MEng Robotics **UCAS code: H675**
For students entering Part 1 in 2012/3

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Engineering
Faculty:	Science Faculty
Programme length:	4 years
Date of specification:	25/Jul/2014
Programme Director:	Dr John Bowen
Programme Advisor:	Dr Richard Mitchell
Board of Studies:	UG Systems Engineering
Accreditation:	Institution of Engineering and Technology (IET) Institute of Measurement and Control (InstMC)

Summary of programme aims
The programme aims to provide a thorough degree-level education in Robotics, covering the relevant parts of control, computing, electronics and intelligent systems. The programme focuses especially on the design and development of embedded autonomous agents or cognitive robots.
The programme aims to combine an understanding of systems in general, but with particular relevance to robotic systems and their application; to appreciate relevant modern technology and techniques; to produce good practically oriented engineers whose systems grounding allows them to work in an industrial or academic environment, as individuals or as part of a team. This MEng programme gives in-depth coverage of Robotics, fulfilling all of the educational requirements necessary to achieve Chartered Engineer (CEng) status.

Transferable skills
During the course of their studies at Reading, all students will be expected to enhance their academic and personal transferable skills. In following this programme, students will have had the opportunity to develop such skills, in particular relating to communication, interpersonal skills, learning skills, numeracy, self-management, use of IT and problem-solving and will have been encouraged to further develop and enhance the full set of skills through a variety of opportunities available outside their curriculum.
As part of this programme students are expected to have gain experience and show competence in the following transferable skills: IT (word-processing, using standard and mathematical software, scientific programming), scientific writing, oral presentation, team-working, problem-solving, use of library resources, time-management, career planning and management, and business awareness.

Programme content
The profile which follows states which modules must be taken (the compulsory part), together with one or more lists of modules from which the student must make a selection (the 'selected' modules). Students must choose such additional modules as they wish, in consultation with their programme adviser, to make 120 credits in each Part. The number of modules credit for each module is shown after its title.

Part 1 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
SE1PR11	Programming	20	4
SE1SE11	Software Engineering	20	4
SE1CA11	Computer Applications	20	4
SE1EM11	Engineering Mathematics	20	4
SE1CC11	Cybernetics and Circuits	20	4
SE1FC11	Fundamentals of Computing	20	4

Part 2 (three terms)
Compulsory modules

Mod Code	*Module Title*	*Credits*	*Level*

SE2SM11	Systems Design and Project Management	20	5
SE2SP11	Signal Processing	20	5
SE2EM11	Embedded Microprocessors and Digital Systems	20	5
SE2CS11	Control Systems	10	5
SE2NN11	Neural Networks	10	5
SE2RM11	Robots and Mechanics	10	5
SE2RS11	Robotic Systems	10	5

Optional modules:

SE2EA11	Essential Algorithms	10	5
SE2SD11	Sensors and Devices	10	5
LA1XXX	Institution Wide Language Programme	20	

Part 3 (three terms)
Compulsory modules

Mod Code	*Module Title*	*Credits*	*Level*
SE3GP11	MEng Group Project	40	6
SE3SL11	Social, Legal and Ethical Aspects of Science and Engineering	10	6
SE3LM11	Law and Management	10	6
SE3ME11	Mechatronics	10	6
SE3MM11	Machines in Motion	10	6
SE3IA11	Image Analysis	10	6

Optional modules
Select modules worth 30 credits from:

SE3SI113	System Identification and Control	10	6
SE3SS13	State Space and Frequency Response	10	6
SE3MH11	Modern Heuristics	10	6
SE3VR11	Virtual Reality	10	6
SE3EC11	Evolutionary Computation	10	6
SE3SE11	Sustainable Electrical Energy	10	6
SE3MS11	Measurement Systems	10	6
SE3AE11	Analogue Electronics	10	6
SE3CM14	Computational Methods for Neuroscience	10	6

Part 4 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
SEMSI14	Swarm Intelligence and Artificial Life	10	7
SEMMD14	Manipulator Dynamics and Haptics	10	7
SEMBI14	Biomechanics	10	7
Either:			
SE4IP11	Industrial Project	60	7
Or both:			
SE4RP11	Research Project	50	7
SEMRS14	Research Studies	10	7

Optional modules
Select modules worth 30 credits from:

SEMMM14	Mind as Motion	10	7
SEMNN14	Advanced Neural Networks	10	7
SEMNC14	Nonlinear and Optimal Control	10	7
SEMMI14	Medical Image and Signal Processing	10	7
SEMTH14	Terahertz Technology	10	7
SEMVI14	Visual Intelligence	10	7
MMM038	Practice of Entrepreneurship	20	7

Progression requirements

To gain a threshold performance at Part 1 and qualify for the CertHE a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 1, where all the credits are at level 4 or above, and a mark of at least 30% in individual modules amounting to not less than 100 credits.
In order to progress from Part 1 to Part 2, a student shall normally be required to achieve a threshold performance at Part 1, and to have no module mark below 30%.
Students who have failed or are not qualified to progress to Part 2 are permitted one re-sit examination in each module in which they fail to meet the progression requirements. The mark used for the purposes of progression will be the higher of the mark obtained in the original examination and the mark obtained in the re-examination.
Students who do not meet the above requirement but gain a threshold performance at Part 1 may be eligible to transfer to another programme or to leave with a CertHE.

To gain a threshold performance at Part 2, a student shall normally be required to achieve:
(i) a weighted average of 40% over 120 credits taken at Part 2;
(ii) marks of at least 40% in individual modules amounting to not less than 80 credits; and
(iii) marks of at least 30% in individual modules amounting to not less than 120 credits.
In order to progress from Part 2 to Part 3, a student must achieve the threshold performance and achieve an overall average of 50% in the 120 credits taken in Part 2.
Students who fail to progress are permitted one re-sit examination in each module in which they obtain less than 50% or fail to meet the progression requirements. For any module passed in a re-sit examination the maximum mark carried forward into the final degree classification will be the higher of (a) the first attempt mark and (b) the lower of 40 and the mark achieved in the re-examination.
Students who do not meet the above requirements for progression to Part 3 but gain a threshold performance may be eligible to transfer to another programme or leave with a DipHE.

In order to progress from Part 3 to Part 4, a student shall normally be required to achieve the following in Part 3:
an overall weighted average of at least 40% over 120 credits, and
a mark of at least 40% in SE3GP11 project module.
Students who fail to progress are permitted one re-sit examination in each module in which they obtain less than 40% or fail to meet the progression requirements. For any module passed in a re-sit examination the maximum mark carried forward into the final degree classification will be the higher of (a) the first attempt mark and (b) the lower of 40 and the mark achieved in the re-examination.
Students who do not meet the above requirements for progression to Part 4 but gain a threshold performance willbe eligible for the award of BSc Robotics. To gain a threshold performance at Part 3 a student shall normally be required to achieve:
a mark of at least 40% in the Part 3 major project module; and
a mark of at least 40% in individual modules amounting to not less than 80 credits.

To be eligible for honours, a student shall normally be required to have satisfied all of the above progression requirements and to achieve the following in Part 4:

- a mark of at least 40% in individual modules amounting to not less than 80 credits;
- a mark of at least 40% at first attempt in the Part 4 major project module.

Students who fail the degree are permitted one re-sit examination (for a Pass degree) in each Part 4 module in which they have achieved less than 40%. For any such module which is subsequently passed on the re-examination, the mark carried forward into the final degree assessment will be the higher of the original mark and the mark in the re-examination.

Assessment and classification

The University's honours classification scheme is:

Mark	interpretation
70% - 100%	First class
60% - 69%	Upper Second class
50% - 59%	Lower Second class
40% - 49%	Third class
35% - 39%	Below Honours Standard
0% - 34%	Fail

For the University-wide framework for classification, which includes details of the classification method, please see: www.reading.ac.uk/internal/exams/Policies/exa-class.aspx

The weighting of the Parts/Years in the calculation of the degree classification is

Integrated Masters programmes
Part 2 20%
Part 3 40%
Part 4 40%

Teaching is organised in modules that typically involve lectures and tutorial or laboratory practicals. Most modules are assessed by a mixture of coursework and formal examination. Some modules, for example the Part 3 project, are assessed only as coursework. Details are given in the relevant module description.

Admission requirements
Entrants to this programme are normally required to have obtained:
Grade B or better in Combined Science and grade B or better in Mathematics at GCSE;
and achieved AAB from 3 A level subjects including Maths at grade A and a second science.
International Baccalaureate: 35 points overall including 6,6 in Maths and a science both at higher level.

Admissions Tutor: Dr Etienne Roesch

Support for students and their learning
University support for students and their learning falls into two categories. Learning support is provided by a wide array of services across the University, including: the University Library, the Careers, Placement and Experience Centre (CPEC), In-sessional English Support Programme, the Study Advice and Mathematics Support Centre teams, IT Services and the Student Access to Independent Learning (S@il) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, School Senior Tutors, the Students' Union, the Medical Practice and advisers in the Student Services Centre. The Student Services Centre is housed in the Carrington Building and offers advice on accommodation, careers, disability, finance, and wellbeing, academic issues (eg problems with module selection) and exam related queries. Students can get key information and guidance from the team of Helpdesk Advisers, or make an appointment with a specialist adviser; Student Services also offer drop-in sessions and runs workshops and seminars on a range of topics. For more information see www.reading.ac.uk/student

Within the providing School additional support is given though practical laboratory classes. The development of problem-solving skills is assisted by appropriate assignment and project work. There is a Programme Adviser to offer advice on the choice of modules within the programme. Course handbooks are provided for each Part of the course: these give more details about the modules which make up the degree. In addition, the School produces a Handbook for Students, which provides general information about the staff and facilities within the school.

Career prospects
Career prospects for the School's graduates tend to be good as the courses are very relevant to today's high technology society and, because the courses are not dependent upon any one industry, graduates are employed in a variety of areas. Some graduates join large companies, often IT based companies; others join smaller

companies and consultancies; and some choose to further their research interests either in the School or at other Universities.

Assuming the course becomes accredited, graduates from this programme may, after a period of professional experience, together with other appropriate educational requirements, apply for Chartered Engineer status.

Opportunities for study abroad or for placements
Placement opportunities are available as part of the Industrial Project module.

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

Knowledge and Understanding

A. Knowledge and understanding of:	**Teaching/learning methods and strategies**
1. Appropriate mathematical techniques to help model and analyse systems 2. Science underlying robotic systems. 3. Information technology. 4. Systems design. 5. Relevant management and business practices 6. Engineering practice.	The knowledge required for the basic topics is obtained via lectures, tutorials, laboratory practicals, assignments and project work. Appropriate IT packages are taught. Demonstrators in laboratory and project supervisors advise students, and feedback is provided on all continually assessed work. As the course progresses, students are expected to show greater initiative and undertake independent research. *Assessment* Most knowledge is tested through a combination of practicals, assignments and formal examinations (open book in parts 3 and 4): students write reports on most assignments after part 1, and oral presentations also contribute.

Skills and other attributes

B. Intellectual skills - *able to:*	**Teaching/learning methods and strategies**
1. Select and apply appropriate scientific principles, mathematical and computer based methods for analysing robotic systems. 2. Analyse and solve robotic problems. 3. Be creative. 4. Organise tasks into a structured form. 5. Understand the evolving state of knowledge in a rapidly developing area. 6. Transfer appropriate knowledge and methods from Robotics to related disciplines. 7. Plan, conduct and write a report on a project or assignment. 8. Prepare an oral presentation.	Appropriate mathematical, scientific and IT skills and tools are taught in lectures, and problems to be solved are given as projects or assignments. Project planning is part of the Part 3 project, and written and oral presentations are required for various assignments and projects. In the latter part of the course, some of the research in Robotics and related subjects is presented. *Assessment* 1-6 are assessed partly by examination, though sometimes also by project or assignment work. 7 and 8 are assessed as part of project work.

C. Practical skills - *able to:*	**Teaching/learning methods and strategies**
1. Use appropriate mathematical methods or IT tools. 2. Program a computer to solve problems. 3. Use relevant laboratory equipment and analyse the results critically.	Mathematics and IT tools are introduced in lectures and their use is assessed by examinations and assignments. Programming assignments are set, and students may write programs to solve other projects.

4. Design, build and test a system.
5. Research into robotic problems.
6, Use project management methods.
7. Present work.

Laboratory practicals and projects are used to teach about 3, and projects are used for 4, 5, 6 and 7.

Assessment
1 and 5 are tested in coursework and in examinations. 2, 5 and 7 are tested by assignments and projects, 3 is assessed in practicals and sometimes in projects, 4, 5 and 6 are assessed through project work.

D. Transferable skills - *able to:*

1. Use IT tools.
2. Acquire, manipulate and process data.
3. Use creativity and innovation.
4. Solve problems.
5. Communicate scientific ideas.
6. Give oral presentations.
7. Work as part of a team.
8. Use information resources.
9. Manage time.

Teaching/learning methods and strategies

Some IT tools are taught in lectures, but most through laboratory sessions and assignments. Data skills are acquired in laboratory and projects. Creativity and problem solving are experienced through projects, as are team working, time management and presentations. Use of information resources, such as the library and IT methods, is experienced through projects and assignments.

Assessment
Some skills, like the use of IT tools and the ability to communicate orally and in written form are directly assessed, in assignments or projects, other skills are not directly assessed but their effective use will enhance the students overall performance.

Please note - 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 each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the process of academic development and feedback from students, quality assurance process or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.