STUDENT AND ACADEMIC SERVICES

PROGRAMME SPECIFICATION

Part 1: Basic Data			
Awarding Institution	University of the West of England		
Teaching Institution	University of the West of England		
Delivery Location	Frenchay Campus		
Faculty responsible for programme	Faculty of the Environment & Technology (FET)		
Department responsible for programme	Engineering Design and Mathematics		
Modular Scheme Title	FET Modular Scheme		
Professional Statutory or Regulatory Body Links	Institution for Engineering and Technology Accreditation in partial fulfilment of the requirements for CEng.		
Highest Award Title	BEng(Hons) Robotics		
Default Award Title	BEng(Hons) Robotics		
Fall-back Award Title	BEng(Hons) Robotics		
Interim Award Titles	BEng Robotics Diploma of Higher Education Robotics Certificate of Higher Education Robotics		
UWE Progression Route			
Mode(s) of Delivery	Full-Time (FT)/Sandwich (SW) with foundation year		
Codes	**UCAS: H671** **ISIS2: H671** **H67D (SW)** **H67D13 (FT)**	**JACS: H671** **HESA: H6**	
Relevant QAA Subject Benchmark Statements	Subject benchmark statements:Engineering, QAA (2015)		
First CAP Approval Date	14th November 2012	Valid from	September 2012
Revision CAP Approval Date	18th February 2014 July 2015 v1.2 June 2016 v1.3 Jan 2017 v2 15 January 2019 v3	Revised with effect from	September 2019
Version	3		
Review Date			

Part 2: Educational Aims of the Programme

The programme is designed to provide the balance of theoretical and practical understanding needed to meet the demands of engineering industries where there is a requirement for engineering practitioners with

Part 2: Educational Aims of the Programme

the skills to work at the interface between hardware and software, and in particular to meet the requirements for IET accreditation in partial fulfilment of CEng.

The Specific aims of the programme are;

- To produce graduates with a broad understanding of the discipline in conjunction with a detailed understanding of their chosen specialism; robotics.
- To prepare students for a career in robotics or an allied discipline.
- To develop students with a thorough understanding of the technologies, techniques and theories underpinning effective design, realisation and development of intelligent autonomous 'robotic' systems, and the practical skills used in their creation.
- To produce graduates with a sound understanding of the tools and techniques used to support the design and development process behind systems with embedded intelligence.
- To produce practitioners with the ability and experience to tackle the cradle-to-grave process of robotics development, from requirements capture to testing and delivery.
- To produce graduates with a clear sense of user focused design and who possess a range of tools and techniques to uncover and define user requirements.

The General aims of the programme are;

- To produce graduates with the capacity to proactively solve problems.
- To produce graduates with strong communication skills, who are able to explain their concepts to a diverse audience using a range of media.
- To prepare students for progression to further study and/or research into robotics or related disciplines.
- To develop students' independent study skills and prepare them for lifelong learning experiences.

Programme requirements for the purposes of the Higher Education Achievement Record (HEAR)

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 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 3: Learning Outcomes of the Programme

The award route provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas:

Learning Outcomes:	UFMFJ9-30-1	UFMFJ3-30-1	UFMFCA-15-1	UFMFN7-15-1	UFCFE3-15-1	UFMFR8-15-1	UFMFKA-30-2	UFMFJA-30-2	UFMFL9-15-2	UFMFLQ-15-2	UFMFA7-15-2	UFMFV7-15-2	UFMFX8-30-3	UFCFY3-15-3	UFMFMQ-15-3	UZRSSR-15-3	UFMFNF-15-3	UFMFM7-15-3	UFMF89-15-3	UFMFCL-15-3	UFMF99-15-3	UFMFH8-15-3
A) Knowledge and understanding of:																						
1. A Knowledge and understanding of scientific principles and methodology necessary to underpin their education in robotics SM1p		X						X		X		X	X	X	X			X				
2. The mathematical principles necessary to underpin their education in robotics and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems SM2p	X	X				X	X	X	X	X		X	X	X	X		X					X
3. The requirement for engineering activities to promote sustainable development ET4p	X										X		X			X		X	X			
(B) Intellectual Skills																						
1. Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of robotics SM3p	X				X		X	X	X	X		X			X	X	X		X	X	X	
2. Understanding of engineering principles and the ability to apply them to analyse key engineering processes EA1p		X	X	X		X		X		X		X	X		X				X	X		X
3. Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modeling techniques EA2p	X		X			X		X		X		X	X	X			X		X	X		X

4.	Understanding of and ability to apply a systems approach to robotics problems EA4p	X			X		X	X	X		X	X		X		X				X	X		
5.	Work with information that may be incomplete or uncertain and quantify the effect of this on the design D3p											X		X		X					X		
(C) Subject/Professional/Practical Skills																							
1.	Ability to apply quantitative methods and computer software relevant to robotics in order to solve problems EA3p	X	X				X		X	X	X	X	X	X	X	X		X		X	X	X	X
2.	Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues D2p		X						X			X		X		X		X	X	X	X	X	
3.	Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal D4p			X															X	X				
4.	Knowledge of management techniques, which may be used to achieve engineering objectives ET3p		X					X					X						X	X	X			
5.	Workshop and laboratory skills EP2p		X	X	X		X		X			X	X	X				X	X		X			
6.	Understanding of appropriate codes of practice and industry standards EP6p				X				X		X			X					X	X	X			X
7.	Understand customer and user needs and the importance of considerations such as aesthetics D1p			X				X	X		X	X	X	X		X			X	X	X			
8.	Identify and manage cost drivers D5p		X	X				X	X			X		X		X		X	X	X				X
9.	Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues ET5p				X									X					X	X	X			
10.	Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and											X		X					X		X			

	of risk assessment and risk management techniques ET6p																					
11.	Understanding of, and the ability to work in different roles within an engineering team EP9p						X						X					X		X		
(D) Transferable skills and other attributes																						
1.	Use creativity to establish innovative solutions			X				X	X		X			X		X		X	X	X	X		X
2.	Knowledge and understanding of commercial and economic context of engineering processes ET2p		X													X	X		X	X	X		
3.	Understanding of the need for a high level of professional and ethical conduct in engineering ET1p		X	X	X		X							X			X			X	X		X
4.	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology development, etc.) EP1p			X									X						X	X	X		
5.	Understanding use of technical literature and other information sources EP4p			X	X		X	X	X		X	X		X		X		X		X	X	X	X
6.	Awareness of nature of intellectual property and contractual issues EP5p			X										X						X			
7.	Understanding of appropriate codes of practice and industry standards EP6p				X				X					X					X	X	X		
8.	Awareness of quality issues EP7p										X			X		X			X	X			
9.	Ability to work with technical uncertainty EP8p				X									X				X		X	X		
10.	Ability to communicate work to technical and non-technical audiences D6p			X				X	X		X	X		X		X			X		X		

Part 4: Student Learning and Student Support

Personal Development
Each student is allocated an academic personal tutor who will ensure student engagement with the academic programme and the delivery of generic skills through a programme of graduate development. At level 1 this is designed to equip students with the necessary skills and information to help them develop as effective learners and to approach their work with confidence. Level two work is designed to help them recognize, describe and demonstrate their academic achievements and skills, in preparation for their placement year. At level three this should help them plan their own 'preferred future' and present their skills, attributes and abilities in a way that will help them achieve their goals.

Pastoral Care
The University divides responsibilities for pastoral care between academic personal tutors who look after the academic well-being of students and Student Advisors who provide comprehensive, full-time student support on a range of issues including funding, academic regulations, personal and health issues. The service operates on a drop-in basis or by appointment.

Progression to Independent Study
Many modules require students to carry out independent, such as research for projects and assignments and a full range of facilities are available to support students in this activity. The philosophy is accordingly to offer students both guided support and opportunities for independent study. Guided support, mainly in the form of timetabled sessions, takes the form of lectures, tutorials, workshops and computer practical sessions. Students are expected to attend all sessions on their timetable.

The progression to independent study will also be assisted by the nature of the support offered in individual modules. Typically, module leaders will provide a plan for the module indicating the activities to be carried out and the forms of learning to be undertaken during the delivery of the module, with a view to encouraging students to plan ahead and to take responsibility for managing their time and resources.

Computing Facilities
The faculty offers a specialised computing facility alongside the general University provisions. A range of computer laboratories with access to Microsoft or Unix operating systems are available for students to use when not in use for teaching. An open access computer laboratory with 24 hour opening is extensively used by students for the completion of coursework activities. Laboratories are equipped with the specific software for Engineering and Robotics students; including Software Design Tools development environments, mathematical software, CAD, and finite element analysis software to support the taught programmes.

University wide facilities
University-wide services include a Virtual Learning Environment; significant library facilities including electronic resources, individual and group study areas; dedicated services for international students including optional English language and study skills.

Academic support
Academic advice and support is the responsibility of those delivering the individual modules. Academic staff are expected to be available outside normal timetabled hours, either by appointment or during published "surgery" hours, in order to offer advice and guidance on matters relating to the material being taught and on its assessment. Students also have a personal academic tutor.

Industrial Support
The Department has strong links with industrial partners through knowledge exchange, student placements and regular industrial liaison panel meetings. These links are used to inform the curriculum by identifying changing skill needs and gaps in provision. Employers also actively participate in aspects of course delivery.

Developing graduate skills
In year 1 students have group meetings with their Academic personal tutor to introduce reflection on graduate skills and career aspirations. Year 2 provides extensive opportunities toward placement and career planning, including sessions from university careers and placements team and from industrial recruitment personnel toward application and CV writing, and good interview techniques. In Year 3 students engage with developing their graduate skills through project work and their project supervisor.

Part 4: Student Learning and Student Support

PAL
The Peer Assisted Learning (PAL) scheme provides additional learning support for students by students. PAL leaders are recruited from the level 2, 3 and M cohorts each year and are trained in both facilitating learning and study skills. PAL leaders support taught modules by providing sessions in addition to lectures, labs and tutorials.

Mathematics and Programming Support
Additional support in mathematics outside of timetabled classes is available throughout the academic year via:
(i) PAL sessions,
(ii) Drop-in mathematics and programming helpdesks, "espressoMaths" and "espressoProgramming" which are open every week day during term in social learning spaces.
(iii) The Mathematics Resource Centre which is accessible by students using their swipe card and has take-away leaflets, text books, module handbooks and reference material
(iv) On-line support and electronic learning resources such as that Maths 1st Aid Kit leaflets, HELM booklets and http://www.mathcentre.ac.uk/
(v) Mathematical software such as Maple (which students may download for home use) and Matlab.

Technology Enhanced Learning
All modules on the programme are available via the university's Virtual Learning Environment.

- Computer based e-assessment is implemented in a number of modules, so that students can take regular short tests with automated computer generated feedback.
- Recordings of some lectures (audio and/or video) are made available after classes via the university's Virtual Learning Environment.

Pastoral Care
The faculty offers pastoral care through two routes:

- Personal Academic Tutors: All level 1 students are assigned a Personal Academic Tutor, who is an academic member of staff in their department. Students meet individually with their tutor at least twice a year and also participate in group sessions with the Personal Academic Tutor's tutor group (max size 15) during years 1 and 2. In year 3 project supervisors take on the role of Personal Academic Tutor.

- Student Advisers, a team of administrative staff who provide comprehensive, full-time student support service on a drop-in basis or by appointment. Advisers are trained to provide advice on matters commonly of concern, including regulatory and other matters; the Adviser will, when necessary, advise the student to seek advice to from other professional services including the university's Centre for Student Affairs or from members of academic staff.

Facilities to Support Learning
Within the Faculty of Environment and Technology student learning will be supported in the following distinctive ways :

1. Through provision of Open Access and other available computer laboratories that provide access to a range of relevant computer based applications
2. Through provision of the System Support Helpdesk that provides a range of support for learning to students including: support for a wide range of applications used by the students; help in the form of assistants who are trained to resolve many common student problems and help in the form of a large set of 'help-sheet documents', developed over a number of years, that cover a variety of common student requests for information.
3. Technical support staff are available in laboratory sessions and during project work.
4. Extensive laboratory facilities to support the technological modules. These include the Electronics Laboratory (2N40) with facilities for investigation of electrical and electronic principles and circuit design, build and test; the Control and Telecommunications Laboratory (1N65) with facilities for control system analysis and design; the Microprocessors and Digital Systems laboratory (2N24) as well as dedicated facilities for embedded systems development.
5. Several Project Rooms which provide students with individual and group work spaces and the facilities.

Part 4: Student Learning and Student Support

University-wide services include a Virtual Learning Environment (Blackboard), significant library facilities including dedicated services for international students, and a Global Student Support team.

Computing Facilities
In addition to the wide range of computing facilities offered by the University, the Faculty runs a specialised system with 13 laboratories running Windows and 4 with the Linux operating system. The facilities are available on a 24 hours basis during term time, with swipe card access during evenings, at night and at weekends. The labs offer a variety of specialist engineering software, much of which is available for students to download for their home machines. In addition there is an Open Access lab, not used for teaching so giving access to machines at all times.

Support for the computing system is provided with extensive information on the web, ranging from which lab has free machines (on a real time basis), where to find specific software packages and how to use the printing system, to problem solving and FAQs. A support desk, staffed largely by placement students, provides first line support to users during normal office hours.

Industrial Support
The Department has strong employer links which are used to inform the curriculum by identifying changing skill needs and gaps in provision. Employers also actively participate in aspects of course delivery.

Description of any Distinctive Features

The foundation year is common with a number of other **Engineering, Design and Mathematics** programmes which allows the flexibility for students to transfer between programmes in this subject area as is most appropriate to their emergent subject and/or their professional interests.

Design and Engineering Lab Facilities
The School offers a wide variety of specialised design and engineering facilities that will be used during the teaching of this degree, including Electronics and Mechatronics labs. The Bristol Robotics Laboratory is a state-of-the-art robotics research lab located on campus. Students will visit the lab regularly for demonstrations relating to particular theory or techniques, and for their final year project work.

Technology Enhanced Learning
Staff in the department are keen adopters of technology to support and enhance student learning. This includes

- Computer based e-assessment implemented in a number of modules, so that students can take regular short tests with automated computer generated feedback.
- Recordings of some lectures (audio and video) which are made available after classes via the Virtual Learning Environment.

The Placement Year
An optional placement year provides opportunities for real-world, industrially based final year projects. The student will in most cases be on a formal contract in which they are paid for their employment. He or she will have the opportunity to explore career possibilities, make new business contacts for the future and prepare for the final year at University. Students are responsible for finding their own placement, however, many opportunities are published through the University Placements Office, and the process of finding a placement is supported in year 2 of the Graduate Development Scheme. Once on placement, students retain access to the support network of the University and will be visited in their place of work at least once by a Visiting Tutor. Placement students gain credit for their work through submitting a portfolio, which reduces the amount of credit required to be taken in their final year by 15 credits.

Mathematics Support

- EspressoMaths: provides drop-in one-to-one tuition each day in an accessible social learning area and a web-site that provides a portal to a variety of on-line resources in mathematics and statistics.

The Bristol Robotics Laboratory
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

Part 4: Student Learning and Student Support

partnership between the University of the West of England (UWE Bristol) and the University of Bristol, and home to a vibrant community of over 150 academics, researchers and industry practitioners. Together, they are world leaders in current thinking on service robotics, intelligent autonomous systems and bio-engineering. The state-of-the-art facilities cover an area of over 3,500 sq. metres (over 37,000 sq. feet) and BRL is an internationally recognised Centre of Excellence in Robotics.

Part 5: Assessment

A: Approved to University Regulations and Procedures
With the following variant:
The degree classification for the 360 credit honours degrees BEng (Hons) Electrical and Electronic Engineering, BEng (Hons) Electronic Engineering, BEng Robotics and BEng Electronics and Computer Engineering (or 480 credit honours degree with an integrated foundation year) is based upon all the marks achieved at level 3 and all the marks achieved at level 2. Marks achieved for level 3 credits are weighted three times the value of the marks for the level 2 credits (Paper AB16/05/07).

It is the Award Board's responsibility to determine whether the student's attainment at level 0 is sufficient to progress to level 1.

Assessment Strategy

Assessment strategy to enable the learning outcomes to be achieved and demonstrated:

A broad range of assessment strategies are used ensuring that both theoretical and practical aspects of the learning outcomes are assessed.

Testing of the knowledge base is through assessed coursework (individual and group), laboratory work, oral presentation, observed group meetings, through tasks undertaken under controlled conditions and through formal examinations.

Comprehension of and ability to apply intellectual skills are tested in all engineering modules, through coursework, lab and computer exercises and examinations.

Part 6: Programme Structure

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 requirements, module diet, including compulsory and optional modules

		Compulsory Modules	Optional Modules	Interim Awards
ENTRY	Year 1 (Level 0)	Foundation Mechanics UFMFAG-30-0 Foundation Mathematics: Algebra and Calculus UFMFBG-30-0 Engineering Experimentation UFMFEG-30-0 Introduction to Mechanics UFMFCG-15-0 Foundation Group Project UFMFHG-15-0	None	120 credits at Level 0 Successful completion of all level 0 modules required to permit progression to level 1.
	Year 2 (Level 1)	Introduction to Robotics & Electronics UFMFJ3-30-1 Introduction to Artificial Intelligence for Robotics UFCFE3-15-1 Engineering Mathematics UFMFJ9-30-1 Digital Principles for Robotics UFMFR8-15-1 C Programming UFMFN7-15-1 Practical Electronics UFMFCA-15-1	None	Certificate of Higher Education Robotics Credit Requirements: 240 credits At least 100 credits at level 1 or above. 120 credits at level 0.

	Compulsory Modules	Optional Modules	Interim Awards
Year 3 (Level 2)	Maths for Signal and Control UFMFL9-15-2 Control UFMFV7-15-2 Microcontroller Applications Group Laboratory UFMFKA-30-2 Robotic Systems UFMFJA-30-2 Practical Electronic Design UFMFA7-15-2 From 2019/20 Introduction to Machine Vision (UFMFLQ-15-2)	None	Diploma of Higher Education Robotics Credit requirements: 360 credits At least 100 credits at level 2 or above. At least 120 credits at level 1 or above. 120 credits at level 0.

Year Out: We recommend that students take this opportunity to do a year-long placement in industry or research. However, this is not necessary and students can enter the third year immediately after year 2.

	Compulsory Modules	Optional Modules	Interim Awards
Year 4 (Level 3)	2019/20 Machine Vision UFMFC9-15-3 From 2020/21: Advanced Machine Vision UFMFMQ-15-3 BioComputation UFCFY3-15-3 Individual Project BEng UFMFX8-30-3 Probabilistic Robotics UFMFNF-15-3 Ethics of Technology UZRSSR-15-3	Choose one from: Business Environment UFMFM7-15-3 Industrial Placement UFMF89-15-3 Engineering and Society UFMFCL-15-3 Choose one from: Digital Signal Processing UFMFH8-15-3 Intelligent and Adaptive Systems UFMF99-15-3	BEng Robotics Credit requirements: 420 credits At least 60 credits at level 3 or above. At least 100 credits at level 2 or above. At least 140 credits at level 1 or above. 120 credits at level 0. **Highest Award:** BEng(Hons) Robotics Credit requirements: 480 credits At least 100 credits at level 3 or above. At least 100 credits at level 2 or above. At least 140 credits at level 1 or above. 120 credits at level 0.

GRADUATION

Part 7: Entry Requirements

The University's Standard Entry Requirements apply according to the year and point of entry.

Tariff points as appropriate for the year of entry – up-to-date requirements are available through the courses database.

Part 8: Reference Points and Benchmarks

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

QAA Subject Benchmark Statement: Engineering 2015
The expectation of a graduate in Robotics in terms of their ability, knowledge and understanding of the subject has been considered in accordance with the QAA Benchmark Statement for Engineering.

QAA UK Quality Code for HE
All modules in the programme have been written to conform to the learning outcomes required by the Engineering Council UK. This is mandatory for accredited engineering programmes. The specific outcomes are derived from the requirements for electronic, digital and computer systems engineering described in the The IET Handbook of Learning Outcomes for BEng and MEng programmes
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 clearly designed to address skills shortages in the STEM related sectors. This was developed in conjunction with academic and industrial partners as feeders into this programme.

The curriculum has been designed to take the best practice from other programmes along with the introduction of online and electronic assessment.

Staff research projects

Research and industrial collaborations are key to several modules including UFMFE7-15-3. There are strong links between the programme and the Institute for Bio-Sensing Technologies, the Bristol Robotics Lab, the Centre for Machine Vision and knowledge transfer programmes.

Any relevant PSRB requirements:

All modules in the programme have been written to conform to the learning outcomes required by the Engineering Council UK. This is mandatory for accredited engineering programmes. The specific outcomes are derived from the requirements for electronic, digital and computer systems engineering as described in Guidance on meeting AHEP learning outcomes

The modules have been designed to ensure adequate and appropriate coverage of these outcomes across the levels of study. Accreditation by the IET will be applied for.

The programme was design was influenced by our understanding of what skills are needed in the electronic design, control and programming of mobile robots and manipulators. During the design phase talks with BAE Systems, Shadow Robotics and OCR were taken in to consideration.

Regular liaison meetings will be held with the key stakeholders. This ensures that the programme meets the requirements of major employers regionally, nationally and globally in providing the blend of academic and vocational skills needed by modern engineers.

Part 7: Entry Requirements

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.