Module Details	
Module Title	Sustainability and Innovation for Engineers
Module Code	ENB7011-B
Academic Year	2024/5
Credits	20
School	School of Engineering
FHEQ Level	FHEQ Level 7

Contact Hours

Type	Hours
Tutorials	1. To develop a comprehensive and in-depth knowledge on the interrelated concepts of sustainability and circular economy, with a systems thinking approach. 2. To develop a comprehensive and in-depth knowledge on innovation management fundamentals, strategies and models, emphasising a sustainability perspective.
Tutorials	The concept of Sustainability. The concept of Circular Economy. Sustainable Materials Management. Circular Business Models. Assessing Circular Systems. Applying software for Systems Thinking and Systems Dynamics modelling to analyse, evaluate, design and simulate business models. Fundamentals of Innovation Management. Technology strategies. Models of Innovation. Assessing Innovation Projects. Collaboration.
Tutorials	1. The module is delivered through a series of face-to-face lectures and tutorials, supported by appropriate case study material. The learning materials (both lecture notes and case study materials) use a coherent problem-based approach, introducing sustainability, circular economy, and innovation management fundamentals. In addition, lectures provide the opportunity to undertake guided reading to understand and address a variety of themes related to sustainability, circular economy, and innovation management. 2. Face-to-face tutorial sessions offer the opportunity to interact more with students, reinforce learning, provide formative feedback and to further develop interpersonal and intercultural skills. As a distinctive approach to promote teamworking, participation in multidisciplinary group discussions and presentation skills, tutorial sessions include group discussions to analyse case studies with relevant sustainability and innovation management issues. Representatives of the discussion groups present their findings and reflection at the end of the sessions. Formative feedback is provided by the instructor and peers. This approach helps to develop interpersonal and intercultural skills, and it also allows to promote a sense of programme identity and to enhance a cohesive student experience. Thus, tutorial sessions promote the development of team-work, oral presentation, e-learning, peer feedback and self-learning skills. 3. Computer lab sessions allow students to apply system dynamics principles to build and simulate business models. 4. Directed study hours are dedicate to self-study, reading study materials before lectures and tutorials, research and preparation of coursework. 5. The module is aligned with the CDIO innovative educational framework (Conceive, Design, Implement, Operate). This means that our learning strategy will be to encourage students to work in teams to Conceive potential solutions, Design new products, processes or services, Implement (or model) and test those designs and processes, and elaborate on the Operation of the product or solution. Thus, you will have numerous opportunities to be an active learner, to think and execute as an engineer leading real-world projects and reflect on operational and implementation aspects.
Directed Study	160
Laboratories	4
Lectures	20
Tutorials	16

Availability

Occurrence	Location / Period
BDA	University of Bradford / Semester 2

Module Aims
1. To develop a comprehensive and in-depth knowledge on the interrelated concepts of sustainability and circular economy, with a systems thinking approach. 2. To develop a comprehensive and in-depth knowledge on innovation management fundamentals, strategies and models, emphasising a sustainability perspective.

Outline Syllabus
The concept of Sustainability. The concept of Circular Economy. Sustainable Materials Management. Circular Business Models. Assessing Circular Systems. Applying software for Systems Thinking and Systems Dynamics modelling to analyse, evaluate, design and simulate business models. Fundamentals of Innovation Management. Technology strategies. Models of Innovation. Assessing Innovation Projects. Collaboration.

Learning Outcomes	
Outcome Number	Description
01	Critically analyse the concepts of sustainability and circular economy.
02	Analyse and develop circular business models.
03	Apply software for the system dynamics modelling technique to develop, quantitatively analyse, evaluate and simulate circular business models.
04	Critically analyse the innovation management process.
05	Apply a variety of innovation management tools and methods.
06	Apply IT and data presentation skills and quantitative analysis related to the application of principles of innovation management, apply communication and oral presentation skills, acquire problem solving and teamwork abilities in multidisciplinary groups and develop self-learning and personal reflection.

Learning, Teaching and Assessment Strategy

1. The module is delivered through a series of face-to-face lectures and tutorials, supported by appropriate case study material. The learning materials (both lecture notes and case study materials) use a coherent problem-based approach, introducing sustainability, circular economy, and innovation management fundamentals. In addition, lectures provide the opportunity to undertake guided reading to understand and address a variety of themes related to sustainability, circular economy, and innovation management.

2. Face-to-face tutorial sessions offer the opportunity to interact more with students, reinforce learning, provide formative feedback and to further develop interpersonal and intercultural skills. As a distinctive approach to promote teamworking, participation in multidisciplinary group discussions and presentation skills, tutorial sessions include group discussions to analyse case studies with relevant sustainability and innovation management issues. Representatives of the discussion groups present their findings and reflection at the end of the sessions. Formative feedback is provided by the instructor and peers. This approach helps to develop interpersonal and intercultural skills, and it also allows to promote a sense of programme identity and to enhance a cohesive student experience. Thus, tutorial sessions promote the development of team-work, oral presentation, e-learning, peer feedback and self-learning skills.

3. Computer lab sessions allow students to apply system dynamics principles to build and simulate business models.

4. Directed study hours are dedicate to self-study, reading study materials before lectures and tutorials, research and preparation of coursework.

5. The module is aligned with the CDIO innovative educational framework (Conceive, Design, Implement, Operate). This means that our learning strategy will be to encourage students to work in teams to Conceive potential solutions, Design new products, processes or services, Implement (or model) and test those designs and processes, and elaborate on the Operation of the product or solution. Thus, you will have numerous opportunities to be an active learner, to think and execute as an engineer leading real-world projects and reflect on operational and implementation aspects.

Summative assessment (100%) is through an individual coursework (3000 words) to analyse a case study of a technological innovation, including the application of innovation management tools and the system dynamics modelling technique to support this analysis. The analysis also considers sustainability and circular economy aspects. Thus, the design of the assessment considers ensuring academic integrity aspects.

As part of the assessment, students in this module must complete the Academic Integrity Induction Online Course. This will allow students to prepare better for the assessment and understand better the importance of referencing and avoid plagiarism issues.

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Coursework - Written	Individual coursework - analysis of a case study of a technological innovation.3000 words	100%
Formative		Oral presentations during group discussions in tutorial sessions.	N/A

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.