Programme Specification

Mechatronics Engineering [Frenchay]

Version: 2024-25, v2.0, 26 Apr 2024

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Section 1: Key Programme Details

Part A: Programme Information

Programme title: Mechatronics Engineering [Frenchay]

Highest award: BEng (Hons) Mechatronics Engineering

Interim award: BEng Mechatronics Engineering

Interim award: DipHE Mechatronics Engineering

Interim award: CertHE Mechatronics Engineering

Awarding institution: UWE Bristol

Teaching institutions: UWE Bristol

Study abroad: No

Year abroad: No

Sandwich year: No

Credit recognition: No

School responsible for the programme: CATE School of Engineering, College of Arts, Technology and Environment

Professional, statutory or regulatory bodies: Not applicable

Modes of delivery: Full-time, Sandwich

Entry requirements: For the current entry requirements see the UWE public website.

For implementation from: 01 September 2023

Programme code: H73J13

Section 2: Programme Overview, Aims and Learning Outcomes

Part A: Programme Overview, Aims and Learning Outcomes

Overview: Inspired by the key technologies of the fourth industrial revolution (Industry 4.0) and the idea of the factories of the future (the smart factories), this programme in Mechatronics Engineering creates a multidisciplinary award that brings together expertise from academic staff to build and prepare the Mechatronics Engineers of the Future.

The mechatronics field has a significant impact on manufacturing processes, especially in the new era of the fourth industrial revolution and the global demand for sustainable manufacturing processes to meet the national and international targets in reducing the carbon dioxide equivalent gases that result from these processes.

This programme responds to current technological developments that impact the manufacturing process and offer potential solutions to environmental challenges we face in the industry.

This is a multidisciplinary programme, accessible/suitable to students from a wide range of STEM disciplines.

This programme is designed to support graduates in finding professional opportunities in the smart factories era: across the engineering sector in manufacturing, mechanical, electronics, and mechatronics, as well as in hardware and software development.

Students would have an understanding of a multidisciplinary field with the previously mentioned technologies and would have developed key attributes in collaborative working. We would also expect that a significant proportion of graduates from the programme would be attracted to careers in research and development organisations and also to have an entrepreneurial disposition with respect to bringing to market innovations from this field.

Also, graduates from this program are expected to forge successful careers in the development of microcontroller-based embedded systems, robotics, integration of renewable energy sources and the design of the associated power conversion systems. Alternatively, they might progress into the development of automation and control systems for various industrial processes, automotive electronics, the design of electrical machines and the development of guidance and control systems for unmanned intelligent underwater; or ground and aerial vehicles.

Features of the programme: Immersive Project Weeks create a student engineer community within the curriculum and new building.

Integrated Learning Framework and use of problem-based and project-based learning.

Industry-informed curriculum (Inspired by the key technologies of the fourth industrial revolution (Industry 4.0).

Engineering Practice modules to scaffold the journey from student engineer to graduate engineer.

Professional and personal development are embedded throughout all levels of the programme.

Interdisciplinary projects.

Real engineering problems in the core curriculum where students can explore the industrial, environmental and societal impact of discipline.

Mathematics skills aligned and taught in an engineering context.

Educational Aims: EA1: To support graduates in developing the necessary skills to work as an effective multidisciplinary team member as a graduate mechatronics engineer across the engineering sector.

EA2: To support undergraduates in acquiring the knowledge and understanding of scientific principles and methods necessary to underpin education in engineering.

EA3: To instil the requisite academic knowledge, skills and preparation for progression to study for higher degrees in appropriate engineering disciplines.

EA4: To provide insight into, and practical skills in, the creation and maintenance of complex engineering products and will explore the environmental impact of

engineering.

EA5: To develop and demonstrate an ability to integrate their knowledge and understanding of core subject material in order to solve a substantial range of engineering problems, including ones of a complex nature, either individually or as part of a team.

EA6: To develop and demonstrate an understanding of the competencies and social responsibilities required by a professional engineer in the workplace and society.

EA7: Activities to scaffold this development are embedded throughout the core curriculum to develop engineering habits of mind. to critically appraise the value and effectiveness of future engineering innovations in the field in terms of business improvement and environmental sustainability.

Programme Learning Outcomes:

On successful completion of this programme graduates will achieve the following learning outcomes.

Programme Learning Outcomes

PO1. Apply scientific and mathematical principles necessary to underpin mechatronics and mathematical methods, computational tools and notation used to evaluate, integrate and analyse fundamental mechatronics problems.

PO2. Use systems incorporating digital hardware, software, communication, processing algorithms, interfacing circuits and sensing and actuating devices.

PO3. Plan, design, model, and build mechatronics systems and be able to specify and assess technical mechatronics designs.

PO4. Apply problem-solving skills and technical knowledge, using a systems approach, to establish solutions that are fit for purpose for all stages of the product lifecycle.

PO5. Evaluate and analyse design proposals in view of their sustainability, manufacturing, financial and marketing implications.

PO6. Pursue independent study, undertake a scientific enquiry into new concepts and implement change in an engineering environment.

PO7. Communicate and operate effectively, professionally and ethically both as individuals and as members of a team.

Assessment strategy: The assessment strategy for the new curriculum is designed to connect topics and levels within the curriculum and to enable students to reflect upon their development. The assessment methods on the programme are aligned to the requirements of the Institution of Engineering and Technology (IET) who place high importance on the demonstration of authentic and verifiable learning outcomes for each individual student. This consideration can lead to a reliance on written examinations and limit the scope for project or group work activities. We have therefore widened the range of activities within our examinations to include more open book examinations, questions based on pre-seen scenarios, questions that build on practical laboratory-based activities and computer-based examinations where students demonstrate the use of software to solve engineering problems.
The above Factors influence and inform the design of this programme's assessment strategy.
In year 1 the Engineering Practice 1 module develops professional attributes and engineering habits of mind through activities and assessments that encourage reflections through a structured portfolio and presentations. As part of the portfolio, we have the concept of a "passport" where students demonstrate key professional skills such as workshop skills, library skills and health and safety awareness. This "replicates" part of the experience of an engineering apprentice but for one who is working in an academic environment.
The assessment strategies of the other core level 4 modules each designed to make sure that the content covered is connected.
Applied Artificial Intelligence is a strong example of the design as students are assessed on key technical material during or at the end of the first semester, then moving to an exercise where the knowledge and skill are assessed in the context of an engineering design problem and then with a controlled assessment at the end of the module. The written examination references and builds upon design activities undertaken during the module and provides an efficient vehicle for integrating the

different module elements and assessing individual knowledge.
The assessment strategy is programmatic and connects the two immersive project weeks with the task from the first feeding into the second, where a more technical treatment is considered bringing the content from these two modules together. The level 4 module Fundamental Mechatronics Principles feeds into the immersive project week activity. The assessment at level 4 should create the culture required for students to embrace active learning styles.
At level 5, Microcontroller Applications Group Lab provide an example of how content and assessment is developed from level 4 to level 5. The immersive project weeks are used by the project orientated modules Engineering Practice 2 and Engineering Research.
The module Engineering Practice 2 takes over from the level 4 version and is a module that relies on the importance and creation of the team with key roles allocated and the dynamics of the team monitored through a regular peer assessment process. The problem to be tackled and forms the vehicle for the assessment is designed to be motivational and accessible and is assessed through group presentation.
Engineering Research is designed to have a significant impact on our operation. Students work in groups to scope out research ideas. They then work with technical and academic staff to develop a project proposal that will be pitched as an individual presentation that will feed forward to an individual written proposal. Students should be able to start their individual level 6 project from the very start of that academic year.
In the final years of the programme, students are able to work on individual and group projects to showcase their understanding and skill as engineering practitioners. The design of the Engineering Research module will strengthen the performance, management and consistency of the Engineering Project. Optional modules provide the opportunity to pursue specialist areas, and a variety of assessment approaches are used for these modules.
The interdisciplinary Group Design and Integration Project is an exciting new development that brings mechanical, automotive, electronic engineers and roboticists together on projects that are electromechanical in nature. Typical problem fields could involve projects in biomechatronics, assistive living, autonomous vehicles, and robotics. Projects from these areas would each have the potential to

demonstrate modern developments and the impact of engineering. The assessment for this module replicates a professional environment with group design review meetings forming part of the assessment.

Student support: - Espresso Engineering and Espresso Maths drop-in support stations.

- Personality and professional strengths finding activity at the start of the programme.
- Development of group work skills and attributes.
- Academic mentors to provide continuity of support to SpLD students.
- Academic personal tutors.
- Video capture of course content delivery.
- E-assessments for rapid feedback.

Part B: Programme Structure

Year 1

Full time and sandwich students must take 120 credits from the modules in Year 1.

Year 1 Compulsory Modules (Full-time and Sandwich)

Full time and Sandwich students must take 120 credits from the modules in Compulsory modules (Full-Time and Sandwich)

Module Code	Module Title	Credit
UFMFKS-30-1	Engineering Practice 1 2024-25	30
UFMEU1-30-1	Fundamental Mechatronics Principles 2024-25	30
UFMFFT-15-1	Mathematical Modelling for Electronics and Robotics 2024-25	15
UFMEAH-30-1	Practical Electronics 2024-25	30
UFMFGT-15-1	Programming for Engineers 2024-25	15

Year 2
Full time and sandwich students must take 120 credits from the modules in Year 1.

Year 2 Compulsory Modules (Full-time and Sandwich)
Full Time and Sandwich students must take 120 credits from the modules in Compulsory modules (Full-Time and Sandwich).

Module Code	Module Title	Credit
UFMEX1-15-2	Digital Manufacturing and Industry 4.0 2025-26	15
UFMFQS-15-2	Engineering Practice 2 2025-26	15
UFMFRS-15-2	Engineering Research 2025-26	15
UFMEV1-30-2	Industrial Data Analytics 2025-26	30
UFMEW1-15-2	Industrial Internet of Things (IIoT) 2025-26	15
UFMFKA-30-2	Microcontrollers Applications Group Lab 2025-26	30

Year 3
Full time students must take 120 credits from the modules in Year 3.
Sandwich students must take 15 credits from the modules in Year 3.

Year 3 Compulsory Modules (Full Time)
Full time students must take 105 credits from the modules in Compulsory Modules (Full Time).

Module Code	Module Title	Credit
UFMF31-30-3	Applied Artificial Intelligence 2026-27	30
UFMF41-15-3	Biomechatronics 2026-27	15
UFMFX8-30-3	Engineering Project 2026-27	30
UFMFV8-15-3	Group Design and Integration Project 2026-27	15

UFMFNQ-15-3	Professionalism for Engineers 2026-27	15

Year 3 Compulsory modules (Sandwich)
Sandwich students must take 15 credits from the modules in Compulsory modules (Sandwich).

Module Code	Module Title	Credit
UFMF89-15-3	Industrial Placement 2026-27	15

Year 3 Optional Modules (Full Time)
Full Time students must take 15 credits from the module in Optional Modules (Full Time).

Module Code	Module Title	Credit
UFMFH8-15-3	Digital Signal Processing 2026-27	15
UFMFSL-15-3	Integrated Electro-Mechanical Systems 2026-27	15
UFMF71-15-3	Smart Factory Modelling and Simulation 2026-27	15

Year 4
Sandwich students must take 105 credits from the modules in Year 4.

Year 4 Compulsory Modules (Sandwich)
Sandwich students must take 105 credits from the modules in Compulsory Modules (Sandwich).

Module Code	Module Title	Credit
UFMF31-30-3	Applied Artificial Intelligence 2027-28	30
UFMF41-15-3	Biomechatronics 2027-28	15
UFMFX8-30-3	Engineering Project 2027-28	30
UFMFV8-15-3	Group Design and Integration Project 2027-28	15

Part C: Higher Education Achievement Record (HEAR) Synopsis

Mechatronics Engineering is an exciting multidisciplinary subject which combines the principles of mechanics, electronics, robotics, and computer engineering to develop sustainable systems. Combining a broad range of skills, the graduates build a solid base from which they'll be ready to solve a range of complex engineering problems. This programme provides insight and skills to create and maintain complex engineering products.

Part D: External Reference Points and Benchmarks

Description of how the following reference points and benchmarks have been used in the design of the programme:

QAA UK Quality Code for HE (October 2019)

Framework for higher education qualifications (FHEQ)

Subject Benchmark Statement for Higher Education qualifications in engineering (October 2019)

Strategy 2030

University policies

Staff research projects

IET requirements: AHEP4

Industrial Advisory Board

Part E: Regulations

Approved to University Regulations and Procedures:

https://www.uwe.ac.uk/study/academic-information/regulations-and-procedures