University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: MEng Chemical Engineering Research Project			
Code: ENGG11051	**SCQF Level: 11 (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:	Mojtaba Mirzaeian		

Summary of Module

Students are required to conduct research at an advanced level into an agreed chemical engineering related topic. The work involves a proper review of the relevant scientific literature and this will allow the students to set their project objectives in the context of the wider body of academic knowledge relating to the subject. The initial research should be developed to a level commensurate with the award of MEng degree.

The student will be supported by a member of academic staff, who will advise on matters relating to the topic of research and completion of the written dissertation.
There will also be a series of support lectures delivered which will assist the students in achieving the requirements of the module. This includes the introduction of the principles of scientific projects, scientific process and research cycle, literature review on the subject of investigation and development of research hypothesis. The lectures also cover research planning and design, experimental-research design and key concepts in design and analysis of experiments, Different methods for the analysis of the experimental data and related error analysis are covered in the lectures.

The work undertaken during the project, the conclusions drawn and recommendations for future work will be presented and submitted in a written dissertation in the agreed format. The students will then be required to present and defend their thesis as part of the overall module assessment requirements.

- 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**	**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	Execute and successfully complete a substantial piece of advanced independent work relative to the theories, practical issues for solving chemical engineering problems and identify requirements for more advanced techniques or specialist expertise in an area of chemical and process engineering including the development of the ability to critically review and consolidate knowledge with originality and experience in dealing with uncertainty and new concepts and/or applications for which data are unreliable or limited.
L2	Critically apply research methods through a systematic process for designing and conducting a research programme or/and an experiment for a given application and objective of experimentation and/or investigation. This should involve a comprehensive understanding of design processes and methodologies and an ability to apply and adapt them in unfamiliar situations; selection of response variables, the selection and characterization of factors, levels, and ranges, the choice of experimental design or investigation parameters, data collection, and statistical analysis.
L3	Critically assess and evaluate the relevant evidence to refine or refute any current theories relating to the problem or issue under investigation in order to

	understand how to combine and adapt different aspects of systems thinking to complex and novel processes.
L4	Critically implement various analysis techniques and methodologies to analyse data and draw conclusions.
L5	Communicate the findings of the investigation in an orderly, reasoned and analytical manner to address combinations of societal, business, and customer needs, while considering diversity, inclusion, cultural, societal; environmental and commercials matters, codes of practice, and industry standards and also Intellectual Property Protection in research.

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 **11** • Develop extensive, detailed, and critical knowledge and understanding in one or more of the specialisms of chemical and process engineering which is informed by current research and development within each specialism. • Demonstrate a critical knowledge that covers and integrates most of the main parts of the Design of Experiments (DoE) subject and their relevance and application in engineering context at an advanced level. • Demonstrate extensive, detailed, and critical knowledge and understanding of the role of DoE and other analysis techniques in investigating and modelling chemical engineering processes and applications, as well as other related phenomena in science and engineering. • Develop a critical understanding of the implication of using DoE and/or other analysis techniques in the advancement of modern and innovative engineering design, safety, conservation of resources and sustainability.
Practice: Applied Knowledge and Understanding	SCQF Level **11** • Define, plan, and execute a significant project of chemical engineering research, investigation, or development. • Plan, develop, execute, and analyse a relevant experimental design and/or theoretical investigation based on the knowledge of DoE and/or other advanced analysis methodology. • Develop expertise in a range of specialised chemical engineering skills, techniques, practices, and associated topics that are at the forefront of and are informed by recent developments and research. • Demonstrate originality, creativity and innovation via the thorough understanding and use of DoE and/or advanced analysis methodology.
Generic Cognitive skills	SCQF Level **11** • Critically review and consolidate knowledge, skills, practices and thinking involving chemical engineering. • Develop critical thinking to critically assess information or data and make informed judgments. • Apply critical analysis, evaluation, and synthesis to forefront issues of any kind in chemical and process engineering using state of the art analysis methodologies. • Critically review information and existing theories and practices from a variety of sources and apply them as part of a research investigation.

	• Practice at a high level the ability to critically identify, conceptualise, define, and analyse new problems related to chemical and process engineering. • Develop and demonstrate original and creative thinking and responses in dealing with complex or novel problems and issues. • Deal with complex issues and make informed judgements in situations in the absence of complete or consistent data/information through innovation and research. • Develop- digital, innovation, entrepreneurship and social enterprise skills. • Develop knowledge, employability skills and attributes relevant to their future careers.
Communication, ICT and Numeracy Skills	SCQF Level **11** • Ability to perform, interpret and evaluate engineering data in problem solving. • Communicate effectively, orally and in writing with peers and superiors using data analysis where appropriate. • Communicate, using appropriate methods, to a range of audiences with different levels of knowledge and/or expertise. • Use a wide range of ICT applications to support and enhance work at this level and show critical understanding of the scope and limitations of the tools used and their underlying theoretical basis. • Undertake critical evaluations of a wide range of numerical and graphical data with the ability to deal with situations involving missing data and lack of information using research.
Autonomy, Accountability and Working with others	SCQF Level **11** • Identify and address their own learning needs in support of research activity. • Exercise high level of autonomy and initiative in professional and equivalent activities with the ability to work independently on significant and demanding tasks. • Take responsibility for own work and/or significant responsibility for the work of others providing leadership. • Take responsibility for a significant range of resources. • Plan and record self-learning and development as the foundation for live learning/CPD. • Practise in ways which draw on critical reflection on own and others' roles and responsibilities. • Familiarize themselves with the new and unknown; identify solutions and strategies in solving research problems. • Demonstrate high motivational skills when working individually. • Apply principles of sustainability, economics and ethics to novel and complex situations with conflicting requirements. • Display appropriate time management skills when undertaking research activities. • Deal with complex ethical and professional issues in engineering context and make informed judgements on issues not addressed by current professional and/or ethical codes or practices. • Have some understanding of the limits of available process safety technology and of the potential of new and emerging technology.
Pre-requisites:	Before undertaking this module the student should have undertaken the following:
	Module Code: / **Module Title:**
	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	24
Tutorial/Synchronous Support Activity	4
Independent Study	172
	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:

Laurel, B. (Editor) (2003) Design Research: Methods and Perspectives. Cambridge, Mass; London: MIT Press

Leedy, P. D. and J E Ormrod (2015) Practical Research: Planning & Design. 11th Edition. Boston: Pearson.

Montgomery, D.C. (2013) Design and Analysis of Experiments. 8th Edition. Hoboken, N.J.: John Wiley.

Lazic, Z. R. (2006) Design of Experiments in Chemical Engineering: A Practical Guide. Weinheim; [Great Britain]: Wiley-VCH.

Creswell, J.W. (2013) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, (3rd edit.)

Dawson, C. (2009) (4th edition) Introduction to Research Methods: A Practical Guide for Anyone Undertaking a Research Project, How To Books Ltd.

Leavy, P (2017) (4th edition) Research design: Qualitative, quantitative, and mixed methods approaches, The Guilford Press.

Articles from scientific journals with emphasis on different aspects of chemical engineering depending on the project.

(**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	Cristina Rodriguez
External Examiner	R. Ocone
Accreditation Details	Pending accreditation.
Changes/Version Number	V 1.5 - Change of delivery from Blended 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 exercise problems, during the regular meetings with the academic supervisor(s) and as part of the preparation for the written thesis submission. Summative assessment is provided by the thesis and the oral presentation and viva. There are two assessment categories, and they are detailed below:
Assessment 1 - Thesis that is worth 90%. This is the written dissertation that must conform to UWS regulations and should comprise a satisfactory record of a substantive research undertaken by the student

and a satisfactory critical survey of knowledge and understanding in the field of study, and it must show that the student is capable of conducting independent and original research. The length of the dissertation must conform to UWS regulations, and the guidelines given in UWS's Assessment Handbook. The written report is blind-double marked by the first supervisor and a second independent assessor with NO knowledge or sight of the supervisor marks or comments. If the marks awarded by the supervisor and the assessor are very different then the dissertation must be marked by a second independent assessor who will make formal recommendations to the module coordinator and the programme leader.
Assessment 2 - Oral Presentation and Examination (Viva) that worth 10%. The student must make an oral presentation then submit to a viva. At least two independent assessors (one of them will act as a chair) must be present at the presentation and conduct the viva in addition to the supervisor.
(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	✓	✓	✓	✓		90	0

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**
Clinical/ Fieldwork/ Practical skills assessment / Debate/ Interview/ Viva voce/ Oral					✓	10	1