Bristol Institute of Technology, UWE

Programme specification for Masters in Research in Robotics

PART 1: Programme Specification

Section 1: Basic Data

Awarding institution/body	UWE
Teaching institution	UWE
Faculty responsible for programme	Environment & Technology
Programme accredited by	
Highest award title	Masters by Research in Robotics
Default award title	
Interim award title	PG Cert (Multidisciplinary Robotics), PG Dip (Robotics by Research)
Modular Scheme title (if different)	Postgraduate Scheme BIT
UCAS code (or other coding system if relevant)	
Relevant QAA subject benchmarking group(s)	Mathematics, Statistics and Operational Research
On-going **Valid from (insert date if appropriate)**	September 2010

Authorised by… **Date:…**

Version Code 1

For coding purposes, a numerical sequence (1, 2, 3 etc.) should be used for successive programme specifications where 2 replaces 1, and where there are no concurrent specifications. A sequential decimal numbering (1.1; 1.2, 2.1; 2.2 etc) should be used where there are different and concurrent programme specifications

Section 2: Educational aims of the programme

The aims of the programme are:

1. To provide an intellectual experience of advanced study, underpinned by staff expertise, research, and experience;
2. To enable the student to further and deepen his/her knowledge, understanding and analytical abilities in a stimulating and challenging academic environment;
3. To develop the student's ability to conduct research in their chosen field
4. To develop the student's ability to work on a short term collaborative projects with industrial partners
5. To provide critical insight into, as well as practical skills in, the creation of intelligent robotic products and systems. This involves developing, understanding and critically analysing design concepts with special emphasis on systems engineering, embedded intelligence and the behaviour of the robotic products and systems, using the resulting insights to build smart technologies.
6. To develop the students' ability to make an immediate contribution to organisations engaged in the systems engineering and design of intelligent technologies of various kinds
7. To develop the students' ability to solve complex problems in any domain, though with particular reference to the development of hardware and/or software suitable for a robotic application.
8. To encourage the discerning use of reference material and technical information from a variety of sources, but especially scientific journals and technical reports in the wide range of robotics applications and technologies.
9. To prepare students for progressing to study for higher research degrees in Autonomous Robotics, Intelligent Systems, Artificial Intelligence and Embedded Microprocessor Systems.

Section 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: …

A Knowledge and understanding

Learning outcomes	***Teaching, Learning and Assessment Strategies***
A Knowledge and understanding of: 1. Research methodologies 2. The applications of robots and robotic technologies in the context of the research project. 3. Developing robotic products and systems using multidisciplinary approach 4. Learning outcomes of the modules agreed by the programme team and the student to support their robotics research 5. The ways in which the student's background discipline and the areas studied in the agreed taught modules are applied in a robotics research context	**Teaching/learning methods and strategies:** Robotics is a synthetic discipline that draws upon many different branches of physical and social science, engineering and the arts. Examples might include, computer science, mechanical, electrical or electronic engineering, mathematics, design, etc. In order to support this multi-disciplinary background, the programme will be designed to focus the student's background knowledge within a robotics context, while extending their knowledge for similar application through an agreed diet of appropriate taught modules, which will include a module on research methodologies. A large research project delivers Learning Outcomes 2, 3, and 5. Taught modules deliver 1 & 4. LO 1 is further underlined by the student's experience of the research project. **Assessment:** 1 and 4 are assessed through the standard modular framework which may include a combination of written coursework, practical exercises, written and oral examination. 1, 2, 3 and 5 are assessed primarily through the research project module. Research project module is assessed through a formal viva process and a written dissertation.

B Intellectual Skills

Students will develop skills in:

1. Critical Thinking
2. Analysis
3. Synthesis of different types of information
4. Evaluation
5. Problem Solving
6. Appreciate problem contexts
7. Balance conflicting objectives
8. Research skills

Teaching/learning methods and strategies

Students are required to bring together their background knowledge and knowledge and skills acquired in the chosen modules so the need to synthesise (3) ever-greater volumes of information and approaches into a coherent approach is developed and consequently so is their critical thinking (1). The Masters Project/Dissertation consolidates the development of these skills and also promotes intellectual independence and self-confidence.

Analysis (2), Evaluation (4) and Problem Solving (5) are developed on problems in various activities in a number of modules. In some cases, the focus is on understanding the problem and then solving it free from the environmental implications of real-world problems and without the need to examine alternatives and to balance conflicting goals. In other cases, involving larger scale systems, comes the need to evaluate (4) alternative methods and designs and to balance conflicting objectives (7).

Specific application examples involving the need to appreciate problem contexts (6) are also developed in which the student must strike the right balance when facing conflicting objectives (7).

Research skills are taught in only core module of this programme.

Assessment

Robotics requires demonstration of all of the intellectual skills. This is particularly true in laboratory coursework assessment, undertaken in a number of modules.

Skills 1-4 are assessed in the submitted reports and essays.

Design-work requires demonstration of skills 1,2,5,6,7 and a number of coursework assessments and exam questions are devoted to such work.

All of the examinations assess skills 1-4 whilst skills 5-7 are covered in many exams.

Finally, skill 8 is assessed in the research method module.

The Masters project module, with its assessment based on a substantial dissertation, further enhances intellectual skills.

C Subject/Professional/Practical Skills – some or all of:

1. Create designs that correspond to stated requirements
2. Develop robotic products and systems to meet application requirements
3. Understand/design electronic circuits used in robotic systems
4. Develop software in the context (examples include embedded processing and control, intelligent decision making for mobile robots, system optimisation, etc.)
5. IT Skills in Context (use software in the context of problem-solving investigations, and interpret findings)
6. Use real and virtual models to develop and optimise design concepts

Teaching/learning methods and strategies

Throughout the program, the skills listed are developed through a combination of theoretical discussion, practical laboratory based work, classroom based tutorial exercises, studio work and directed self-study. Some of the skills listed (5,6,13) are developed throughout the research project module. The general teaching/learning method is therefore to impart these practical/professional skills by a process of moving from an overview of what is required to a specific application of an individual skill at a higher level.

Student's requirements for taking the right path in the research project will be analysed and individual needs addressed through a selection of appropriate taught modules.

Assessment

7. Develop initial design concepts into functional product and system specifications
8. Understand the engineering implications of design specifications
9. Generate and evaluate alternative design solutions.
10. Search for, and evaluate, information and solutions using a wide range of information sources - including online sources
11. Manage projects which may be multidisciplinary. This may involve management of interactions with other stakeholders.
12. Specify required hardware and software (example: sensors, actuators, data processing software) for incorporation into design solutions.
13. Understand implications of integrating the specified components in a single robotic system
14. Communicate alternative design proposals using visual mediums.

The possession of these skills is demonstrated by the development of practical laboratory work, coursework and presentations as well as examinations. The practical nature of the skills to be acquired means that some are specifically addressed by particular modules (3,4,5,6,11,12). The more generic skills (1,2,7,8,9,10,13,14) are assessed across a range of modules particularly the Project module.

D Transferable skills and other attributes

1. Communication skills: to communicate orally or in writing, including, for instance, the results of technical investigations, to peers, external collaborators and/or to “problem owners”.
2. Self-management skills: to manage one’s own time; to meet deadlines; to work with others having gained insights into the problems of team- based systems development.
3. Problem formulation: To express problems in appropriate notations.
4. Progression to independent learning: To gain experience of, and to develop skills in, learning independently of structured class work. For example, to develop the ability to use on-line facilities to further self-study.
5. Awareness of professional literature: to read and to use literature sources appropriate to the discipline to support learning activities.
6. Working with Others: to be able to work as a member of a team; to be aware of the benefits and problems which teamwork can bring.

Teaching/learning methods and strategies

1. Skill one is developed through a variety of methods and strategies including the following:
   - Students maintain laboratory log books
   - Students participate in electronic conferences, workshops, and group work sessions.
   - Students participate in discussion tutorials
   - Students present research topic findings in tutorials
   - Students participate in individual tutorials
   - Students collaborate on group projects
2. Skill two is developed through a variety of methods and strategies including the following:
   - Students conduct self-managed practical work
   - Students participate in practically-oriented tutorial laboratory sessions
   - Students work through practical work-sheets in teams
   - Students practice design and programming
3. Skill three is developed through a variety of methods and strategies including the following:
   - Students develop problem solving programs
   - Students practice design and programming
   - Students sketch designs of larger systems
4. Skill four is developed through a variety of methods and strategies including the following:
   - Students are encouraged to practice programming to extend their skills
   - Students develop problem-solving programs
   - Students are encouraged to research relevant topics
   - Students are encouraged to use online facilities to discover information
5. Skill five is developed through a variety of methods and strategies including the following:
   - Students are encouraged to access online material
6. Skill six is developed through a communication with external collaborators, course peers and other stakeholders in the project

Assessment

These skills are demonstrated in a variety of contexts which may include the following depending on the requirements of the elective modules agreed with the programme team:

- examination
- poster presentations
- individual and group projects
- Practical assignments
- Presentations to other research students and academics
- Portfolio of exercises

In addition skill two is assessed by both peers and tutors.

Section 4: Programme structure and Interim awards

Semester 1 and 2

Robotics Project dissertation (**UFPEYN-120-M**) 120 credits			
Option 1 15 credits	Option 2 15 credits	Option 3 15 credits	UFMFYA-15-M - Research investigation, planning and methods for change 15 credits

Optional modules will be selected from the range of modules available at the BIT initially with intention to expand the choice to allow students to take a wider range of modules from other faculties at UWE. The project supervisor should, upon checking with the modules leaders, advice on the optional modules to suit the project topic and fill the gaps of the student's background knowledge. The optional modules have to be agreed before the start of the academic year.

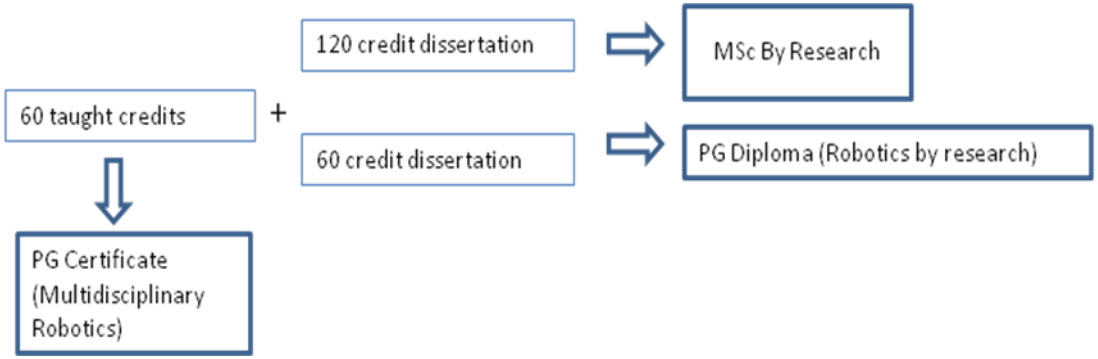
List of Options (not exhaustive, indicative list of options)

UFCE3K-20-3	Advances in Artificial Intelligence
UFMF4X-15-M	Robotic Fundamentals
UFMF99-15-3	Intelligent and Adaptive Systems
UFMEKM-15-M	DSP for Real Time Control Systems
UFME7F-15-M	Advanced Control & Dynamics
UFMEEE-15-M	Theoretical Concepts in Applied Computer Vision
UFMEEA-15-M	Electromechanical Systems Integration
UFMEE9-15-M	Computer Vision and Virtual Environments
UFMEBP-15-M	Structural Integrity in Design
UFMEBN-15-M	Solid Systems Modelling and Simulation
UFMENU-15-M	Design of Fluid Systems
UFMEBA-15-M	Finite Element Modelling with Elastomers and Similar Materials
UFME7G-15-M	Behavioural System Design

Interim Awards

Students who pass only taught part of the course (60 credits) qualify for the PG Certificate in Multidisciplinary Robotics.
After the assessment in March (for FT students, June for PT students) students will progress towards 120-credit dissertation module. After

successful completion, Master by Research (Robotics) will be awarded. If they fail this module they will be offered an opportunity to submit a 60 credit dissertation module (UFPED4-60-M : Dissertation (Masters) after which, PG Diploma (Robotics by Research) will be awarded. .



Section 5: Entry requirements

The University's general requirements for entry to a postgraduate programme are described in the University Academic Regulations. These are available from the UWE's web site, or on request, and apply to this programme. In addition, a 2.1 Honours degree in Computer Science, Electronics/Electrical Engineering, Mechanical Engineering, or a similar subject agreed by the program team will be required. Applicants with first degrees in other disciplines may be considered if they have relevant professional experience of sufficient depth.
All applicants will be invited to submit a portfolio for review..A student's aptitude and commitment should be judged through an interview process prior to being allowed to enrol on the course. Two references per applicant are required to comment on the candidate's suitability to conduct a research project.

Programme Leader and the Project Supervisor would need to be convinced of both the student's aptitude and the practicality of the project within the allowed timescales. The project subject matter should be agreed upon at the start of the overall Masters programme. A selection of M-Level projects topics will be available for applicants to choose from and each will state a required background. Taught modules will be agreed with the project supervisor. Applicants will have to submit a research proposal of maximum 1000 words for consideration. This can be based on a project topic offered by the program team or on the applicant's preferred topic.

Indicative Time Scale for the admission to the course in September:

End of June (End of May for overseas students) – project proposals submitted to the Programme Leader

End of July – Project Supervisor agreed

End of September – Optional modules agreed with the supervisor

Indicative Time Scale for the admission to the course in January:

End of October (End of September for overseas students) – project proposals submitted to the Programme Leader

End of November – Project Supervisor agreed

End of December – Optional modules agreed with the supervisor

Section 6: Induction, Monitoring and Evaluation

New students share induction procedure with the taught MSc Robotics students when they arrive to University. However, their induction starts earlier, through the stages and the timeline indicated in the previous section. The admitted students are introduced to the research and community of Bristol Robotics Lab upon their arrival to UWE. The students are introduced to the available research resources and facilities in the Department. Getting familiar with the health and safety procedure is a requirement for every person joining the lab.

Academic support is available throughout the course on the module basis as well as through the supervision session. Students' research progress is monitored and evaluated for the first time in March through an official assessment. The students are integrated in a wider PGT community of Bristol Robotics Lab. They share the same facilities, attendance at scientific seminars and social events. Student Experience Committee (SEC) is held every 3-4 months for BIT postgraduates. Students get an opportunity to present their experience and concerns to all staff involved in PG teaching at these meetings.

After two intakes have completed the Faculty will review the structure and viability of the MRes provision to ensure that the programme continues to meet its intended purposes. The review will include consideration of the admissions process and the efficiency and effectiveness of the programme in the light of current and projected student numbers. We intend that this review takes place as part of the programme's annual endpoint monitoring and evaluation procedures.

Section 7: Assessment Regulations

The University's standard regulations for the assessment of postgraduate modular programmes shall apply. Thus assessment will be the responsibility of field and award boards with external examiner involvement.

Section 8: Student learning: distinctive features and support

Within the Faculty of Environment and Technology, student learning will be supported in the following distinctive ways :

- Active engagement with the Bristol Robotics Laboratory, a leading-edge internationally renowned robotics research lab, where students will gain access to developments at the cutting-edge of contemporary research in robotics and intelligent systems. This engagement will take the form of provision for students to do project work for their Masters Dissertation in the BRL, joint seminars given by invited speakers, and the occasional contribution to teaching on the Masters programme by doctoral students and postdoctoral researchers based in the BRL.
- The strength of the available supervisory team with an international reputation and long-standing experience in multidisciplinary robotics research
- Help in the form of Help Desk Staff 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.
- Through specialist electronics, microprocessor development and autonomous robots laboratories.
- Technical support staff is available in laboratory sessions and during project work.
- Through provision of Open Access and other available computer laboratories that provide access to a range of relevant computer based applications

Class Activities

The mode of delivery of a module is determined by its Module Leader, and typically involves a combination of one or more lectures, tutorials, practical or laboratory classes, studio, group activities and individual project work. Where modules are common with other programmes, students will typically be taught together (which gives students the opportunity to appreciate the material from the viewpoint of different disciplines). However, a specialist flavour may be given to a common module through the provision of discipline specific practical, laboratory or tutorial material supporting a core of common lectures.

Academic Support

Academic advice and support is the responsibility of the staff delivering the module in question. Members of 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.

Virtual Learning Environment

Each module within the school has a presence on Blackboard the university's virtual learning environment. Minimum engagement standards are set, module leaders are encouraged to use the resource for content storage and announcement as well as online assessment and group discussions

Pastoral Care

The faculty offers pastoral care through its Student Advisers, a team of staff who provide comprehensive, full-time student support service on a drop-in basis or by appointment. . 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.

Progression to Independent Study

As graduates, it is expected that the students who join this programme will already have acquired skill in independent learning. Many modules require

students to carry out independent study, such as research for projects and assignments, and a full range of facilities are available at all sites to help students with these. 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, seminars and practical laboratory sessions. Students are expected to attend all sessions on their timetable, and this is especially important because of the high content of practical work in the programme. 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.

Design and Engineering Facilities
The Department offers a wide variety of specialised design and engineering facilities that will be used by the students of this programme. Depending on the type of the project, facilities in other UWE Faculties will also be made available.

External Facilities
The facilities and expertise available “in-house” will be enhanced through a variety of collaborative opportunities provided by links with other UWE faculties, design and research projects in the academic community, industrial contacts and the Bristol Robotics Laboratory.

Computing Facilities
The School offers a specialised computing facility alongside the general University provisions. There are nine general PC computing laboratories of 20 plus seats all running Windows Vista, along with four Unix based laboratory and 10 specialist computing labs. The design studios contain 65 specialst Mac seats running graphic and product design specialist software. Laboratories are equipped with the specific software for BIT students; including Software Design Tools development environments, CAD and finite element analysis to support the taught programme.

Access to Specialist Facilities
Attached to the Faculty is the Bristol Robotics Laboratory (BRL), an internationally acclaimed robotics research facility. In addition to conducting research, the laboratory runs seminars and poster events to which laboratory members are invited. Students will have full access to the research output of the lab, including being invited to laboratory seminars and other events. In addition, during their dissertation period, Masters Robotics students will be supervised by a member of BRL or another academic with a suitable project expertise.

Section 8: Reference points/benchmarks

In designing this programme, the faculty has drawn upon the following external reference points:
1. The QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland
2. The QAA Benchmark Statement for Mathematics, Statistics and operational research
3. UWE's Learning & Teaching Strategy

The QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland describes the attributes and skills expected of Honours graduates. It is our view that the learning outcomes of this programme are fully consistent with the qualification descriptor in the Framework, and hence that graduates will be able to demonstrate that they meet the expectations of the Framework.

The QAA Subject Benchmark Statement for Mathematics, Statistics and operational research outlines a set of objectives that a typical graduate of this type of masters should reach : apply knowledge and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the programme of study; integrate knowledge and handle complexity, and formulate judgments with incomplete or limited information, where appropriate reflecting on social or ethical responsibilities linked to the application of that knowledge or those judgements; communicate conclusions and the knowledge and rationale underpinning these, to specialist and non-specialist audiences, clearly and unambiguously. These skills map closely to the learning outcomes for this programme, and hence we have confidence that the programme is in accordance with the precepts of the Statement.

UWE's Learning & Teaching Strategy has informed the faculty's policy for the delivery of its programmes, whose main features are described in section 7.

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. These are available on the University Intranet.

Programme monitoring and review may lead to changes to approved programmes. There may be a time lag between approval of such changes/modifications and their incorporation into an authorised programme specification. Enquiries about any recent changes to the programme made since this specification was authorised should be made to the relevant Faculty Administrator.

PART 2: Module Specification

MODULE SPECIFICATION

Code: UFPEYN-120-M	**Title: Robotics Project dissertation**	**Version: 2009**
Level: M	**UWE credit rating: 120**	**ECTS credit rating: 60**
Module Type: Masters Dissertation		
Owning Faculty: Bristol Institute of Technology	**Field: Professional Studies Field**	
Valid from: September 2010	**Discontinued From:**	
Pre-requisites:	**None**	
Co-requisites:	**None**	
Excluded combinations:	**None**	

SEEC descriptors for Level 7 (Masters)

Learning Outcomes

Development of knowledge and understanding
On completion of this module a student will typically be able to:-

Assessed in component(s):

A. Knowledge base, Disciplinary methodologies, Ethical Issues

Show a detailed knowledge and understanding of

i.	an area of robotics technology which is at the forefront of professional and/or academic practice;	A
ii.	methodologies and techniques applicable to chosen research and, where appropriate, proposed new hypotheses and solutions;	A
iii.	current research, contemporary problems and/or new insights in areas of robotics and intelligent systems in relation to their research;	A
iv.	current ethical issues of robotics, especially in human-centred applications	A

B. Demonstrate **subject specific and practical skills** with respect to

		A
i.	Competence in applying appropriate techniques and in interpreting the results;	A
ii.	Ability to devise innovative solutions to the research area under investigation, integrate or devise systems or models using existing technologies and to present these solutions effectively.	A
iii.	Ability to exercise initiative and personal responsibility in professional practice	A
iv.	Ability to adapt skills or develop new skills for new situations and scenarios	

C. Show **cognitive skills** with respect to

i.	generating clear research question or hypothesis;	A
ii.	critical analysis and evaluation of current research, contemporary problems in areas of robotics and intelligent systems	A
iii.	synthesizing data from relevant sources to produce meaningful and contextually relevant information and/or new insights and constructing an appropriate research methodology and	A
v.	practical understanding of how techniques of research and enquiry are used to create and to interpret knowledge within the professional practice of the discipline;	

vi.	methodological rigour in applying appropriate methods and techniques for problem analysis and investigation	A
		A

D. Demonstrate **key transferable skills** in

i.	Self evaluation and self-management	A
ii.	Learning resources by developing awareness of professional literature	A
iii.	Communication by communicating results clearly to specialist and non-specialist audiences;	A
iv.	Management of information by independent learning ability to develop new skills for continuing professional development	A
v.	Autonomy by developing independent and self-critical learner	A
vi.	Problem Solving – independent learning ability, making professional use of others when appropriate	A
vii.	Group working either as a group member or a leader. Can clarify tasks and use the capacities of group members.	A

Syllabus Outline

The project module involves a critical study of recent developments in the chosen field and will result in the development and validation of a practical component or *artefact* that may be a method or a model, a specification, a design document, a software implementation or any other practical and usable deliverable. The production of this deliverable should involve an organized 'engineering' approach or methodology and a substantial element of originality. It is expected that the deliverable will be validated or proved and that the process by which it is produced will be evaluated critically and future work considered.

A list of possible dissertation titles offered by academic staff will be published on a regular basis every year. Students will be expected to contact supervisors for more information, to help in their choice. Students are encouraged to devise their own dissertation subject where possible and module staff will help to ensure that this subject and scope is acceptable for the Masters by research Dissertation. An initial dissertation proposal will be submitted and evaluated. Guidance will be provided through the consultations with the project supervisor or, in some cases, supervisory team of two or more academics and/or industrial collaborators..Regular meetings will be arranged by the supervisor/supervisory team to support the student’s progress. Advice on the use of library and on-line resources will also be given.

Students will be expected to produce written work which is assessed in terms of its:

- Identification of relevant issues for investigation;
- Appropriateness of research method(s) to the investigation;
- Level of conceptual and/or technical difficulty;
- Depth, breadth and level of critical analysis of secondary research;
- Collection and use of primary evidence;
- Coherence of argument, logic and quality of conclusions (specific and general);
- Quality of writing and presentation;
- Awareness of any related ethical issues
- Accuracy and completeness of citation and listing of references;
- Critical appraisal of the research process and outcome.

Teaching and Learning Strategy

- Further refining the submitted proposal topic in conjunction with an appropriate supervisor to build on previous work done in the chosen research area.
- Student-centred work and research of advanced theoretical principles and methods under appropriate staff supervision;
- Supervisory sessions where research results will be discussed and guidance will be given by the supervisor;
- Critical appraisal of the different paradigms for the focused field of study, and to selection and application of appropriate research methods and techniques to this area of focus;
- Guided research and production of a highly focused dissertation in line with the negotiated and refined masters proposal

This is a project type of module which seeks to ensure that students become autonomous learners. Based on the student chosen topic and/or methodology and in consultation with the programme leader, he/she will be allocated a personal supervisor. The student plans a series of meetings with the supervisor and presents his project plan. The supervisory sessions require some preparation time which might include preparing design concepts for discussions, making content plans for the dissertation chapters, drafting the methodological or practical issues at stake, discussing state of the art as reported in the relevant literature or preparing an experiment setup for demonstration. The student should also compile a list of questions prior to a supervisory meeting.

Reading strategy

All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University. These include a large range of journals (both print and electronic) and a wide variety of resources available through web sites and information

gateways. The University Library's web pages provide access to subject relevant resources and services, and to the library catalogue. Students will be presented with opportunities within the programme curriculum (especially the Dissertation and Research Methods module) and within this module to develop their information retrieval and evaluation skills, in order to identify appropriate resources effectively.
Blackboard – This module is supported by Blackboard, where students will be able to find all necessary module documentation,. Direct links to information resources will also be provided from within Blackboard. **Essential reading**. This module does not have a set textbook and students are expected actively search relevant reading material for the selected topic of the dissertation. Due to the individual nature of the project, students may be provided with generic resources using the shared medium of Blackboard, but it is unlikely that their specific requirements will be provided for in this way. **Further reading** –The purpose of the Further Reading is to ensure students are familiar with current research, state of the art in robotics, and material specific to their interests from the academic – often journal – literature. Students are expected to employ their own initiative and discretion in selecting appropriate Further Reading that will support their study. It is expected that students will engage with the academic journal literature on Robotics subject, and as such are likely to use articles from some of the following indicative academic journals in their further reading: *Advanced Robotics, Autonomous Robotics, IEEE Transactions on Robotics (T-RO), IEEE Transactions on Automation Science and Engineering (T-ASE), IEEE Transactions on Image Processing, IEEE Transactions on Robotics and Automation (T-RA, published from March 1985 to June 2004, replaced by T-RO and T-ASE), IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI), IEEE Transactions on Control Systems Technology (T-CST), Industrial Robot, International Journal of Humanoid Robotics, International Journal of Robotics Research, International Journal of Robotics and Automation, Journal of Intelligent and Robotic Systems, Journal of Field Robotics, The International Journal of Medical Robotics and Computer Assisted Surgery , Journal of Robotic Systems, Mechatronics, Robotica, Robotics & Automation Magazine, Robotics and Autonomous Systems,* as well as using more dissertation topic focused material found in related scientific publications. Access to all these publications is available through the library, and most are available electronically.

Indicative Reading List

The following list is offered to provide validation panels/accrediting bodies with an indication of the type and level of information students may be expected to consult. As such, its currency may wane during the life span of the module specification. However, CURRENT and more research topic specific advice on readings will be available via other more frequently updated mechanisms.

Allison, B& Race, P (2004). *The Student's Guide to Preparing Dissertations and Theses (Routledge Study Guides)*, Routledge, NY.

Walliman, N (2006). *Your Research Project: A Step-by-Step Guide for the First-Time Researcher (SAGE Study Skills Series*), Alden Press, Oxford

Berry, R (2004). Research *Project How to Write it (Routledge Study Guide)*. Routledge, NY

Hunt, A (2005). *Research Project : How to Manage it. (Routledge Study Guides)*. Routledge, NY.

Assesment

Weighting between components A and B A: 100% B: 0%

This module is composed of two elements: a 3000 word portfolio of research with 30 minute presentation (worth 20% of the total mark); and a 20,000 word extended dissertation with viva voce (worth 80% of the total mark).

ATTEMPT 1
First Assessment Opportunity

Element Description	Element Type	% of Component	% of Assessment
Component A (Controlled Conditions)			
Research Review and Presentation	Project	100%	20%
Dissertation and Viva Voce	Project	100%	80%

Research Review and Presentation

Research Review and Presentation are due in **March** for full time students and late **June** for part time students. It will include a critical overview of relevant literature and a proposed design/methodology concept. The maximum word count of this document is 3000 words. The presentation will take 20 minutes followed by 10 minutes questions posed by the student's peers and staff involved in robotics teaching and research at UWE. The presentation will take place immediately after submitting the portfolio of research.

The Dissertation and Viva Voce

The dissertation should be no more than 20,000 words in length. It is due in late **November** for full-time students and in **May** following year for part time students. The following are a list of requirements for the presentation of your dissertation:

- You should submit two copies of your dissertation
- The dissertation must be word-processed and on one side of A4 paper. Visual and graphic material should either be incorporated into the text or attached as an appendix.
- The dissertation should be suitably bound and the title, your name and award should be written on the front cover.
- You should provide a title page which lists the chapters, bibliography and appendices (if included).
- You should keep to the specified word length
- You should reference all sources and direct quotations in the body of the dissertation text.

SECOND (OR SUBSEQUENT) ATTEMPT
NOT APPLICABLE - MASTERS' DISSERTATIONS ONLY HAVE ONE ATTEMPT

PART 3: Contextual Information for Validation

Introduction

There is an increasing demand by funding bodies, employers and students to develop academic and key (transferable) skills during study programmes. The Masters by Research in Robotics programme has been developed in response to a rapid expansion of the Bristol Robotics Laboratory and ongoing need to extend UWE's talented Robotics graduates' experience to the postgraduate level. It is also designed for likely PhD students as the first part of the PhD programme. The integration of academic and transferable skills development into PhD programmes is now the norm and the Masters by Research provides a framework for the enhancement of these skills. The current taught MSc Robotics programme is a conversion course aimed at the students with a non-robotic background. This is unsuitable for Robotics graduates who aspire for more advanced robotics topics. Masters by research in Robotics aims at good, creative graduates interested in applying their creativity and knowledge to create intelligent robots. The programme goes in line with RAE recognised research profile of the Bristol Robotics Laboratory and will enhance its reputation for the provision of research-led teaching.

Aims of the course

- To introduce students to academic and key skills essential for all fields of research in Robotics
- Provide practical research training under supervised conditions in highly rated Bristol Robotics Laboratory and other BIT research units with excellent track records of independent research and critical analysis.
- Provide a sound basis for subsequent PhD studies.

The academic content of this programme concentrates on one substantial research project module supported by four taught modules during the course of study. The taught modules include one compulsory research methods module and three modules selected from the BIT modules list. The selected modules will be advised and agreed with the project supervisor and should fill the gaps in the student's background knowledge that is required to successfully carry out the project module. The programme leader and the project supervisor will also have to ensure that the selected project topic is suitable and practical for the proposed length of time.
Failure to complete and pass the project module would not allow the award of anything other than a PGCert, assuming that the requisite taught modules had been passed. If the student does not satisfy the 60% mark on the four taught modules he/she will be advised to take additional modules up to 120 credits in order to qualify for a PGDip award. There are no development costs and extra costs of delivery as all taught modules would be selected from the running BIT modules. On the successful completion of this programme, the student can choose to start up a PhD providing he/she has sufficient fundings and required MRes award classification (>60%) for it.

Market

As noted, there are no costs for delivery of this programme. Design of new modules is not required as students enrol on the existing ones. The market search has shown that only a small number of universities offer Masters by Research in Robotics or one of robotics sub disciplines. Robotics has been identified as one of critical areas for educational growth and further research development not only at UWE but in the latest internationally recognised research and business strategy publications. The Masters by Research is an opportunity for the University to develop strategic partnerships with the users of robotics technologies expertise in a range of applications from health care to nuclear inspection. The degree will build on existing research strengths and an international reputation in this area, providing opportunities for scaling up this research activity through inter-disciplinary collaboration both within and outside the university. The course will provide new opportunities for internationalization, bringing students from outside UK and enhancing the reputation of the University for the provision of research-led teaching excellence.
Robotics, being a multidisciplinary subject brings together academics from engineering, non-engineering and software disciplines that will consequently bring more students to this course from various backgrounds. The programme will be marketed nationally and internationally with the intention of attracting individuals who are self-funded, or funded by governments or employers on an individual basis.

Staff Resources

Programme Leader: Dr Sanja Dogramadzi
Masters project modules supervisors include initially: Alan Winfield, Chris Melhuish, Tony Pipe, Matthew Studley, Farid Dailami, Sanja Dogramadzi (BRL) and members of AI group Larry Bull, Jim Smith and Praminda Caleb-Solly. It is intended to extend the interest to other BIT academics involved in robotics from related areas like mechanical engineering, human user interactions, psychology, social sciences, life sciences, art and media, etc.

Module leader - Core Module:

Robotics Project Dissertation	Sanja Dogramadzi
Research Methods	Peter Rawlings

Module leaders for additional modules will be as per university published information.

QAA Academic Framework

Framework for Higher Education Qualifications: the amount and levels of credit included in the programme comply with the requirements set out in the relevant qualification descriptor of the QAA Framework for Higher Education Qualifications.
Throughout the programme students are developing advanced knowledge and skills in aspects of Engineering, Computing and Robotics design. This programme therefore requires individuals to demonstrate the independence of thought and understanding that characterize study at the Masters level.
QAA Subject Benchmark Statements: there is no explicit subject benchmark group within the QAA framework directly relevant to M-level programmes in Robotics. The benchmark statement for *Engineering (MEng) (2006)* guided the development of this programme.

Other reference points and benchmarks

The programme is fully aligned with the University's objectives to 'Ensure we have a curriculum that is innovative, attractive, relevant and exciting …'.
And to 'Increase value from knowledge exchange/transfer ..'. The Faculty Plan for 2007/08 specifically identified working with employers to identify potential markets and accredited programmes to meet the needs of business, research and the community as an objective in line with UWE strategy. The Faculty Plan as well as UWE Research Strategy Implementation Group indicated the intention in a 'post-Leitch' context to expand research-led provision particularly in

relation to strategic research areas and ‘to provide research training of the highest quality for staff and students’. There is no professional statutory or regulatory body relevant to the programme.

The Programme Leader and Project Module Academics all have considerable experience and are currently active in supervision of research students and the delivery of M-level modules. All are also research-active, were submitted to RAE 2008 and will draw on their research in the design and supervision of the project module content. We are confident therefore that the programme can be delivered at an appropriate standard and that it is underpinned by leading-edge research and scholarship in the field.

Course Entry requirements

High calibre students with a good first degree or related work experience.
Good first degree (2:1 or better) or equivalent and a commitment to innovation in learning and research.
Those who are likely but not exclusively wanting to proceed to a PhD in Robotics and its allied specialities or to pursue a career in research and scientific investigations in industry or in Professions Allied to Robotics.