ES3E4-15 Life Cycle Engineering of Manufacturing Systems

24/25

Department
School of Engineering
Level
Undergraduate Level 3
Module leader
Simoni Da Ros
Credit value
15
Module duration
10 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

ES3E4-15 Life Cycle Engineering of Manufacturing Systems

Module aims

This module integrates and consolidates students' understanding of manufacturing systems' entire life cycle behaviour. It focuses on providing students with the knowledge and understanding of environmental, economic and social modelling frameworks applied to manufacturing systems, so that such models can be used to optimise the life cycle of product systems from a financial and/or environmental perspective. By modelling a given manufacturing system in detail, students will develop an understanding of goal and scope, inventory analysis, flows (such as materials, cash, process and information) and impact assessment methods.

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.

- Fundamentals of Life Cycle Engineering – definitions and principles.
- Fundamentals of Life Cycle Analysis – introduction to LCA and frameworks; benefits and limitations of LCA; software, databases and their capabilities; impact assessment methods; interpretation and reporting; data quality and uncertainty; sensitivity analysis.
- Fundamentals of Environmental Life Cycle Costing and Social Life Cycle Assessment.
- Optimisation of whole lifecycle of MS – decision making and trade-offs.

Learning outcomes

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

- Explain the fundamental principles of life cycle analysis (LCA), including application, reporting requirements, and impact assessment methods (C7, M7).
- Select appropriate models, tools, and data required to evaluate the different life phases of a manufacturing system (C2, M2, C4, M4, C16(D), M16(D)).
- Design and conduct a full LCA of a manufacturing system using appropriate software (C5, M5, C6, M6, C7, M7, C16 (D), M16(D)).
- Distinguish between life cycle engineering design paradigms such as ‘cradle-to-gate’ & ‘cradle-to-cradle’ in order to evaluate their applicability in a given manufacturing system (C7, M7, C13, M13).
- Interpret and optimise the life cycle of a manufacturing system from an economic and/or environmental perspective. (C7, M7, C13, M13)
- Communicate effectively on life cycle evaluation of manufacturing systems matters, in a clear and sensitive manner which is appropriately varied according to different audiences (C17, M17).

Indicative reading list

- Klöpffer, W., Grahl, B., Life Cycle Assessment: a guide to best practice. Wiley-VCH, 2014.
- Hauschild, M. Z., Rosenbaum, R. K., & Olsen, S. I. Life Cycle Assessment – Theory and Practice, Springer International Publishing AG, 2018.
- Zio, E.; The Monte Carlo Simulation Method for System Reliability and Risk Analysis, Springer-Verlag London 2013
- Yang, G., Life Cycle Reliability Engineering, Wiley, 2007
- Hitomi, K., Manufacturing Systems Engineering, Taylor & Francis, 1996

View reading list on Talis Aspire

Subject specific skills

Ability to conceive, make and realise a component, product, system or process
Ability to develop economically viable and ethically sound sustainable solutions
Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality
Ability to seek to achieve sustainable solutions to problems and have strategies for being creative and innovative
Ability to be risk, cost and value-conscious, and aware of their ethical, social, cultural,

environmental, health and safety, and wider professional engineering responsibilities

Transferable skills

Exercise initiative and personal responsibility, including time management, which may be as a team member or leader
Apply problem-solving skills, information retrieval, and the effective use of general IT facilities
Function effectively as an individual, and as a member or leader of a team, operating within, and contributing to, a respectful, supportive and cooperative group climate.
Be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.

Study

Study time

Type	Required
Lectures	7 sessions of 1 hour (5%)
Seminars	8 sessions of 1 hour (5%)
Supervised practical classes	3 sessions of 1 hour (2%)
Online learning (independent)	11 sessions of 1 hour (7%)
Other activity	4 hours (3%)
Private study	117 hours (78%)
Total	150 hours

Private study description

117 hours of self-study to complete the module's teaching and learning activities and assessments.

Other activity description

Tutorials. Please note that tutorials involve interactive openLCA software exercises. Tutorials will be held in person and will require the use of a computer.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A6

	Weighting	Study time
Group Presentation 20 minutes. Including peer assessment	40%	
Individual report 12-page individual report	60%	

Feedback on assessment

Each group will receive written feedback on their presentations.
Written comments on submitted assignment.
Support through office hours (2 hours weekly).

Availability

Courses

This module is Core for:

- Year 3 of UESA-HH75 BEng Manufacturing and Mechanical Engineering
- Year 4 of UESA-HH74 BEng Manufacturing and Mechanical Engineering with Intercalated Year
- Year 3 of UESA-HH76 MEng Manufacturing and Mechanical Engineering

This module is Core optional for:

- Year 3 of UESA-H115 MEng Engineering with Intercalated Year
- UESA-HH77 MEng Manufacturing and Mechanical Engineering with Intercalated Year
    - Year 3 of HH77 Manufacturing and Mechanical Engineering MEng with Intercalated Year
    - Year 4 of HH77 Manufacturing and Mechanical Engineering MEng with Intercalated Year
- Year 3 of UESA-H11L Undergradaute Engineering (with Intercalated Year)

This module is Optional for:

- Year 3 of UESA-H113 BEng Engineering
- Year 3 of UESA-H114 MEng Engineering
- Year 4 of UESA-H115 MEng Engineering with Intercalated Year
- UESA-H11L Undergradaute Engineering (with Intercalated Year)
    - Year 3 of H11L Engineering (with Intercalated Year)
    - Year 4 of H11L Engineering (with Intercalated Year)

This module is Option list A for:

- Year 4 of UESA-H111 BEng Engineering with Intercalated Year
- UESA-H112 BSc Engineering
    - Year 3 of H112 Engineering
    - Year 3 of H112 Engineering

This module is Option list B for:

- Year 3 of UESA-HN15 BEng Engineering Business Management
- Year 4 of UESA-HN13 BEng Engineering Business Management with Intercalated Year