## SECTION 1: KEY PROGRAMME DETAILS

This section provides students with key details about their programme.

| PROGRAMME INFORMATION | |
|---|---|
| **Final Award Title** | BEng (Hons) Robotics |
| **Default Award Title (Exit Award)** | N/A |
| **Interim Award Titles (Exit Awards)** | BEng (Hons) Robotics<br>BEng Robotics<br>DIPHE Robotics<br>CERTHE Robotics |
| **Awarding Institution** | UWE Bristol |
| **Teaching Institutions** | None |
| **Partner Institutions** | None |
| **Delivery Locations** | Frenchay Campus |
| **Study Abroad / Exchange / Credit Recognition** | N/A |
| **Faculty Responsible For Programme** | Environment and Technology |
| **Department Responsible For Programme** | Engineering and Design |
| **Professional Statutory or Regulatory Body (PSRB) Links** | Institution of Engineering and Technology (IET) |
| **Apprenticeship** | N/A |
| **Mode of Delivery** | FT, SW |
| **Entry Requirements** | The University's Standard Entry Requirements<br><br>Tariff points as appropriate for the year of entry - up to date requirements are available through the courses database. |
| **For Implementation From** | Implementation from September 2020 |
| **Programme Codes** | FOR QUALITY ENHANCEMENT TEAM TO COMPLETE<br>ISIS: H671 |

| **PART B: FOR STUDENT AND ACADEMIC SERVICES COMPLETION ONLY** | |
|---|---|
| **First UVP Approval Date** | **Date of first UVP approval** |
| **Date of Last Revalidation (through Programme Enhancement Review)** | **Dates of subsequent PERs and revalidations** |
| **Next Programme Enhancement Review Date** | **Academic year in which next Programme Enhancement Review due (6 years from initial approval or last PER)** |

## SECTION 2: PROGRAMME OVERVIEW, AIMS and LEARNING OUTCOMES

This section provides students with an overview of the programme, its aims and its learning outcomes. It sets out what prospective and registered students can expect to know, understand and be able to do on successful completion of the programme.
Please write this section in the first person, addressing your prospective students.

### PART A: PROGRAMME OVERVIEW, AIMS and LEARNING OUTCOMES

**1. (Programme) Overview (c. 400 words)**

The curriculum is designed for students seeking an engineering education closely aligned to engineering practice. Technical knowledge, engineering practice, business awareness and sustainability are integrated through projects and revisited to produce confident graduates able to apply their skills to novel situations and create engineering solutions that benefit society.

Professional development is placed at the heart of the curriculum. From day one, students are taken on a journey from student engineer to graduate engineer, preparing them for life as an engineering professional. Students will identify, develop and demonstrate competencies expected of a professional engineer in the workplace. Projects and activities, embedded throughout the curriculum, are designed to develop the engineering habits of mind such as: Problem-finding, Problem-solving, Visualising, Systems Thinking, Improving, and Adapting. Foundation principles of engineering science, skills and practice are integrated throughout all years of study.

The programme is designed to provide the balance of theoretical and practical understanding needed to meet the demands of the Robotics industry for engineering practitioners, and in particular to meet the requirements for professional accreditation in partial fulfilment of CEng. Furthermore, it caters for students with both industrial and/or academic backgrounds, to develop problem solving skills and be able to demonstrate leadership in a number of engineering settings.

The Robotics programme produces graduates with a wide range of expertise relevant to the robotics and electronics industries. Roboticists are employed throughout the engineering sector in the creation, development, maintenance and improvement of engineering operations. Consequently, Robotics graduates need to be able to integrate engineering knowledge skills from across engineering and be able to be an effective member of a multidisciplinary team. The programme covers a broad range of disciplines such as, robotics principles, mechatronics, digital and analogue circuit design, kinematics, control, signal processing and project management. A number of optional modules provide a deeper level of learning into more advanced and state of the art technologies. As we move closer to a more digitally connected network of systems and devices, this programme allows students to develop expertise particularly in system design, microprocessor hardware/software design, machine vision and simulation and modeling techniques.

The BEng (Hons) Robotics programme is supported by the Bristol Robotics Laboratory (BRL). The BRL is the most comprehensive academic centre for multi-disciplinary robotics research in the UK. It is a collaborative partnership between the University of the West of England (UWE Bristol) and the University of Bristol, and home to a vibrant community of over 300 academics, researchers and industry practitioners. Together, they are world leaders in current thinking on service robotics, intelligent autonomous systems and

The ability to work in multidisciplinary teams on projects that require a broader view of the role of engineering in industry and society is developed through the core programme using project

## PART A: PROGRAMME OVERVIEW, AIMS and LEARNING OUTCOMES

weeks to bring students together in problem finding and solution spaces where students are able to interact with each other, academics and external practitioners in a range of engineering fields.

The integration of knowledge, skills and practice allows the tacking of real engineering challenges and encourage students to engage with the wider role that robotics engineers and specifically engineering habits of mind can play in tackling global challenges. This is a modern engineering curriculum designed to attract students from diverse backgrounds able to see the future role of engineering in industry and society.

### 2. Educational Aims (c. 4-6 aims)

This programme aims to:

1. support graduates to develop the necessary skills to be able to work as an effective member of a multidisciplinary team, as a graduate robotics engineer across the engineering sector.

2. support undergraduates in acquiring the knowledge and understanding of scientific principles and methods necessary to underpin an education in engineering.

3. instill the requisite academic knowledge, skills and preparation for progression to study for higher degrees in appropriate engineering disciplines.

4. The programme will provide insight into, and practical skills in, the creation and maintenance of complex engineering products and will explore the environmental impact of engineering.

5. 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.

6. develop and demonstrate an understanding of the competencies and social responsibilities required by a professional engineer in the workplace and society. Activities to scaffold this development are embedded throughout the core curriculum to develop the engineering habits of mind. As a consequence, students will be able to critically appraise the value and effectiveness of future engineering innovations in the field in terms of business improvement and environmental sustainability.

### 3. Programme Learning Outcomes (c. 6-8 outcomes)

**Programme (Learning) Outcomes (POs)**

| No. | PO Text |
|---|---|
| PO1 | Apply scientific and mathematical principles necessary to underpin Robotics and mathematical methods, computational tools and notation used in the evaluation, integration and analysis of robotics problems |
| PO2 | Use systems incorporating digital hardware, software, communication, processing algorithms, interfacing circuits and parameter sensing and actuating devices |
| PO3 | Plan, design, model and build robotic systems and be able to specify and assess technical designs |
| PO4 | Apply advanced problem-solving skills and technical knowledge, using a systems approach, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal |
| PO5 | Demonstrate a critical awareness of the manufacturing, financial and marketing implications of design proposals |

## PART A: PROGRAMME OVERVIEW, AIMS and LEARNING OUTCOMES

| | |
|---|---|
| PO6 | Pursue independent study, undertake scientific enquiry into novel and unfamiliar concepts and implement change in an engineering environment |
| PO7 | Communicate and operate effectively, professionally and ethically either as individuals or as members of a team |
| PO8 | Make considered judgements and decisions on complex engineering issues in which not all facts and consequences are accurately known |

## 4. Programme (Learning) Outcomes (POs) Mapping

| ***Programme Outcomes: Level 4 and 5 modules*** | Module No: UFMFKS-30-1 (core) | Module No: UFMFFT-15-1 (core) | Module No: UFMFGT-15-1 (core) | Module No: UFMFKT-30-1 (core) | Module No: UFMFHT-30-1 (core) | Module No: UFMFQS-15-2 (core) | Module No: UFMFRS-15-2 (core) | Module No: UFMFKA-30-2 (core) | Module No: UFMFVF-30-2 (core) | Module No: UFMFNT-15-2 (core) | Module No: UFMFLQ-15-2 (core) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PO1: | x | x | x | x | x | | | x | x | x | x |
| PO2: | | | | x | x | | | x | x | x | x |
| PO3: | | | | x | x | | | x | x | | |
| PO4: | x | | | | | x | | x | | | |
| PO5: | x | | x | | | x | | x | | | |
| PO6: | x | x | | | | x | x | x | x | x | x |
| PO7: | | x | x | x | x | x | x | x | x | x | x |
| PO8: | x | x | x | x | x | x | x | x | x | | x |
| | | | | | | | | | | | |

## 4. Programme (Learning) Outcomes (POs) Mapping

| ***Programme Outcomes: Level 6***<br><br>Option numbering indicates mutually exclusive options | Module No: UFMFX8-30-3 (core) | Module No: UFMFV8-15-3 (core) | Module No: UFMFNQ-15-3 (op 1) | Module No: UFMF89-15-3 (op 1) | Module No: UFMFTT-30-3 (core) | Module No: UFMFUT-15-3 (core) | Module No: UFMFWT-15-3 (op 2) | Module No UFMF99-15-3 (op 2) | Module No: UFMFH8-15-3 (op 2) |
|---|---|---|---|---|---|---|---|---|---|
| PO1: | x | | | | x | x | x | x | x |
| PO2: | x | x | | | x | x | x | x | x |
| PO3: | x | | | | | | x | x | x |
| PO4: | | x | x | x | x | | x | x | x |
| PO5: | x | | | | | | | | |
| PO6: | x | x | x | x | x | x | x | x | x |
| PO7: | x | x | x | x | x | x | x | x | x |
| PO8: | x | x | | | x | x | x | x | x |
| | | | | | | | | | |
| | | | | | | | | | |

## PART B: PROGRAMME STRUCTURE

### 1. Structure (Full-time)

This structure diagram demonstrates the student journey from entry through to Graduation for a typical **full-time student** including:

- level and credit requirements
- interim award titles
- compulsory and optional modules

## Year: 1

**Interim award:** CertHE Robotics requires 120 credits at the appropriate level. Please refer to UWE Academic Regulations for details.

**Compulsory modules**

| Module Code | Module Title | Level | Credit |
|---|---|---|---|
| UFMFKS-30-1 | Engineering Practice 1 | 4 | 30 |
| UFMFHT-30-1 | Applied Electronics | 4 | 30 |
| UFMFKT-30-1 | Fundamental Robotics Principles | 4 | 30 |
| UFMFFT-15-1 | Mathematical Modelling for Electronics and Robotics | 4 | 15 |
| UFMFGT-15-1 | Programming for Engineers | 4 | 15 |

## Year: 2

**Interim award:** DipHE Robotics requires 240 credits at the appropriate level. Please refer to UWE Academic Regulations for details.

**Compulsory modules**

| Module Code | Module title | Level | Credit |
|---|---|---|---|
| UFMFQS-15-2 | Engineering Practice 2 | 5 | 15 |
| UFMFRS-15-2 | Engineering Research | 5 | 15 |
| UFMFKA-30-2 | Microcontroller Applications Group Lab | 5 | 30 |
| UFMFVF-30-2 | Robot Control Systems | 5 | 30 |
| UFMFNT-15-2 | Signal Theory | 5 | 15 |
| UFMFLQ-15-2 | Introduction to Machine Vision | 5 | 15 |

## Year: 2P (Placement Year)

**Interim award:** DipHE Robotics requires 240 credits at the appropriate level. Please refer to UWE Academic Regulations for details.

**Optional module**

| Module Code | Module title | Level | Credit |
|---|---|---|---|
| UFMF89-15-3 | Industrial Placement | 6 | 15 |

## Year: 3

**Interim award:** BEng Robotics requires 300 credits at the appropriate level. Please refer to UWE Academic Regulations for details.

**Compulsory modules**

| Module Code | Module title | Level | Credit |
|---|---|---|---|
| UFMFX8-30-3 | Engineering Project | 6 | 30 |
| UFMFVA-15-3 | Group Design and Integration Project | 6 | 15 |
| UFMFTT-30-3 | Advanced Vision for Localisation and Mapping | 6 | 30 |
| UFMFUT-15-3 | Human Robot Interaction Technologies | 6 | 15 |
| **Optional modules Set 1:** Select 15 credits from | | | |
| UFMFNQ-15-3 | Professionalism for Engineers | 6 | 15 |
| UFMF89-15-3 | Industrial Placement (must be selected in year 2P) | 6 | 15 |
| **Optional modules Set 2:** Select 15 credits from | | | |
| **Module Code** | **Module title** | **Level** | **Credit** |
| UFMFWT-15-3 | Robotic System Architectures | 6 | 15 |
| UFMF99-15-3 | Intelligent and Adaptive Systems | 6 | 15 |
| UFMFH8-15-3 | Digital Signal Processing | 6 | 15 |

## PART C: HIGHER EDUCATION ACHIEVEMENT RECORD (HEAR) SYNOPSIS

Designed in conjunction with key national and multi-national employers, the Robotics programme provides graduates with the mix of skills and capabilities required by UK business for the specification, design and delivery of robotic, electronic and embedded systems and solutions, including safety critical systems, as required by the aerospace, transport, medical, military and other industries.

Delivered in a way that develops technically competent individuals who think and communicate effectively and who can conduct inquiry, solve problems, undertake critical analysis and deliver effective robotic systems solutions in a constantly changing business context. It provides a solid foundation for lifelong learning, emphasising the development of knowledge, skills and professional values essential to the practice of systems development.

## 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: AHEP3
- Industrial Advisory Board

## PART D: EXTERNAL REFERENCE POINTS AND BENCHMARKS

The learning outcomes required by the Engineering Council UK are mandatory for accredited engineering programmes. The specific outcomes are derived from the The IET Learning Outcomes Handbook for BEng programmes. There are constraints from IET that have been taken into account, for example, that a minimum of 40% written examinations across the programme is considered an acceptable form of controlled assessment. Whilst this provides a constraint on the style of assessments, it does not inhibit our integrated learning approach.

The modules have been designed to ensure adequate and appropriate coverage of these outcomes across the levels of study.

SEEC level descriptors have informed the design of the assessment of the learning outcomes.

**University strategies and policies:** This programme is a refreshed and updated version of a programme that has run for many years. It has a long tradition of accepting students from diverse backgrounds and a wide range of entry qualifications. It accommodates student entry on a part-time basis at several points within the programme as well as having a tradition of direct entry to year 2 for full-time overseas students. Modules within the programme are also delivered within partner institutions regionally and globally. Foundation degrees and higher apprenticeship schemes have been developed in conjunction with academic and industrial partners as feeders into this programme.

The new curriculum has been designed to take the best practice from the previous structure along with the introduction of the integrated learning framework. This, when combined with the new laboratories, will provide enhanced student experience.

**Employer interaction and feedback:** The Department of Engineering Design & Mathematics works with a number of industrial partners through two consortia and a newly formed industrial liaison panel. Feedback from employers during visits to placement students has also has also helped inform this revised programme. The programme provides part-time options which ensure an ongoing interaction with regional employers. This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of individual modules can be found in module specifications, available on the University's website.

## PART E: REGULATIONS

A: Approved variant to University Academic Regulations and Procedures

B: The Institution for Engineering and Technology accreditation requirements:

- All level 5 and 6 credits are considered when calculating the Degree classification.

The degree classification for the 360 credit honours degrees BEng (Hons) Electrical and Electronic Engineering, BEng (Hons) Electronic Engineering, BEng (Hons) Robotics and BEng (Hons) Electronics and Computer Engineering (or 480 credit honours degree with an integrated foundation year) is based upon all the marks achieved at level 5 and all the marks achieved at level 6. Marks achieved for level 6 credits are weighted three times the value of the marks for the level 5 credits (Paper AB16/05/07).

**Condoned Credit**
From September 2020 intake onwards to comply with conditions set out by Engineering Council UK we will only be able to condone a maximum of 30 credits across the whole programme.