

## Module specification

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|                             |                                           |
|-----------------------------|-------------------------------------------|
| <b>Module Code</b>          | ENG7B1                                    |
| <b>Module Title</b>         | Automation, Robotics, and Control Systems |
| <b>Level</b>                | Level 7                                   |
| <b>Credit value</b>         | 20                                        |
| <b>Faculty</b>              | FACE                                      |
| <b>HECoS Code</b>           | 100188                                    |
| <b>Cost Code</b>            | GAME                                      |
| <b>Pre-requisite module</b> | N/A                                       |

### Programmes in which module to be offered

| <b>Programme title</b>                   | <b>Core/Optional/Standalone</b> |
|------------------------------------------|---------------------------------|
| MSc Engineering (Advanced Manufacturing) | Core                            |
| MSc Engineering (Electrical)             | Core                            |

### Breakdown of module hours

|                                                             |                |
|-------------------------------------------------------------|----------------|
| Learning and teaching hours                                 | 18 hrs         |
| Placement tutor support hours                               | 0 hrs          |
| Supervised learning hours e.g. practical classes, workshops | 18 hrs         |
| Project supervision hours                                   | 0 hrs          |
| <b>Active learning and teaching hours total</b>             | <b>36 hrs</b>  |
| Placement hours                                             | 0 hrs          |
| Guided independent study hours                              | 164 hrs        |
| <b>Module duration (Total hours)</b>                        | <b>200 hrs</b> |

### Module aims

This module fuses advanced theoretical study with applied experimentation, enabling learners to interrogate, test, and extend current professional and research practice. Through a combination of conceptual exploration and laboratory enquiry, students cultivate critical evaluation, leadership, and evidence-based decision-making skills suitable for professional or doctoral progression.

This module aims to develop advanced, systems-level understanding of automation, robotics, and control technologies, enabling students to model, analyse, and optimise complex engineered systems for modern industrial applications.

### Module Learning Outcomes

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

|          |                                                                                                                                                                                                                                                         |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | Critically apply advanced mathematical and engineering modelling techniques to analyse and optimise the performance of complex automated and robotic systems (AHEP4 M1).                                                                                |
| <b>2</b> | Evaluate and synthesise different automation and robotic system architectures using natural science and engineering principles, to identify performance constraints, integration challenges, and opportunities for system-level improvement (AHEP4 M1). |
| <b>3</b> | Design and justify an improved automation or control strategy using simulation outputs, analytical methods, statistical analysis, and critical assessment of complex system requirements and constraints (AHEP4 M1).                                    |

### 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:

Students will complete a structured technical report in which they analyse an automated and/or robotic system and propose evidenced improvements based on modelling or simulation. Further details on structure and expectations will be provided in the assignment brief

| Assessment number | Learning Outcomes to be met | Type of assessment | Duration/Word Count | Weighting (%) | Alternative assessment, if applicable |
|-------------------|-----------------------------|--------------------|---------------------|---------------|---------------------------------------|
| 1                 | 1-3                         | Coursework         | 4000                | 100           | N/A                                   |

### Derogations

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

### Learning and Teaching Strategies

Learning integrates advanced theoretical study with applied experimentation, enabling students to test and extend current professional and research practice. Face-to-face sessions are complemented by virtual discussions, simulations, and case studies to support analytical depth. Tutorials and supervision focus on independent enquiry, innovation, and leadership in addressing complex challenges.



## 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

- Critically evaluate and design advanced system integration strategies and architectures for complex automated and robotic systems
- Develop and apply high-fidelity modelling and simulation techniques to analyse and optimise automated and robotic system performance
- Critically analyse and synthesise advanced concepts in robotics, including kinematics, dynamics, and motion planning for complex applications
- Design, implement, and critically assess intelligent, adaptive, and advanced control strategies for autonomous and automated systems
- Critically evaluate human–automation interaction, system ergonomics, and coordinated behaviour within complex socio-technical systems
- Apply advanced methods in safety engineering, reliability analysis, and verification and validation to ensure robustness and compliance in automated systems.

## Indicative Bibliography

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

### Essential Reads:

Correll, N. (2020) Introduction to Autonomous Robots. 3rd ed. Available at: <https://open.umn.edu/opentextbooks/textbooks/316>

### Other indicative reading:

Kuphaldt, T. R., *Lessons in Industrial Automation (Industrial Automation & Control Textbook Series)*, Creative Commons 4.0, [Online]. Available: <https://control.com/textbook/>.

## 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              |

