# ES3E4-15 Life Cycle Engineering of Manufacturing Systems

## 23/24

**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

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## Description

### Introductory description

ES3E4-15 Life Cycle Engineering of Manufacturing Systems

### Module aims

This module seeks to integrate and consolidate students' understanding of the full life cycle behaviour of manufacturing systems. By modelling in detail, a given manufacturing system, a greater understanding of goal and scope, inventory analysis, flows (such as materials, cash, process and information) and impact assessments will be developed within the module.

### 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.

1. Fundamentals of Life Cycle Engineering – definitions & principles
2. Fundamentals of Life Cycle Analysis – introduction to LCA & frameworks, benefits & limitations of LCA, impact assessment methods, interpretation & reporting, tools and their

capabilities
3. Optimisation of whole lifecycle of MS – decision making and trade-offs.

## Learning outcomes

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

- 1. Identify different models, tools and data required for the different life phases of a manufacturing system (MS).(C2, M2, C4, M4, C16 (D), M16(D))
- 2. Understand the theory of life cycle analysis (LCA) including application, reporting requirements, impact assessment methods. (C7, M7)
- 3. Design and conduct a full LCA of a MS using appropriate software. (C7, M7, C5, M5, C6, M6, C16 (D), M16(D))
- 5. Distinguish between life cycle engineering design paradigms such as ‘cradle-to-gate’ & ‘cradle-to-cradle’ in order to evaluate their applicability in a given MS. (C7, M7, C13, M13,
- 8. Interpret and optimise the life cycle of MS from an economic and/or environmental perspective. (C7, M7, C13, M13)

## Indicative reading list


1. Hauschild, Michael Z.; Rosenbaum, Ralph K.; Olsen, Stig I., Life Cycle Assessment – Theory and Practice, Springer International Publishing AG, 2011.
2. Zio, Enrico; The Monte Carlo Simulation Method for System Reliability and Risk Analysis, Springer-Verlag London 2013
3. Yang, G., Life Cycle Reliability Engineering, Wiley, 2007
4. Hitomi, K., Manufacturing Systems Engineering, Taylor & Francis, 1996


## 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
Communicate (written and oral; to technical and non-technical audiences) and work with others
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 | 10 sessions of 1 hour (7%) |
| Seminars | 20 sessions of 1 hour (13%) |
| Supervised practical classes | 3 sessions of 1 hour (2%) |
| Private study | 117 hours (78%) |
| Total | 150 hours |

### Private study description

117 hours of self-study in order to complete assessments for the module.

## Costs

No further costs have been identified for this module.

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## Assessment

You must pass all assessment components to pass the module.

### Assessment group A5

| | Weighting | Study time |
|---|---|---|
| Group Presentation<br>20 minutes. Including peer assessment | 40% | |
| Individual assignment<br>4500 word assignment | 60% | |

### Feedback on assessment

Open feedback on group presentation
Written comments on submitted assignment.
Support through office hours.

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## 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