Module Descriptor

Title	Separation Processes		
Session	2025/26	**Status**	Published
Code	ENGG11039	**SCQF Level**	11
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	M Mirzaeian		

Summary of Module

The module reviews the principles of transport processes relevant to separation processes, discusses the different types of separation techniques used and the principles underlying their operations. It also discusses the design principles of equipment and their economic integration into the overall process.

• Distillation: This provides an in-depth analysis of advanced and emerging distillation technologies such as azeotropic, reactive, extractive, adsorption, membrane, pressure-swing, cyclic, and dividing-wall column distillation. Batch distillation, Ponchon-Savarit techniques, heat integration, and distillation operations economics, are among the topics to be covered.

• Ion Exchange discusses sorbents properties and structure, physicochemical description of the process, equilibrium, kinetics, applications, equipment and equipment design operating in both batch and continuous modes.

• Adsorption is focused on adsorbent and adsorption isotherms, equilibrium, kinetics, breakthrough curve, temperature and pressure swing adsorption principles and models, equipment design.

• Large Scale Chromatographic Separations provide information on the principles and applications, techniques, retention theory and elution chromatography, applications, separation performance and equipment.

• Leaching gives infoemation on the principles and equilibrium relations, mass transfer between soluble solids and liquid, multistage design with both constant and variable underflow, applications, modes of operation and equipment design.

• Membrane processes discusses advanced membrane separation processes and types of membranes, mechanisms, applications, equipment design.

During the course of this module students will develop their UWS Graduate Attributes (https://www.uws.ac.uk/current-students/your-graduate-attributes/). Universal: Academic attributes - critical thinking and analytical & inquiring mind; Work-Ready: Academic attributes - integration of processes to give more efficient use of resources; Successful :autonomous, driven and resilient.

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	Develop a critical understanding of advanced concepts of separation processes that covers both depth and breadth of the subject.
L2	Develop advanced and critical knowledge of the role played by separation processes in the design and analysis of equipment that will also take into consideration the separation of substances with complex behaviour azeotropic distillation and issues such as environmental protection, resources conservation and sustainability and economic viability.
L3	Develop the underlying knowledge that will enable the analysis and design of equipment even in the cases of missing and/or incomplete data through research and innovation.
L4	Develop the advanced skill required to use modern tools such as process simulators in the design of complex separation processes with critical understanding of their scope and limitations and also the use of software and digital technologies for problem solving in separation processes.
L5	Develop critical understanding of emerging technologies in separation processes and their fit for purpose and limitations and understand how to combine and adapt different aspects of systems thinking to complex and novel processes.

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 11** Demonstrate:

[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

	• A critical knowledge that covers and integrates most of the main areas of the discipline of separation processes and their relevance and application in chemical engineering context and at advance level. • A critical understanding of the principal theories, concepts and principles of separation processes. • A critical understanding of a range of specialised theories, concepts and principles applied to separation processes. • Extensive, detailed and critical knowledge and understanding of the role of separation processes in chemical engineering applications. • Develop a critical understanding of the implication of knowledge of separation processes principles in the advancement of modern and innovative chemical engineering design, conservation of resources and sustainability.
Practice: Applied Knowledge and Understanding	**SCQF 11** • Use a significant range of the core chemical engineering knowledge and skills to advance the knowledge of separation processes and their application in chemical engineering context. • The ability to use a range of specialised skills, techniques, practices and/or materials that are informed by the recent advances in the field of separation processes. • Apply a range of standard and specialised research and other techniques to advance understanding of separation processes. • Plan, develop and execute a relevant design based on advanced knowledge, research and innovation. • Demonstrate originality, creativity and critical thinking. • Apply knowledge of separation processes in a wide variety of chemical engineering applications that demand innovation.
Generic Cognitive skills	**SCQF 11** • Apply critical analysis, evaluation and synthesis to forefront issues, or issues that are informed by forefront developments in the area of separation processes and the interaction with the aspects of the Chemical Engineering profession. • Practice at a high level the ability to critically identify, analyse, conceptualise and define new and abstract problems related to separation processes and the application of the concepts in chemical engineering context. • Develop and demonstrate original and creative thinking and responses in dealing with complex or novel problems and issues. • Critically review, consolidate and extend knowledge, skills, practices and thinking in the field of separation processes. • Deal with complex issues and make informed judgements in situations in the absence of complete or consistent data/information through innovation and research. • Develop knowledge, employability skills and attributes relevant to their future careers.
Communication, ICT and Numeracy Skills	**SCQF 11** • Communicate, using appropriate methods, to a range of audiences with different levels of knowledge/expertise.

	• Communicate with peers, more senior colleagues and specialists. • 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. • Communicate results accurately and reliably in a variety of formats and settings.
Autonomy, Accountability and Working with Others	**SCQF 11** • 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. • Demonstrate leadership and/or initiative and make an identifiable contribution to change and development. • Practise in ways which draw on critical reflection on own and others' roles and responsibilities. • 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.

Prerequisites	**Module Code**	**Module Title**
	Other	
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.	
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	24
Tutorial / Synchronous Support Activity	12
Independent Study	164
n/a	0
n/a	0
n/a	0

TOTAL	Hours Total 200

Indicative Resources

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Henley, E. J., J. D. Seader and D. K. Roper (2016) Separation Process Principles. 4th Edition. Hobeken, N.J.: Wiley.

Kiss, A. A. (2013) Advanced Distillation Technologies: Design, Control and Applications. Chichester: Wiley.

Petlyuk, F. B. (2011) Distillation Theory and Its Application to Optimal Design of Separation Units. Cambridge: Cambridge University Press.

Smith R. (2016) Chemical process design and integration, 2nd edition, Wiley Blackwell

McCabe, W, J. C. Smith and P. Harriott (2014) Unit Operations of Chemical Engineering, 7th edition, McGraw Hill

Backhurst, J. R.; Harker, J. H.; Richardson, J. F.; Coulson, J.(2002) Chemical Engineering Volume 2, 5th Edition, Butterworth-Heinemann.

(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. Specialist assistive equipment, support provision and adjustment to assessment practice 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	Design
Moderator	C Rodriguez
External Examiner	P Weston
Accreditation Details	N/A
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	1.12 - Updated module summary. - Updated student learning hours. - Updated Attendance and Engagement Procedure. - Updated Equality and Diversity. - Updated accreditation. - Updated external examiner. - Updated Assessment section.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen open book examination worth 70% of the final mark.
Assessment 2
Continuous assessment worth 30% of the final mark. The continuous assessment component in this module will consist of the submission of two written assignments with calculations each worth 15% of the final mark. Further details, and the academic calendar when assessments are likely to feature, will be provided within the Module Information Pack.
Assessment 3
(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 open book examination	☒	☒	☐	☐	☒	70	3

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Design/ Diagram/ Drawing/ Photograph/ Sketch	☐	☐	☒	☒	☐	30	0

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

Change Control

What	**When**	**Who**
Updated module summary. - Updated student learning hours. - Updated Attendance and Engagement Procedure. - Updated Equality and Diversity. - Updated accreditation. - Updated external examiner. - Updated Assessment section.	March 2025	M Mirzaeian