University of the West of Scotland
Module Descriptor

Session:2024/25

Title of Module: Clean Technology and Resource Management			
Code: CEWM11008	**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:	Andrew Hursthouse		

Summary of Module

The public awareness of the 'climate emergency' has drawn people's attention to what we do in our day to day lives in terms of how products are made and the impact on the wider environment. The need for cleaner, more innovative products has been seen by the increase in hybrid and electric vehicles, and the increased use of renewables in our energy mix. As such there is a continued need for innovation within different sectors whilst ensuring our natural resources are protected.

This module develops your skills and knowledge in the field of clean technologies, i.e. those processes that can enhance sustainable resource use and minimise pollution during resource extraction, processing, and the manufacturing process. The central objectives of the module are to raise awareness of the drivers and opportunities for development of clean technologies and to enhance CT-relevant scientific, engineering and management skills across a range of industrial sectors.

The module examines the economic, societal and environmental drivers for innovation in CT and reviews points in industrial processes where opportunities exist for such applications. Principles of concept development, design and engineering in CT are then introduced. These concepts and principles are then applied to a range of industrial and utility sectors, whilst including resource recovery and recycling.

On completion of this module you will gain the following Graduate Attributes:

- **Critical thinking** as you work **collaboratively** on a **research-minded** assignments
- **Problem solving** and **effective communication**
- Your research will be **innovative** and **creative** producing **resilient** clean technology solutions to environmental challenges.

Module Delivery Method

Face-To-Face	Blended	Fully Online	HybridC	HybridO	Work-based Learning
			✓		

Face-To-Face
Term used to describe the traditional classroom environment where the students and the lecturer meet synchronously in the same room for the whole provision.

Blended
A mode of delivery of a module or a programme that involves online and face-to-face delivery of learning, teaching and assessment activities, student support and feedback. A programme may be considered "blended" if it includes a combination of face-to-face, online and blended modules. If an online programme has any compulsory face-to-face and campus elements it must be described as blended with clearly articulated delivery information to manage student expectations

Fully Online
Instruction that is solely delivered by web-based or internet-based technologies. This term is used to describe the previously used terms distance learning and e learning.

HybridC
Online with mandatory face-to-face learning on Campus
HybridO
Online with optional face-to-face learning on Campus
Work-based Learning
Learning activities where the main location for the learning experience is in the workplace.

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)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
✓						

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1		Term 2	✓	Term 3	

Learning Outcomes: (maximum of 5 statements)
On successful completion of this module the student will be able to: L1. Make critical, informed and reasoned arguments regarding the drivers for application of clean technologies in the context of managing resources in a sustainable manner. L2. Be able to explain in detail comprehension of the general principles of concept development, design and engineering relevant to the application of clean technologies. L3. Demonstrate an ability to apply CT concept development and design principles at an appropriate level across a range of industrial, utility and agricultural sectors and to innovate in at least one such sector ensuring resources are management in a sustainable manner.

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. Reasoned and rigorously argued explanation of the drivers for innovation in clean technologies. Detailed explanation of the principles of concept development and engineering design of clean technology applications. Reasoned and rigorously argued explanation of current practice and the potential for future innovation in clean technology over a range of common industrial and utility sectors.
Practice: Applied Knowledge and Understanding	SCQF Level 11. Apply clean technology design and engineering principles to the solution of real-world problems and the exploitation of entrepreneurial and socially beneficial opportunities. Synthesise information and gain a coherent understanding of

	principles and practices in framing a technological solution to an environmental problem or opportunity.	
Generic Cognitive skills	SCQF Level 11. Effectively conceive, plan and execute a programme of design for a clean technology application. Seek, acquire and synthesise relevant information from the primary technical literature in support of a clean technology application. Seek, acquire and synthesise relevant information from the primary technical literature in support of a clean technology application.	
Communication, ICT and Numeracy Skills	SCQF Level 11. Effectively communicate the results of technically complex design and engineering applications to audiences of diverse technical levels as appropriate to the professional setting, using a range of oral, written and graphical media. Comprehend and apply relevant mathematical principles and software systems to the conception, design and development of clean technology applications.	
Autonomy, Accountability and Working with others	SCQF Level 11. Work co-operatively as part of a professional team to analyse information, formulate a solution and present it to stake-holders, superiors and the wider population. In both leadership and team-member roles, apply skills in motivation, conflict resolution, mutual respect and collegiate decision-making. Work independently towards a set goal in a timely and efficient manner. Apply safe working practices in the context of appropriately-formulated risk assessment.	
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	
Classes are delivered by both UWS staff and visiting experts from industry and government. When opportunities arise, visits will be made to local industrial and utility sites where Clean Technologies are being applied in practice. Assessment includes an individual research exercise, a group design project and an end-of-trimester written examination. All class materials and links to web resources are available on the UWS Virtual Learning Environment.	
Learning Activities During completion of this module, the learning activities	**Student Learning Hours** (Normally totalling 200 hours):

undertaken to achieve the module learning outcomes are stated below:	(Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	30
Tutorial/Synchronous Support Activity	6
Independent Study	164
	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:
James R. Mihelcic, Julie B. Zimmerman (2010) Environmental Engineering: Fundamentals, Sustainability, Design. John Wiley & Sons. ISBN 978-0-470-16505-8. 720 pages

T. E. Graedel, B Allenby (2009) Industrial Ecology and Sustainable Engineering International Version. Pearson Education. ISBN13: 9780138140342
ISBN10: 0138140340. 352 pages.

ISBN10: 0138140340. 352 pages.

Ron Pernick, Clint Wilder (2007) The Clean Tech Revolution. 1st edition. Harper Business. ISBN-10: 006089623X, ISBN-13: 978-0060896232. 320 pages

Daniel A. Vallero, Chris Brasier (2008) Sustainable design: the science of sustainability and green engineering. John Wiley. ISBN 0470130628. 332 pages.

David Allen, David Shonnard (2012) Green Engineering: Environmentally Conscious Design of Chemical Processes (2nd Edition). Prentice Hall. ISBN-10: 0132657074, ISBN-13: 978-0132657075. 704 pages.

Documents and other resources available on the UWS Virtual Learning Environment.

On-line peer-reviewed academic journals available through the UWS Library and Learning Resource Centre e-journal list.

(**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)

Engagement Requirements

In line with the Academic Engagement 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 the relevant learning platform, and complete assessments and submit these on time. Please refer to the Academic Engagement Procedure at the following link: Academic engagement procedure

Supplemental Information

Programme Board	Physical Sciences
Assessment Results (Pass/Fail)	No

Subject Panel	Physical Sciences
Moderator	Dr Iain McLellan
External Examiner	A Oke
Accreditation Details	
Changes/Version Number	2.19 Equality & Diversity statement updated; accreditation details updated; Learning Outcomes updated; Module Summary updated.

Assessment: (also refer to Assessment Outcomes Grids below)
Assignment: Research exercise to make a critical evaluation of the drivers for the application of clean technologies in the context of economics, politics and environmental impacts, normally with reference to a particular industrial sector or case study. Assessment type - essay. Worth 30% of the final mark.
Assignment: Team-based exercise intended to apply the general principles of concept development, design and engineering relevant to the application of clean technologies, and to apply them in the context of an industrially-relevant design project. Assessment types - preliminary oral presentation followed by a written group project report. Worth 40% of the final mark.
Assignment: Intended to assess both breadth and depth of comprehension, knowledge and reasoning skills across the range of topics covered in the module, normally to include a major, discursive, critical discussion of some aspect of clean technologies. Worth 30% of the final mark.
(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)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Essay	✓			30	0

Component 2

Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Dissertation/ Project report/ Thesis		✓	✓	30	0

Presentation		✓	✓	10	2

Component 3

Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Essay	✓	✓	✓	30	0
Combined Total For All Components				100%	2 hours

Footnotes

A. Referred to within Assessment Section above

B. Identified in the Learning Outcome Section above

Note(s):

1. More than one assessment method can be used to assess individual learning outcomes.
2. Schools are responsible for determining student contact hours. Please refer to University Policy on contact hours (extract contained within section 10 of the Module Descriptor guidance note).
   This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

Equality and Diversity

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. This module has lab-based / site visit teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations. More information on the University's EDI policies can be accessed at: https://www.uws.ac.uk/about-uws/uws-commitments/equality-diversity-inclusion/

UWS Equality and Diversity Policy

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)