University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Unit Operations 2			
Code: ENGG10032	**SCQF Level: 10 (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

In this module:
Different separation processes will be considered as follow:

- Liquid-liquid extraction (LLE) covers immiscible solvents, determination of number of stages, transfer unit approach, partially miscible systems, choice of solvents (considering hazards such as toxicity and flammability as well as ability to dissolve), and use of triangular diagrams.

- Gas absorption examines the calculation of the number of ideal stages required for the separation of dilute solutions, the calculation of packed height for dilute solutions and the calculation of pressure drop across the packed bed. The topic then extends into the calculation of packed height for concentrated solutions.

- Filtration covers the derivation of the Ruth equation, cloth resistance, constant rate and constant pressure filtration. Application of filtration theory to common types of industrial filters. Application of Ruth’s equation to centrifuges.

- Drying covers both batch and continuous processes with relation to the changing drying rate of a solid as time progresses. Various items of drying equipment are also discussed.

- Size classification and size reduction of solids covers mass balances over a screen to determine the oversize effectiveness, undersize effectiveness and overall effectiveness of the screen. Von Rittinger's, Kick's and Bond's laws to calculate required power for size reduction, mechanical and crushing efficiencies are introduced and work index, energy of size reduction and size reduction equipment are discussed.

This module will work to develop a number of the key 'I am UWS' Graduate Attributes to make those who complete this module: Universal (Critical Thinker, Ethically minded, Research-minded); Work Ready (Problem-Solver, Effective Communicator, Ambitious); Successful (Autonomous, Resilient, Driven).

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	Understand how to select an appropriate separation process for a given multiphase separation problem considering the principles of equilibrium, mass transfer and their application to phase behaviour, equipment sizing and performance.
L2	Produce a design for one of the fluid-fluid or fluid particle separation processes described using published data/information to quantify the effect of processing steps on the state of the material being processed, and its transformation to the end product.
L3	Understand the limitations of approximate design methods and how these can be improved/extended by use of computer software packages and digital techniques to solving Chemical Engineering Problems.
L4	Appreciate the characteristics of masses of particulate solids and understand how to determine the screen effectiveness as a measure of the successes of a screen in separating solid particles.

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 **10** Demonstrating a broad and integrated knowledge and understanding of fluid-fluid staged separation processes and fluid particle separation processes.	
Practice: Applied Knowledge and Understanding	SCQF Level **10** Being able to use design procedures to size/specify fluid/fluid staged separators and fluid-particle separators. Understand the limitations of these design methods.	
Generic Cognitive skills	SCQF Level **10** Be able to compare calculated designs with expected /realistic values.	
Communication, ICT and Numeracy Skills	SCQF Level **10** Interpret, use and evaluate numerical /graphical data to design a given separator.	
Autonomy, Accountability and Working with others	SCQF Level **10** Judging the relevance and accuracy of published numerical /graphical data used. Adopting an inclusive approach to engineering practice, recognizing the responsibilities, benefits and importance of supporting equality, diversity and inclusion.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG09038	**Module Title:** Unit Operations 1
	Other:	or any other suitable prior learning
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	12
Practice Based Learning	12
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:

“Transport Processes and Separation Process Principles” by C.J. Geankoplis, Published by Pearsons Education Ltd., 5th Edition , 2018, ISBN: 978-0134181028.

“Separation Process Principles” by E. R. Henley, J. D. Seader, and D. K. Roper, Wiley, 4th Edition, 2016

“Unit Operations of Chemical Engineering” by W.L. McCabe, J.C. Smith and P. Harriott, Published by McGrawHill, 7th Edition, McGraw Hill, 2014.

“Chemical Engineering Design” by R.K. Sinnott and G. Towler, SI Edition, Published by ButterworthHeinemann, 6th Edition, 2019

(**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	This module is part of BEng (Hons) Chemical Engineering Programme, accredited by IChemE.
Changes/Version Number	4.5 -Updated module summary - Change of delivery from Blended to “Face to Face”. 4.4 - Alterations to Learning Outcomes to comply with new IChemE guidelines following Engineering Council AHEP4. - Alterations to Employability Skills and Personal Development Planning (PDP) Skills - Alterations to students learning hours. - Updating Resources and books. 4.3 - Alterations to Learning Outcomes to comply with new IChemE guidelines following Engineering Council AHEP4. 4.2 Attendance requirements is added: In line with the Academic Engagement and Attendance Procedure, Students are defined as academically engaged if they are regularly engaged with timetabled teaching sessions, course-related learning resources including those in the Library and on Moodle, and complete assessments and submit these on time. Please refer to the Academic Engagement and Attendance Procedure at the following link: Academic engagement and attendance procedure . 4.1 - Removal of Membrane separations and addition of drying process to the summary of the module section. - Update of the list of Indicative Resources. - Update of continuous assessment component elements to: i) written assignment worth 10% and a class test worth 5% of the final mark and ii) laboratory reports worth 15% of the final mark. - Minor edit to the Employability Skills and Personal Development Planning (PDP) Skills section. - Update of learning activities to: 9 hours Tutorials/Synchronous Support Activity, 9 hours Practical Based learning and 146 hours independent study

	4.0 Amendment of topics and amendment of formative assessment. 3.9 Addition of the book: “Particle Technology and Separation Processes” to the list of Indicative Resources. 3.8 Addition of formative assessments as part of assessment categories 3.7 Addition of laboratory exercises as part of learning activities. Amendment of student learning hours and assessment categories to reflect this. Replacement of class tests with written assignments and lab reports. 2 hours for giving feedback to students on their learning activities are included in "Tutorial/Synchronous Support Activity". 3.6 Implement KIS changes. Edit of module summary to spell out the details of the size reduction processes. Addition of a new learning outcome to reflect this. Replacement of two assignments with class tests 3.5 Change of module coordinator Minor edit of the module summary Change of code of module pre-requisite Change of CRN Change of Exam duration.

Assessment: (also refer to Assessment Outcomes Grids below)
Assessment will be based on the following:
Assessment 1 – Final written exam 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 following elements: i) a class test worth 5% of the final mark ii) written assignment worth 10% of the final mark iii) laboratory reports worth 15% of the final mark. Further details, and the academic calendar when assessment is likely to feature, will be provided within the Module Information Pack
(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**
Unseen open book	✓	✓	✓	✓		70	3

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**
Class test (written)	✓	✓	✓	✓		5	1
Design/ Diagram/ Drawing/ Photograph/ Sketch	✓	✓		✓		10	0
Report of practical/ field/ clinical work	✓	✓	✓			15	0
Combined Total for All Components						**100%**	**4 hours**