

Module specification

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Module Code	ENG6D4
Module Title	Continuous Improvement and Lean
Level	6
Credit value	20
Faculty	FACE
HECoS Code	100202
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Industrial Engineering (Mechanical)	Core
BEng (Hons) Mechanical Engineering with Manufacture	
BEng (Hons) Mechanical Engineering	

Breakdown of module hours

Learning and teaching hours	18 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	18 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	36 hrs
Placement hours	0 hrs
Guided independent study hours	164 hrs
Module duration (Total hours)	200 hrs

Module aims

This module integrates advanced theoretical study with applied laboratory investigation. Students critically evaluate techniques, interpret data, and justify design or methodological decisions within a professional context. The combination of theory and practice cultivates independent learning, innovation, and readiness for individual project or dissertation work.

This module aims to introduce students to the core principles of lean methodologies and their application within manufacturing processes and management systems. Drawing on the Toyota Production System as a central framework, students will engage with case studies and real-world industrial challenges to select and apply appropriate lean tools and techniques. Continuous improvement is embedded throughout the module, with a focus on enhancing efficiency, sustainability, and environmental performance.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Describe and explain the principles of the Toyota Production System and select and evaluate technical literature and other sources of information to address complex manufacturing problems using lean methodologies (AHEP-4 C2, C6).
2	Evaluate the environmental and societal impact of design solutions of complex products for recycling and investigate their sustainability and how a product's life cycle can be extended to minimise adverse impacts (AHEP-4 C7).
3	Select and apply problem solving methodologies, such as FMEA, Six Sigma and Triz to solve complex models in a simulated industrial environment and recognise the limitations of the techniques employed (AHEP-4 C12).

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1: Written Assignment

The module is assessed through a written assignment designed to evaluate students' achievement of Learning Outcomes 1–3.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1,2,3	Written Assignment	3000	100	N/A

Derogations

Credits shall be awarded by an Assessment Board for those modules in which a pass mark 40% has been achieved, with a minimum mark of 30% in each assessment element.

Learning and Teaching Strategies

Learning combines theoretical exploration with applied laboratory investigation to bridge conceptual understanding and professional competence. Students critically analyse data, test approaches, and evaluate outcomes in practical settings. Blended delivery through the Virtual Learning Environment supports flexibility and reflection. Tutorials focus on independent enquiry, innovation, and readiness for project or dissertation work.

Welsh Elements

This module will be delivered through the medium of English; however, students have the option to submit their assessments in the medium of Welsh. While this module is not currently offered fully through Welsh, Welsh language support and guidance are available, and some learning materials or tutorial discussions may incorporate Welsh elements where appropriate. To further promote bilingual learning, all students have the opportunity to take the 20-credit *Welsh for STEM* short course, designed to develop confidence and subject-specific language skills in both English and Welsh.

Indicative Syllabus Outline

Lean Manufacturing Principles and Toyota Production System: Introduction to the history, evolution, and modern applications of lean manufacturing, with detailed study of the Toyota Production System and its role in developing a culture of continuous improvement and operational excellence.

Lean Implementation and Line Management: Examination of managing lean manufacturing systems, including the evaluation of technical literature, case studies, and real-world practices to address complex manufacturing challenges.

Waste Reduction and Value Stream Optimisation: Analysis of waste elimination within product development and production value streams, considering efficiency, environmental impact, and sustainable resource use.

Sustainability and Lifecycle Thinking: Evaluation of lean approaches to extending product life cycles, improving recyclability, and minimising environmental and societal impacts through sustainable design and manufacturing practices.

Problem-Solving Methodologies: Application of structured problem-solving techniques such as FMEA, Six Sigma, and TRIZ to model and address complex manufacturing and production issues.

Application and Limitations of Lean Techniques: Critical application of problem-solving tools within lean environments, including recognition of their limitations and suitability in different industrial contexts.

Indicative Bibliography

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads:

M. L. George, *The Lean Six Sigma Pocket Toolbox*. New York, NY, USA: McGraw-Hill, 2004.

Other indicative reading:

N. Patel, *Practical Project Management for Engineers*. Boston, MA, USA: Artech House, 2019.

Inc. BarCharts, *Lean Six Sigma – Quick Study*. Boca Raton, FL, USA: BarCharts Inc., 2016.

J. K. Liker, *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, 2nd ed. New York, NY, USA: McGraw-Hill, 2021.

K. Schwab, *The Fourth Industrial Revolution*, 4th ed. London, UK: Portfolio Penguin, 2017.

Plus, various others to be signposted on Moodle.

Administrative Information

For office use only	
Initial approval date	June 2026
With effect from date	September 2026
Date and details of revision	
Version number	1