

## Module specification

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Module Code	ENG786
Module Title	Digital Manufacture
Level	7
Credit value	20
Faculty	FAST
HECoS Code	100202
Cost Code	GAME

### Programmes in which module to be offered

Programme title	Is the module core or option for this programme
MSc Engineering (Mechanical Manufacture) MSc Engineering (Mechanical Manufacture) with Advance Practice MEng Mechanical Engineering	Core

### Pre-requisites

None

### Breakdown of module hours

Learning and teaching hours	25 hrs
Placement tutor support	0 hrs
Supervised learning e.g., practical classes, workshops	5 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
<b>Total active learning and teaching hours</b>	<b>30 hrs</b>
Placement / work-based learning	0 hrs
Guided independent study	170 hrs
<b>Module duration (total hours)</b>	<b>200 hrs</b>

For office use only	
Initial approval date	22 <sup>nd</sup> Aug 2022
With effect from date	Sept 2022
Date and details of revision	
Version number	1

## Module aims

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- 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
- To understand and implement Design for Manufacture and Assembly (DFMA) methodologies and
- To envisage how products will be recycled or disassembled after use.
- To evaluate reverse engineering procedures, whilst understanding intellectual property and patents.
- To understand digital manufacturing methodologies and how the design process must evolve to match technology trends.

## Module Learning Outcomes - at the end of this module, students will be able to:

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In addition to the module learning outcomes, students will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: **M1, M2 & M5**

1	Identify how industry 4.0 can use disruptive technologies to advance production and assembly methodologies.
2	Critically analyse how design for manufacturing and assembly can optimise the costs and lead times of products
3	Demonstrate a conceptual understanding of digital manufacturing methodologies.

## Assessment

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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 One:** A time constrained examination covering all learning outcomes. Analytical and descriptive problem-based questions proposed, the student will not have the choice in the questions to be answered to fully assess the whole learning outcomes. Assessment one is a written examination (3 hrs.) and represents 100% of the overall module mark.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1-3	Examination	100%

## Derogations

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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.

## Learning and Teaching Strategies

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A series of workshop style lectures with student-led seminars and computer tutorials. Directed learning using library and internet resources will be facilitated using Moodle. This module will also follow the ALF (Active Learning Framework) guidelines, which will include alternative methods of assessment and a blended approach to delivery, with some theory and software sessions being delivered online (depending on requirements and student experience).

## Indicative Syllabus Outline

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- 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.
- The Toyota Production System, Building a Culture to Support Excellence and Relentless Improvement.
- Introduction to concurrent engineering, design for manufacturing, design for assembly.
- DFM/DFA guidelines, feature-based design, virtual manufacturing, quantitative evaluation methodologies, rapid prototyping, integrated CAD/CAM systems.
- Reverse engineering and its applications in design
- Case studies of products that have undergone DFMA
- How designing parts for additive manufacture differs from conventional design
- 3D printing technologies and how we can implement these into production.
- Recycling and upcycling methodologies.

## Indicative Bibliography:

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### Essential Reads

G. Boothroyd, et al., *Product Design for Manufacture and Assembly*. [Online]. Bosa Roca: CRC Press, 2011.

### Other indicative reading

G. Alasdair, *Industry 4.0: The Industrial Internet of Things*. Apress, 2016.

J. Hugh, *Engineering Design, Planning, and Management*. 2<sup>nd</sup> ed. Academic Press, 2021.

J. Soldatos, et al., *The Digital Shopfloor - Industrial Automation in the Industry 4.0 Era: Performance Analysis and Applications*. Aalborg: River Publishers, 2019.

Plus, various others to be signposted on Moodle.

## **Employability skills – the Glyndŵr Graduate**

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Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

### **Core Attributes**

Engaged  
Creative  
Ethical

### **Key Attitudes**

Commitment  
Curiosity  
Resilience  
Confidence  
Adaptability

### **Practical Skillsets**

Digital Fluency  
Organisation  
Critical Thinking  
Communication