Seader J. D., Widagdo S., Gani R., and Ming NG K.A. NG(2019) Product & Process Design Principles: Synthesis, Analysis and Evaluation. N.J.: Wiley.

R K Sinnott and G Towler, Chemical Engineering Design: SI Edition, Butterworth-Heinemann 6th Edition, 2019.

Crowl, D. A. and Louvar J. F. (2019) Chemical Process Safety: Fundamentals with Applications. 4th Edition. Boston, Mass.; London: Prentice Hall.

El-Halwagi, M. (2017) Sustainable design through process integration : fundamentals and applications to industrial pollution prevention, resource conservation, and profitability enhancement. 2nd Edition, Amsterdam : Elsevier.

Lee's Loss Prevention in the Process Industries", Volumes 1,2 and 3, 4th Edition, Elsevier-Butterworth, 2012.

J.R. Couper et al, Chemical Process Equipment–Selection and Design, 2nd edition, Elsevier Publishers (2010).

Ludwig's Applied Process Design for Chemical and Petrochemical Process Plants, Volumes 1,2 and 3, 3rd/4th Editions, 2004/2007 Gulf Professional Publishing.

Foo, D. C.Y. M. M. El-Halwagi and R. R. Tan (Editors), Recent advances in sustainable process design and optimization, World Scientific, 2012

Erwin, D., Industrial Chemical Process Design, 2nd Edition, McGraw-Hill, 2014. Dietrich, T. R. Microchemical engineering in practice, Wiley, 2009

Ulmann's Process and Process Engineering, Volumes 1,2 and 3, Wiley-VCH Publishers, 2004. R. Smith, Chemical Process Design and Integration,Revised 2nd edition, Wiley, 2016.

Kletz, T. and Amyotte P. (2010) Process Plants: A Handbook for Inherently Safer Design. 2nd Edition, Boca Raton, Fla.; London: CRC Press.

N.P. Chopey, Handbook of Chemical Engineering Calculations, 4th Edition, McGraw-Hill, 2012. G.F. Hewitt (Ed.), Heat Exchanger Design Handbook Parts 1-5, Begell House, 2002. F. Crawley et al, HAZOP: Guide to Best Practice, IChemE, 2000. Peters M. S., K.D. Timmerhaus and R.E. West, Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, 2003. Inherently Safer Chemical Processes, CCPS, 2nd edition, Wiley, 2009.
(**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	Mojtaba Mirzaeian
External Examiner	R. Ocone
Accreditation Details	This module is part of the BEng(Hons) Chemical Engineering programme accredited by the IChemE.

Changes/Version Number	3.0 Updated module summary and textbooks. 3.1 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, during the weekly and other supervisory meetings and as part of the preparation for written submissions.
Assessment 1 – Design Stage 1 Report which is 35% of the final mark.
Assessment 2 - Design Stage 2 Report which is 45% of the final mark.
Assessment 3 - Design Stage 1 and stage 2 Oral Presentations totalling 20% of the final mark.
(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**
Dissertation/Project report/Thesis	X	X	X	X	X	35	24

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**
Dissertation/Project report/Thesis	X	X	X	X	X	45	24

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**
Debate/ Interview/Viva voce/ Oral	X			X	X	10	2
Debate/ Interview/Viva voce/ Oral	X			X	X	10	2
Combined Total for All Components						**100%**	**52 hours**