Module Definition Form (MDF)

Module code: MOD009176	**Version:** 1 **Date Amended:** 07/Feb/2023

1. Module Title
Sustainable Environmental Design and Engineering Management Systems

2a. Module Leader
Alireza Sanaei

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
7

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:			

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

This module is led by a multidisciplinary investigative project. Weekly topics are introduced to provide ideas to the teams for your research and study. The case study involves the production and presentation of a case study-based research and investigation of a ‘sustainable design and management’ scenario. Each team will demonstrate a proposeed management plan for designing an innovative engineering solution to the sustainability design problem, considering the societal, user, business, and customer needs and requirements for health and safety, diversity, inclusion, cultural, environmental, commercial, and code of conduct.

The weekly lectures will provide you with a conceptual foundation across several disciplines, including Engineering management systems, green energy systems, sustainable environmental design and development, behavioural changes, and policies. The module also addresses topics unique to energy technologies, such as Smart Grid, interfacing, and design issues. This module will introduce you to basic Sustainable Technologies, ranging from traditional topologies to modern renewable energy-based systems, including energy storage systems such as fuel cells. Hybrid electrical vehicle principles are also briefly introduced. The module builds a smooth transition from background material to more complex systems and applications, in the modern context of sustainability and will further develop a critical awareness and understanding of engineering operating systems including production, manufacturing, planning and plant resources required for a business to operate efficiently and reliably satisfy customers' needs and including requirements for health and safety, diversity, inclusion, cultural, environmental, commercial, and code of conductwhile staying true to their sustainability strategy.

The module will further provide you with an in-depth study of the operating systems used in complex technical organisations to identify good practices and the tools and techniques to systematically develop and improve the efficiency of such systems, including the use of discrete event simulation.

For the assignment and in the development of your case study, you will exercise your analytical thinking and show your understanding of different roles within a sustainability and engineering management team and you will demonstrate your aptitude to exercise initiative and personal responsibility, which may be as a team member or leader.

6b. Outline Content

The module content is delivered through a combination of lectures and a multidisciplinary group project.

Topics include:

• Sustainability/sustainable development.

• Strategies & Policies International, European and UK targets for sustainable development.

• the UK Research and Innovation mandates and UKRI Net Zero progress.

• Review of Renewable Energy technologies, classifications, regulatory and planning issues including:

- Solar Energy. PV systems.

- Wind Energy. Descriptions, classification, targets. On / off-shore

- Hydropower. Microhydro. Wave / tidal power.

- Geothermal power technologies. Hydrogen Technologies.

- Electrolysis. Fuel Cell systems. Carbon Storage (CCS).

- Smart Grid concept & infrastructure.

• Life cycle analysis of the component or sub-assembly (specifying cradle to cradle or cradle to grave, unit of account £ or $ and tonnes of carbon). End of life (WEE & design for reuse).

• Behavioural change towards sustainability (policy context)

• Electric / hybrid electric vehicles – main issues, market penetration, barriers, infrastructure.

• Evaluation of solutions, Cost Benefit Analysis and Investment Strategies.

• Critically evaluate a company's sustainability strategy and determination of an appropriate operating system to economically fulfil that strategy.

• Managing the societal, user, business, and customer needs and requirements for health and safety, diversity, inclusion, cultural, environmental, commercial, and code of conduct.

• Modelling an organisation as a system and critically reviewing the efficiency of the systems.

• Systematic understanding of the economic consequences of inefficiency and examination of viable alternative systems.

• Use of discrete event simulation software in identifying system bottlenecks and economical and sustainable solutions to problems

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources

Matlab Simulink and Simscape

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Demonstrate knowledge of sustainable design, national/local policies, and strategies, along with the ability to critically appraise and evaluate sustainable development solutions and suggest appropriate solutions to meet a combination of societal, user, business, and customer needs.
2	Knowledge and Understanding	Illustrate knowledge and understanding of modern renewable energy sources and systems, in the context of a sustainable society and green lifecycle process considering political and economical requirements.
3	Intellectual, practical, affective and transferrable skills	Propose a management plan for designing an engineering solution, considering the societal, user, business, and customer needs and requirements for health and safety, diversity, inclusion, cultural, environmental, commercial, and code of conduct.
4	Intellectual, practical, affective and transferrable skills	Function effectively as an individual and member or leader of the team and evaluate own and team performance; Communicate engineering matters effectively to a non-technical audience.

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2024/5	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	36	1-4	Introduction to the project Lectures/ Lab/ Tutorial 3 Hours per week
Other teacher managed learning	0	None	None
Student managed learning	114	1-4	Self-study
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Coursework	1-2	60 (%)	Fine Grade	40 (%)
Individual 2000 Words Report, maps to Engineering Council Learning Outcome M7					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Practical	3-4	40 (%)	Fine Grade	40 (%)
20 minutes, the equivalent of 1000 words, oral presentation followed by Q&A, maps to Engineering Council Learning Outcome M5, M16, M17					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]