University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Computer Aided Process Analysis and Design			
Code: ENGG09049	**SCQF Level: 9** (Scottish Credit and Qualifications Framework)	**Credit Points: 20**	**ECTS: 10** (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Li Sun		

Summary of Module

This module concentrates on both introductory and advanced concepts of computer aided process simulation, analysis, process design and optimisation.

The module discusses the concept of a process system and its significance in chemical and process engineering. Examples and exercises will be included to show the importance of "System" approach to process design and problem solving in general.

The module explores process design and optimization, and equips the students with the tools necessary for the simulation and analysis of chemical processes and individual equipment.

Process simulation software (Aspen HYSYS and ASPEN PLUS) are applied for simulation, analysis, design and optimisation of equipment, unit operations, and chemical processes.

Computation Fluid Dynamics tools (Fluent/CFX) are used for the analysis and design of representative equipment such as heat exchangers.

- I am UWS (https://www.uws.ac.uk/current-students/your-graduate-attributes/): Upon completing this module the students will be equipped with tools that will help them in their journey to be work-ready, successful and universal. The module develops critical thinking and analytical skills that enhance the students' ability to deal with complicated issues and make them problem solvers. It encourages them to become motivated, innovative, autonomous, inquisitive, creative and imaginative. The module and the teaching approach encourage collaborative working, effective communications, resilience and perseverance, and development of research and inquiry skills. The aim is to produce graduates who are knowledgeable with excellent digital skills fit for the 21st century and aware of the global context in which they operate and the challenges that face humanity in the 21st century in the areas of water, food, energy, environment and well-being, who strive to lead, influence and dare to make transformational changes while being ethically-minded, socially responsible, critically aware of the environmental and social impacts of their decisions and actions, and culturally sensitive.

Module Delivery Method

Face-To-Face	Blended	Fully Online	HybridC	Hybrid0	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	Equip the students with the necessary tools for process simulation, analysis, design and optimisation.
L2	Encourage the proper use of computers for solving chemical engineering problems.
L3	Develop the skills for critical analysis of design decisions and process choices when using process simulation tools with basic economic evaluation.
L4	Develop good working knowledge of systematic approach to solve process problems.

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 process analysis, design and optimisation. Demonstrating a critical understanding of the selection of process parameters. Demonstrate critical understanding of the role of simulation tools in process analysis, design and optimisation.
Practice: Applied Knowledge and Understanding	SCQF Level 9. Use a selection of the principal skills, techniques, practices and/or materials associated with industrial tasks Use iterative multivariable techniques in design and sizing of equipment Practice routine searches for process data and thermodynamic models for process simulation.
Generic Cognitive skills	SCQF Level 9. Be able to compare suggested solutions with expected values.
Communication, ICT and Numeracy Skills	SCQF Level 9. Make formal presentations of process design outcomes to an audience of peers. Use a range of IT applications to facilitate calculations and provision of report and presentations. Interpret, use and evaluate numerical and graphical data to realize calculations in sizing of equipment.

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.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG08022 ENGG08024	**Module Title:** Chemical Engineering Fundamentals Process Modelling and Simulation
	Other:	
Co-requisites	**Module Code:**	**Module Title:**

*Indicates that module descriptor is not published.

Learning and Teaching	
This module covers a wide variety of theoretical, conceptual and practical areas, which require a range of knowledge and skills to be displayed and exercised. Delivery of its syllabus content involves a diversity of teaching and assessment methods to achieve the learning outcomes of the module. These include formal lectures, structured tutorials (work closely integrated with the lecture material), laboratory exercises to develop practical skills and familiarisation with equipment and experimental techniques, completion and submission of written coursework making use of appropriate forms of IT and VLE, and independent study. The hours for Lecture/Core Content Delivery include the exam and the class tests.	
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	12
Laboratory/Practical Demonstration/Workshop	24
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:

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

W Luyben, Principles and Case Studies of Simultaneous Design, Wiley, 2011

J Haydary, Chemical Process Design and Simulation: Aspen Plus and Aspen HYSYS Applications, New York: Wiley, 2019

J Anderson, Computational Fluid Dynamics: the Basics with Applications, McGraw Hill,1995

J Tu, GH Yeoh, and C Liu, Computational Fluid Dynamics: A Practical Approach,3rd Edition, Amsterdam: Butterworth-Heinemann, 2018

(**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. Please ensure any specific requirements are detailed in this section. Module Co-ordinators should consider the accessibility of their module for groups with protected characteristics..
(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

Programme Board	Engineering
Assessment Results (Pass/Fail)	Yes ☐No ☒
Subject Panel	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
Version Number	2.01

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 laboratory sessions and as part of the preparation for written submissions.

Summative assessment includes class test, case study, process design, design exercises and written assessment elements.

The module is 100% continuous assessed.
The continuous assessment is dividing into three groups:
Class Test 10%
Process design, simulation and design exercises 40%
Case study 50%

(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 Handbook.)

Assessment Outcome Grids (Footnote A.)

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
Case study	✓	✓	✓		50	0
Class test (written)	✓	✓			10	2
Design/ Diagram/ Drawing/ Photograph/ Sketch	✓	✓	✓	✓	40	0
Combined Total for All Components					100%	2 hours