Prifysgol Wrecsam
Wrexham University

Module specification

When printed this becomes an uncontrolled document. Please access the Module Directory for the most up to date version by clicking on the following link: Module directory

Module Code	ENG6E1
Module Title	Mechatronic Applications
Level	6
Credit value	20
Faculty	FACE
HECoS Code	100188
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Industrial Engineering (Mechatronics)	Core

Breakdown of module hours

Learning and teaching hours	21 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	21 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**42 hrs**
Placement hours	0 hrs
Guided independent study hours	158 hrs
Module duration (Total hours)	**200 hrs**

Module aims

This module deepens students' understanding of advanced concepts through critical analysis and synthesis of knowledge gained in earlier study. Learners explore specialised topics, evaluate current practices, and consider innovative approaches within their field. The emphasis is on independent enquiry and professional application of complex ideas.

This module aims to introduce students to mechatronic systems and their application in real-world industrial automation. It develops students' understanding of the integration of mechanical and electrical/electronic control systems, enabling them to conceptualise, model, and design fit-for-purpose mechatronic solutions that meet defined industrial specifications.

Module Learning Outcomes

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

1	Select and apply appropriate computational and analytical techniques (including modelling and simulation) to analyse mechatronic systems for industrial automation, recognising the limitations of the methods used.
2	Evaluate and justify the selection of suitable commercial off-the-shelf sensors, actuators, interface electronics and control platforms for specified mechatronic applications, drawing on relevant technical literature and datasheets (AHEP-4 C4).
3	Design, implement and test, including a behavioural/investigative study, of application-specific mechatronic systems to meet a stated industrial specification, and communicate the design rationale and performance clearly using appropriate engineering conventions.

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: Portfolio

Students will undertake an in course portfolio, including a short presentation, in which they apply and analyse appropriate modelling tools, evaluate and justify the selection of commercial components (such as sensors, actuators, and interface electronics), and design, implement, and test (or behaviourally investigate) a mechatronic solution against a defined industrial automation specification.

The assessment requires students to communicate their design rationale, results, and identified limitations in a clear and structured manner.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Portfolio	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 and teaching focus on critical engagement with advanced topics through seminars, lectures, and directed research activity. Students analyse and evaluate complex information to develop higher-level understanding and independent thought. Online resources complement in-person sessions, enabling flexible study and preparation for project-based or professional application. Tutorials and supervision encourage academic independence and critical reflection.

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

Mathematical Modelling of Dynamic Systems: Development and application of mathematical models for mechanical and electrical systems, including empirical and linear time invariant (LTI) models, with consideration of model structure selection, parameter identification, and estimation.

Model Based Design and Simulation: Application of model-based design and simulation techniques using industry relevant software tools and case studies, with critical evaluation of assumptions, validity, and limitations of the models.

Transducer and Actuator Selection: Analysis and selection of suitable sensors and actuators for industrial automation applications, including analogue and digital interfaces (e.g. pressure, thermal, chemical, electromechanical, and optical sensing), based on performance requirements.

Control Platforms and Electronic Interfacing: Evaluation and justification of control hardware and interfacing solutions, including microcontrollers (MCUs), PLCs, and ADC/DAC systems, supported by structured analysis of technical literature, datasheets, and case studies.

Integrated Mechatronic System Design: Design and implementation of integrated mechatronic systems using industry standard modelling and simulation tools, with a focus on industrial automation and process improvement.

Testing, Validation, and Communication: Practical investigation, prototyping, testing (or behavioural analysis) of systems, supported by clear technical communication through a structured portfolio/logbook and presentation that explains design decisions, performance outcomes, and identified limitations against the original specification.

Indicative Bibliography

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

Essential Reads:

V. S. Bagad and S. L. Gadhave, *Mechatronics*, 3rd ed. Pune, India: Technical Publications, 2023.

G. C. Onwubolu, *Mechatronics: Principles and Applications*, 1st ed. Elsevier (Butterworth-Heinemann), 2005.

Other indicative reading:

D. Shetty and R. A. Kolk, *Mechatronics System Design (SI Version),* 2nd ed. CL Engineering/Cengage Learning, 2010.

R. H. Bishop, Ed., *The Mechatronics Handbook*, 2nd ed., 2 vols. CRC Press, 2007.

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