

WM9I4-15 Sustainable and Intelligent Product Life Cycle Management

27/28

Department

WMG

Level

Taught Postgraduate Level

Module leader

Helen Ascroft

Credit value

15

Module duration

4 weeks

Assessment

100% coursework

Study locations

University of Warwick main campus, Coventry Primary

Hong Kong Polytechnic University, Hong Kong

Description

Introductory description

This module introduces students to Sustainable and Intelligent Product Life Cycle Management (PLM), examining how complex products can be designed, managed and transformed to respond to sustainability requirements, increasing digitalisation and organisational change. It develops critical understanding of life cycle thinking, systems perspectives and circular economy design principles, alongside the use of sustainability metrics, standards and assessment tools. The module critically explores digital PLM architectures, data integration and the application of intelligent and AI enabled technologies to support evidence based decision making across design, manufacture, use, support and end of life phases. Through a combination of lectures, applied workshops and industry informed input, students develop the ability to analyse real world PLM practices, synthesise innovative and sustainable life cycle strategies and exercise independent professional judgement when evaluating ethical, financial and strategic trade offs in complex product systems. This module is delivered over 4 weeks. Where this module is delivered at an overseas centre the module will be delivered over 1week.

Module aims

This module aims to show how Product Life Cycle Management (PLM) is used in today's organisations to make products more sustainable, digitally enabled and responsive to change. Students will learn how to use life cycle thinking, systems approaches and circular economy ideas to assess and improve sustainability performance across design, manufacture, use and end of life stages. The module also introduces students to digital and AI enabled tools, to show how data and intelligent technologies support better decision making. Through real world examples, workshops and applied activities, students will develop the skills to bring together sustainability and advanced PLM methods to design improved product life cycle strategies, while building confidence in making well reasoned professional judgements about ethical, financial and strategic trade offs relevant to an advanced engineering or management career.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Indicative Lecture Sessions

1. Product Life Cycle Management in a Sustainability Driven World
2. Life Cycle Thinking, Systems Perspectives and the Circular Economy
3. Sustainability Metrics, Standards and Assessment Tools
4. Digital PLM Architectures and Data Integration
5. Intelligent and AI Enabled Technologies in PLM
6. Sustainable Product Design and Development Strategies
7. Manufacturing, Supply Chains and Responsible Operations
8. Use Phase, Asset Management and End of Life Strategies
9. Managing Change, Risk and Disruption in PLM
10. Professional Judgement, Ethics and Future Directions in PLM

Learning outcomes

By the end of the module, students should be able to:

- Critique product life cycle management approaches to assess sustainability impacts across all stages of product development and use. [AHEP: M2, M4, M7]
- Appraise intelligent digital technologies, including AI and data driven tools, to support sustainable product development and life cycle decision making. [AHEP M1, M3]
- Synthesise sustainability principles with advanced product development and PLM methodologies to design innovative and intelligent life cycle strategies. [AHEP M5, M7, M16, M17]
- Exercise independent judgement in the selection, justification and application of sustainable and intelligent PLM solutions to complex, real world or research informed scenarios. [AHEP M2, M4, M5, M16]

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

On successful completion of this module, students will be able to:

- Critique PLM approaches to assess sustainability across the product life cycle.
- Apply life cycle and circular economy principles to improve sustainability performance.
- Use and evaluate sustainability tools (e.g. LCA) for evidence-based decisions.
- Assess digital and AI-enabled PLM systems and their limitations.
- Develop integrated, sustainable life cycle strategies.
- Evaluate trade-offs in complex PLM decisions.
- Apply professional judgement in selecting PLM solutions.
- Consider ethical and strategic implications of sustainability and digitalisation.

Transferable skills

- Critical thinking: identifying, clarifying, questioning, interpreting, analysing, evaluating, arguing, contextualising, synthesising.
 - Information literacy: understanding academic information; understanding information outside of academia, valuing and using information, articulating information need, searching for information, managing information, selecting information, using and creating information.
 - Sustainability: decision making, social engagement, community citizenship, global citizenship.
 - Communication: creating discourse, presentation and public speaking, adapting output to audience, active listening, creative writing, professional writing, nonverbal communication.
 - Teamwork: collaboration, managing team processes, building and managing rapport, inclusive practices, overcoming and negotiating obstacles, creativity in teams, managing tasks in a team, virtual teamwork.
 - Organisation awareness: organisational research, talent management, achieving organisational goals, networking, social impact, organisational cultural awareness, commercial awareness, external stakeholder awareness, market awareness.
 - Professionalism: responsiveness to change, accountability & responsibility, time management, project management, risk management, operating autonomously, resilience, personal impact, leadership, emotional literacy, negotiation, working under pressure, attention to detail, creative thinking.
 - Problem solving: problem design, intuitive problem solving, creative problem solving, co-creating, innovation, logical processing, cyclical reflection, decision making, learning from failure.
 - Self-awareness: self-awareness, self-reflection, critical reflection, learning adaptability, responsiveness to opportunity, personal worldview.
-

Study

Study time

Type	Required
Lectures	16 sessions of 1 hour (11%)
Demonstrations	2 sessions of 1 hour (1%)
Practical classes	10 sessions of 1 hour (7%)
Online learning (scheduled sessions)	1 session of 2 hours (1%)
Online learning (independent)	15 sessions of 1 hour (10%)
Private study	45 hours (30%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Further research into applications of taught material. Case study work is required, hence some time will be spent researching literature.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment component			
Individual case study analysis	70%	42 hours	Yes (extension)
Students critically analyse a real world or research informed product system and evaluate how Product Life Cycle Management (PLM) approaches and intelligent digital technologies are used to improve sustainability performance across the product life cycle.			

Reassessment component

Analysis essay	No
Students critically examine a product system to identify the limitations of current PLM approaches and intelligent digital technologies, and justify opportunities for improving sustainability outcomes.	

	Weighting	Study time	Eligible for self-certification
Assessment component			
Group work: Intelligent Life Cycle Strategy Design Project	20%	12 hours	No
Students work in teams to design an innovative, intelligent PLM strategy for a complex product system operating under sustainability, digitalisation and change pressures.			

Reassessment component

Individual work: Intelligent Life Cycle Strategy Design Project			Yes (extension)
Recorded presentation: Focus on one aspect group project exercise.			

Assessment component

Individual reflective statement based on group work assessment	10%	6 hours	Yes (extension)
Structured individual reflection focussing on:			
• Personal contribution and learning • Development of professional judgement • Relevance to future engineering or leadership practice			

Reassessment component

Reflective statement			No
Structured reflective statement on personal development focusing on one learning outcome.			

Feedback on assessment

In-class debrief of performance on synchronous activity; written feedback will be provided in a report for all coursework assignments.

Availability

Courses

This module is Core for:

- Year 1 of TWMS-H1S3 Postgraduate Taught Engineering Business Management (Full-time)