MSc in Cybernetics
For students entering Part 1 in 2011/2

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Engineering
Faculty:	Science Faculty
Programme length:	1 years
Date of specification:	24/Aug/2011
Programme Director:	Dr Victor Becerra
Programme Advisor:	Dr Richard Mitchell
	Dr Virginie Ruiz
Board of Studies:	Cybernetics
Accreditation:	Institution of Engineering and Technology

Summary of programme aims
The programme aims to provide a thorough postgraduate Master's education in Cybernetics, covering both the technological and biological aspects of the subject, thus reflecting Wiener's definition that Cybernetics applies both to the 'animal and the machine'.

Transferable skills
At the end of this programme students are expected to have gained 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 and time-management.

Programme content
The profile which follows states which modules must be taken, together with lists of modules from which the student must make a selection. Students must choose such optional modules, in consultation with the Programme Director and according to the restrictions given below, to make 180 credits in total.

Compulsory modules:

Code	*Module title*	*Credits*	*Level*
CYMP2	MSc Dissertation	60	7

Optional modules:
Students must choose modules worth 30 credits from the following list:

SE3SI11	System Identification and Control	20	6
SE3SS11	State Space	10	6
SE3MS11	Measurement Systems	10	6
SE3VR11	Virtual Reality	10	6
SE3MH11	Modern Heuristics	10	6
SE3ME11	Mechatronics	10	6
SE3BI11	Bionics	10	6
SE3MM11	Machines in Motion	10	6

And modules worth 90 credits from the following list:

CY4A2	Advanced Control	20	7
CY4B2	Mind as Motion	10	7
CY4D2	Terahertz Technology	10	7
CY4F8	Swarm Intelligence and Artificial Life	10	7
CY4I7	Biomechanics	10	7

CY4J9	Manipulator Dynamics and Haptics	10	7
CY4M8	Medical Image and Signal Processing	10	7
CY4C9	Advanced Neural Networks	10	7
CYMS2	Signal Processing	10	7
MMM038	Practice of Entrepreneurship	20	7

Co-requisites:
SE3MM11 is a co-requisite for CY4J9. Students registering for CY4J9 must also take SE3MM11, unless they have the appropriate background knowledge on robot kinematics.

Part-time or modular arrangements
Part-time students will be able to take the taught element of the MSc in the Autumn and Spring terms over two consecutive academic years. The MSc project for part-time students will start in April of the first year of registration and will end in September of the second year of registration.

In addition to the full-time and two year part-time options, the programme is offered on a flexible modular basis, giving the opportunity to individuals who are in full-time employment to gain an MSc in Cybernetics (180 credits, including a dissertation), a Postgraduate Diploma (120 credits) or a Certificate (60 credits). Students in the flexible mode will have a maximum of five years to earn up to 180 credits.

The award of the Postgraduate Certificate and the Postgraduate Diploma will be dependent upon the successful completion of 60 credits and 120 credits, respectively, of the course at the same pass marks as for the Masters Degree. Because of the nature of the flexible modular option, students may be awarded the Postgraduate Certificate or Diploma at the termination of any appropriate module.

The maximum study period of five years will allow candidates considerable flexibility in achieving a postgraduate award while continuing to pursue a full-time career in industry. The flexible modular students will take their choice of modules together with the full-time students over the Autumn and Spring terms of each academic year. Each taught module typically involves two hours of lectures per week. 10-credit modules are typically taught over one term (Autumn or Spring), while 20-credit modules are typically taught over two terms (Autumn and Spring).

Progression requirements
N/A

Assessment and classification
Teaching is organised in modules that typically involve lectures and tutorial or laboratory sessions. Most modules are assessed by a mixture of coursework and formal examination. Some modules are assessed only as coursework. Details are given in the relevant module description.
Marking
Work will be assessed on a University wide conventional scale, as follows:

Awards Classification
Mark Interpretation
70 - 100% Distinction
60 - 69% Merit
50 - 59% Good standard (Pass)
Failing categories:
40 - 49% Work below threshold standard
0 - 39% Unsatisfactory Work

Awards Classification
Awarding is made by the Examiners' exercising judgement of the category which best represents the candidate's achievement based on the overall level of performance (the weighted average of the marks), on the profile of marks overall, and on any specific restriction which may apply (for accreditation or other proper purposes), taking into account any relevant special circumstances.

The awarding classification for the master's degree is as follows:

To pass the MSc students must gain an average mark of 50 or more overall including a mark of 50 or more for the dissertation. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.
Students who gain an average mark of 70 or more overall including a mark of 60 or more for the dissertation and have no mark below 40 will be eligible for a Distinction. Those gaining an average mark of 60 or more overall including a mark of 50 or more for the dissertation and have no mark below 40 will be eligible for a Merit.

Further information on marking criteria, awarding classifications (including the Master's course, Postgraduate Diploma, and Postgraduate Certificate), resits, and resubmissions, is given in the *Marking Criteria and Classification Framework for Taught Postgraduate Programmes* (for cohorts entering in the Autumn Term 2008 and thereafter), available at http://www.reading.ac.uk/internal/exams/Policies/exa-class.aspx

Admission requirements
Undergraduate Degree
At least a 2.1 Honours UK BSc/BEng degree or overseas equivalent
Degree Discipline
Engineering (e.g. Electrical, Mechanical, Electronic, Control, Cybernetics, Robotics, Mechatronics, Automotive, Aerospace, Chemical) or other science based subjects (such as Physics) with suitable mathematical content (which should include calculus in one or more variables, differential equations, complex analysis, linear algebra, Fourier series and Laplace transforms).
English
For candidates whose native language is not English, proof of competency is required. The two approved tests are:
IELTS (British Council International English Language Test) - overall score of 6.5 with no less than 6.0 in any component
TOEFL (Test of English as a Foreign Language) - score of 590 (interner-based test - 88)

Admissions Tutor: Dr Victor M. Becerra

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 Student Employment, Experience and Careers Centre (SEECC), 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. 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

The Programme Director will offer advice on the choice of modules within the programme. A course handbook is provided which gives more details about the modules that make up the MSc degree. In addition, the School of Systems Engineering produces a Handbook for Students, which provides general information about the staff and facilities within the school.

Each student will have a supervisor with expertise in the subject area of the student's dissertation project. It is the responsibility of the supervisor to give guidance to the student through regular meetings. For full-time students these meetings should take place at no more than three-weekly intervals, longer for part-time students. It is the responsibility of the student to raise with the supervisor any difficulties or problems which occur in the course of the work and to submit coursework and progress reports as required by the course handbook.

Career prospects
Career prospects for Cybernetists 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 of Systems Engineering or at other Universities.

Opportunities for study abroad or for placements
N/A

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. Advanced mathematical techniques to help model and analyse systems, and use mathematics as a tool for communicating results and concepts. 2. Science underlying cybernetic systems. 3. Information technology as applied in Cybernetics. 4. Systematic design of systems, including a critical awareness of relevant design methods, and the use of appropriate technology. 5. Current problems and new insights in the field of Cybernetics.	The knowledge required for the different topics is obtained via lectures, tutorials, laboratory practicals, assignments and project work. Appropriate IT packages are used and introduced when necessary. Postgraduate demonstrators in laboratory and project supervisors advise students, and feedback is provided on all continually assessed work. By pursuing the course, students are expected to acquire greater initiative and undertake independent research. *Assessment* Most knowledge is tested through a combination of practicals, assignments and formal examinations (mainly open book): students write reports on most assignments and oral presentations are also assessed.

Skills and other attributes

B. Intellectual skills - *able to:*	**Teaching/learning methods and strategies**
1. Select and critically apply scientific principles, mathematical and computer based methods for analysing cybernetic systems. 2. Analyse and solve cybernetic problems showing self-direction and originality. 3. Be innovative and 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 one topic in cybernetics to another. 7. Plan and conduct a research project and write a dissertation. 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 MSc project, and written and oral presentations are required for various assignments and for the MSc project. *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. 4. Research into cybernetic problems. 5. Manage projects. 6. Present work.	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 as part of their MSc project. Laboratory practicals and the MSc project are used to teach about 3, and the MSc project is used for 4, 5, and 6.

Assessment
1 and 4 are tested in coursework and in examinations. 2 is tested by assignments, the MSc project and occasionally by examination, 6 is assessed in assignments and the MSc project. 3 is assessed in practicals and sometimes in the MSc project, 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, innovation and problem solving are experienced through the MSc project, time management and presentations. Team working skills are acquired through laboratory work. 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 through the MSc project, 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.