

Module Code:	ENG769
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Module Title:	Industry 4.0 Manufacture & Production
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Level:	7	Credit Value:	20
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Cost Centre(s):	GSAC	JACS3 code:	J500
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School:	Applied Science, Computing & Engineering	Module Leader:	Martyn Jones
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Scheduled learning and teaching hours	40 hrs
Guided independent study	160 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
MSc Engineering (Mechanical Manufacture)	✓	<input type="checkbox"/>

Pre-requisites
N/A

Office use only

Initial approval: 19/06/2018
 With effect from: 01/09/2018
 Date and details of revision:

Version no:1
 Version no:

Module Aims

- To create a coherent lean production system;
- To build a culture to support excellence and relentless improvement;
- To apply appropriate methodologies for transforming your facility to lean manufacturing;
- To use TRIZ and Six Sigma in engineering manufacturing industries
- To understand and implement Design for Manufacture and Assembly (DFMA) methodologies
- To introduce the student to the principles of Industry 4.0 (fourth industrial revolution), and the current trend of automation, smart sensors and data exchange in manufacturing

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

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

Key Skills

At the end of this module, students will be able to		Key Skills	
1	Critically analyse and develop a lean product development model	KS1	KS5
		KS7	KS6
		KS10	
2	Show a systematic understanding of the Toyota Production System	KS3	KS4
		KS5	
3	Utilise problem solving methodologies, such as, DFMEA, Six Sigma and TRIZ	KS3	
4	Demonstrate a conceptual understanding of Design for Manufacture and Assembly (DFMA)	KS1	KS6
			KS9
5	Identify how industry 4.0 can use disruptive technologies to advance production and assembly methodologies	KS1	KS6
		KS7	
			KS9
6	Demonstrate an understanding of how intelligent automation and sensor technology relates to lean production systems and the Toyota Production System	KS1	KS7

Transferable skills and other attributes

1. Communication
2. Time management and organisation
3. Problem solving
4. Information handling including numeracy

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Assessment:

Indicative Assessment Tasks:

Assessment 1: The report is in two sections: The first section of the report will outline how DFMA can be used to reduce production and assembly time for a given component. The second section of the assignment is a consideration on how Industry 4.0 practices could be used to further improve the design.

Assessment 2: Examination to include (but not limited to) Toyota Production System, Lean Manufacture and assembly, problem solving methods and Industry 4.0 principles.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	4, 5 ,6	Report	50		2000
2	1, 2, 3, 5	Examination	50	2 hours	

Learning and Teaching Strategies:

A series of lectures with student-led seminars and small group practical activities. Directed learning using library and internet resources will be facilitated using Moodle.

Syllabus outline:

History and Modern Applications of Lean Manufacturing.

Managing the Lean Manufacturing Line.

The Toyota Production System, Building a Culture to Support Excellence and Relentless Improvement.

Problem Solving methods and processes

Eliminating Waste in the Product Development Value Stream.

Case study to incorporate how lean manufacture into a traditional manufacturing setup is implemented.

How Design for Manufacture and Assembly can reduce waste and make a leaner production process

Discuss the possibilities of the fourth industrial revolution. The 9 design Industry 4.0 design principles are discussed and how it incorporates emerging technical advancement to optimise manufacturing

Case studies on how industry 4.0 has changed production and assembly.

Indicative Bibliography:

Essential reading

Liker, J.K and Trachilis, G. (2014) Developing Lean Leaders at All Levels: A Practical Guide, Lean Leadership Institute Publications

Other indicative reading

Alasdair Gilchrist (2016) Industry 4.0: The Industrial Internet of Things; Apressa

Morgan, J. and Liker, J.K. (2006) The Toyota Product Development System: Integrating People, Process and Technology, Productivity press

Subhas Chandra Mukhopadhyay (2014) Internet of Things: Challenges and Opportunities (Smart Sensors, Measurement and Instrumentation), Springer

Nof, S.Y.; Wilhalm, W.E. and Warnecke, H. (1997) Industrial Assembly, Chapman and Hall
Liker, J.K. (2004) The Toyota Way, McGraw Hill

Eric D Knapp (2014) Industrial Network Security: Securing Critical Infrastructure Networks for Smart Grid, SCADA, and Other Industrial Control Systems; Syngress