University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Unit Operations 1			
Code: ENGG09038	**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 aims to give students of the chemical engineering degrees a broad appreciation of several separation processes that are key to the process industry.

The separation processes studied here are:

- Evaporation (including single- effect and multi-effect evaporators, boiling point rise , and other designs for energy saving, such as vapour recompression and vacuum operation, with basic economic
- analysis).
- Crystallisation.

Binary and multicomponent distillation in continuous mode, including vapour/liquid equilibrium (VLE), Gibbs' phase rule, bubble and dew point calculations for ideal and non-ideal mixtures, the use of the isothermal flash equation, and shortcut and rigorous distillation calculations.

- Various solid separation processes, including sedimentation, elutriation, and centrifugation, and
- thickening.
- Membrane separations.

Mixing of liquids examines the calculation of power requirements of mixers via dimensionless analysis, the use of baffles and choice of impellers.

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 - safe laboratory working; Successful : autonomous, driven and resilient.

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	Identify, analyse and size separation processes using experimental, tabulated, literature and other numerical data.
L2	Discuss critically the selection of appropriate equipment for the separation of materials in process plant, with appreciation that the products may present hazards that the original materials did not.
L3	Demonstrate ability to obtain and critically evaluate experimental data by set procedures and safety guidelines.

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 evaporators, crystallisers, dryers, distillation columns and solids separators, demonstrating a critical understanding of a selection of their principal theories, principles, concepts and terminology
Practice: Applied Knowledge and Understanding	SCQF Level 9. Use algebraic techniques to design appropriate separators with the correct dimensions. Use graphical techniques to design appropriate separators with the correct dimensions. Use iterative numerical techniques to design appropriate separators with the correct dimensions. Practice routine searches for thermophysical data of fluids
Generic Cognitive skills	SCQF Level 9. Undertake critical analysis and derivation of distillation formulae from first principles Be able to compare suggested solutions with expected values

Communication, ICT and Numeracy Skills	SCQF Level 9. Make formal presentations on pilot plant data 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: ENGG09037	**Module Title:** Chemical Process Principles
	Other:	or suitable alternative
Co-requisites	**Module Code:**	**Module Title:**

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 therefore involves a diversity of teaching and assessment methods suitable to 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, industrial process plant visit trip, completion and submission of written and oral coursework making use of appropriate forms of IT and VLE, and independent study.	
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
Laboratory/Practical Demonstration/Workshop	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: C.J. Geankoplis, A H Hersel and D H Lepek, Transport Processes and Separation Process Principles Prentice Hall, 5th Edition, 2018 W. McCabe, J. C. Smith, and P. Harriott, Unit Operations of Chemical Engineering, McGraw Hill, 7th Edition, 2014 J. F. Richardson, J. R. Harker, and J. R. Backhurst, Chemical Engineering Particle Technology and Separation Processes-Volume 2, Butterworth Heinemann, 5th Edition, 2002 R. Sinnott and G. Towler, Chemical Engineering Design: SI Edition, Butterworth-Heinemann, 6th Edition, 2019 G. F. C.Rogers and Y. R. Mayhew, Thermodynamic and Transport Properties of Fluids, Blackwell, 5th Edition, 1994 E. R. Henley, J. D. Seader, and D. K. Roper, Separation Process Principles, Wiley, 4th Edition, 2016
(**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)

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	Cristina Rodriguez
External Examiner	R Ocone

Accreditation Details	TThis module is part of the BEng (Hons) Chemical Engineering accredited by IChemE
Version Number	4 Assessment updated

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 will be based on the following: (a) Unseen Closed Book Class Test worth 50% of the final mark, and
(b) continuous assessment worth 50% of the final mark. The continuous assessment component in this module will consist of the following elements: (i) written assignment worth 25% of the final mark, (ii) laboratory reports worth 25% 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 Handbook.)

Assessment Outcome Grids (**See Guidance Note)**

Component 1

Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Unseen Closed Book Class Test	✓	✓		50	2

Component 2

Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Design/ Diagram/ Drawing/ Photograph/ Sketch	✓	✓	✓	25	0
Report of practical/ field/ clinical work	✓	✓	✓	25	0

Combined Total For All components	100%	2 hours