Module specification

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Module Code	ENG5AH
Module Title	Mechatronics Application & Manufacturing Systems
Level	5
Credit value	20
Faculty	FAST
HECoS Code	100170
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng (Hons) Production Engineering	Core
FdEng Industrial Engineering (Manufacturing and Production)	Core

Pre-requisites

None

Breakdown of module hours

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

For office use only	
Initial approval date	11/09/19
With effect from date	11/09/19
Date and details of revision	30/01/20 admin update of derogation

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	Sept 22: addition of FdEng Industrial Engineering (Manufacturing and Production)
Version number	3

Module aims

This module aims to develop knowledge of electro-mechanical interfacing and the use of microcontroller/microprocessors to control sensor/actuator systems. Students will be given the opportunity to apply their knowledge by completing practical design and implementation tasks. Integrated manufacturing systems will be discussed and students will learn how machining cells are integrated into factory wide operations.

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

1	Apply principles of Business finance and accounting to justify the value of engineering technology investments and apply benefits management.
2	Explain and analyse the stages of planning and implementing integrated manufacturing systems besides the basic principles of machine tool operation and fixture design for automated operations and be able to design simple fixtures and robot end effectors.
3	Apply the underlying concept in how to design functional electronic systems and analogue/digital circuits from component level, and how to wire, assemble and test electronic circuits and equipment in line with organisational standards.
4	Recognise the different types of sensor used in automation and how control systems can be used to model production cells, mitigate errors in machining and integrate machines, and their importance in designing robust systems.
5	Develop a machine vision solution to a practical problem of sensory-motor control system, configure hardware/software tools, and test, analyse and evaluate its behaviour.

In addition to the module learning outcomes, students will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: F13 for FdEng Industrial Engineering (Manufacturing and Production) and C13 for BEng (Hons) Production Engineering.

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 One: A single case-study to cover outcomes 1, 2 and 3. An example would be an investigation into the specific integrated manufacturing systems within the students workplace, the value of engineering technology investments in it and role of data science in decision making.

Assessment Two: A practical investigation to cover outcomes 4 and 5.

The assessment is about solving a practical problem of sensory-motor control by using vision system and demonstrate a working system.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1,2,3	Coursework	50
2	4,5	Coursework	50

Derogations

A derogation from regulations has been approved for this module which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Learning and Teaching Strategies

The module will be presented to students through a specified series of detailed presentations combined with intermittent interactive sessions to enhance students' learning and assisted by notes given to the student at the start of each lecture. The learning experience will be further supported by tutorials and self-study work.

Case studies will be the backbone of the learning experience. Wherever possible real industrial problems will be used as an analysis subject.

Presentations and reports are designed to develop the involvement of the students in the module and develop their sense of inquisition.

Indicative Syllabus Outline

1. Business finance and accounting
The engineering technology investments and benefits management

2. Manufacturing systems engineering
Planning and implementing integrated manufacturing systems, principles of machine tool operation (including maintenance, repair and condition monitoring), principles of tool and fixture design for automated operations, robotics in automation, the different types of sensor used in automation, control strategies of machining processes (errors mitigation), machining cells integration, production machines management and planning.

3. Industry 4.0
Principles of Data Science, data-driven decision making and automation, the role of data science in industry 4.0 and manufacturing.

4. Mechatronics
Types and range of signals, A-D and D-A convertors, Signal conditioning, Microprocessor systems, Embedded systems, Design functional electronic systems and circuits, Assemble, wire and test electronic circuits and electrical equipment, in line with organisational standards, Artificial Intelligence, Concepts of software design methods, Electromechanical devices, Vision Systems (hardware and software), Analysis of existing mechatronic systems

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update. Please *ensure correct referencing format is being followed as per University Harvard Referencing Guidance.*

Essential Reads

M. P. Groover, *Automation, Production Systems and Computer-Integrated Manufacturing*. Harlow: Pearson, 2015.

Other indicative reading

D. Karnop, *System Dynamics of Mechatronic Systems, John Wiley & Sons, 2012.*

D. Alciatore, Introduction to Mechatronics and Measurement Systems. New York: McGraw-Hill, 2018.

A. Gilchrist, *Industry 4.0: The Industrial Internet of Things*. Apressa, 2016.

N. Slack and R. Johnston, Operations Management. 9th ed. Harlow: Pearson, 2019.

A. Kuttan, *Introduction to Mechatronics.* Oxford: Oxford Higher Education, 2007.

D. Shetty and R. Kolk, *Mechatronics System Design;* CL Engineering, 2012.

W. Bolton, *Mechatronics: Electronic Control Systems in Mechanical Engineering*. 7th ed. Harlow: Pearson, 2018.

J. Miltenburg, *Manufacturing Strategy: How to Formulate and Implement a Winning Plan,* 2nd ed. Productivity Press, 2005.

Employability skills – the Glyndŵr Graduate

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
Enterprising
Creative
Ethical

Key Attitudes

Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets

Digital Fluency
Organisation
Leadership and Team working
Critical Thinking
Emotional Intelligence
Communication