

<b>Module Title:</b>	Industry 4.0	<b>Level:</b>	6	<b>Credit Value:</b>	20
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<b>Module code:</b>	ENG669	<b>Is this a new module?</b>	YES	<b>Code of module being replaced:</b>	
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<b>Cost Centre:</b>	GAME	<b>JACS3 code:</b>	H790
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<b>Trimester(s) in which to be offered:</b>	1, 2 & 3	<b>With effect from:</b>	September 16
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<b>School:</b>	Applied Science, Computing & Engineering	<b>Module Leader:</b>	James Robinson
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Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
<b>Module duration (total hours)</b>	<b>200 hrs</b>

<b>Programme(s) in which to be offered</b>	Core	Option
BEng (Hons) Industrial Engineering	<input type="checkbox"/>	<input checked="" type="checkbox"/>

<b>Pre-requisites</b>
None

<b>Derogations</b>	
A derogation from regulations has been approved for this module which means that whilst the pass mark is 40%, each element of assessment requires a minimum mark of 30% for the module to be passed overall.	
Office use only	
Initial approval June 16	
APSC approval of modification <i>Enter date of approval</i>	Version 1
Have any derogations received SQC approval?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

**Module Aims**

This module will 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. The student will understand how Industry 4.0 integrates smart sensors, Ethernet based communication networks and cloud storage to optimise production and increase production flexibility.

**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	
1	Investigate features requirements of a commodity sensor for the integration into a digital factory. Consider the advantages (and disadvantages) of adapting discrete sensors for 'Internet of Things' (IOT) applications	KS2	KS3
		KS6	
2	How intelligent automation and sensor technology promotes sustainable production.	KS1	KS7
		KS5	KS9

3	Identify how existing automation systems can be adapted and developed to achieve the requirements of Industry 4.0. How can RFID systems and Fieldbus technology to promote efficient manufacturing		
4	Examine the benefits and challenges of Industry 4.0 i.e. Security of information technology.	KS8	

**Assessment:**

Assignments and case studies totalling 100%

A typical assignment may be;

**Example 1**

Develop a device specification for an IOT ready proximity sensor i.e. process data, parameterisation and diagnostics data.

**Example 2**

Using PROFIBUS, PROFINET, IO-Link to undertake innovative projects.

**Case Study**

Evaluate the security challenges of the IOT and cloud data storage system. How to mitigate risk by developing policies and procedures.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2 & 3	Coursework	60		2500
2	4	Case Study	40		1500

**Learning and Teaching Strategies:**

Presentation will be through a series of lectures, tutorials, practical lab sessions and assignments using suitable computer packages where appropriate.

Case Studies will be used to promote student's research and investigative skills.

Problem Based Learning – The problem will be based upon certain aspects of a system design, whereby the students, in small groups, will provide a solution to a design problem for a given sensor system. This learning process will be facilitated by the module leader.

**Syllabus outline:**

- Understand the term Industry 4.0 means the fourth industrial revolution. It incorporates emerging technical advancement to optimise manufacturing.
- Examine what “Things” refer to in the definition Internet of Things (IOT), and how any physical object with an IP address can be connected via a network. How does Industry 4.0 relate to IOT’s for Industrial Application (IIOT)
- Develop an application to control a device using a PLC and Web interface. How a web server acts as a gateway between user and programmable controller.
- The potential risks of connecting devices to IP based system, and how this can be mitigated using security policies. Why Infosec policies and device based firewalls are import to protect assets from malicious attacks from the internet.

**Bibliography:**

**Essential reading**

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

**Other indicative reading**

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

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