

**MEng Cybernetics**  
**For students entering Part 1 in 2007**

**UCAS code: H654**

Awarding Institution:	The University of Reading
Teaching Institution:	The University of Reading
Relevant QAA subject benchmarking group(s):	Engineering
Faculty of Science	
Programme length:	4 years
Date of specification:	2/02/10
Programme Director:	Dr R.J.Mitchell
Programme Advisers:	Dr J.W.Bowen and Dr V.M.Becerra
(Cybernetics)	
Board of Studies:	Cybernetics
Accreditation:	Institution of Engineering and Technology; Institute of Measurement and Control

**Summary of programme aims**

The programme aims to provide a thorough degree-level 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'. (For a full statement of the programme aims and learning outcomes see below)

**Transferable skills**

The University's Strategy for Teaching and Learning has identified a number of generic transferable skills which all students are expected to have developed by the end of their degree programme. In following this programme, students will have had the opportunity to enhance their skills relating to career management, communication (both written and oral), information handling, numeracy, problem-solving, team working and use of information technology.

As part 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, 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*

	<i>Credits</i>	<i>Level</i>
SE1CA5 <i>Cybernetics and Its Application</i>	20	C
SE1SA5 <i>Programming</i>	20	C
SE1SB5 <i>Software Engineering</i>	20	C
SE1EA5 <i>Electronic Circuits</i>	20	C
SE1EB5 <i>Computer and Internet Technologies</i>	20	C
SE1CB5 <i>Engineering Mathematics</i>	20	C

**Part 2 (three terms)**

*Credits      Level*

### Compulsory modules

CY2A7	Control and Measurement	20	I
CY2C6	Systems and Robotics	20	I
CY2D7	Neurocomputation	20	I
SE2A2	Signals and Telecoms	20	I
EE2C2	Digital Circuit Design	10	I
CY2H6	Further Computer Systems	10	I
SE2P6	Engineering Applications	20	I

### Part 3 (three terms)

Credits Level

#### Compulsory modules

SE3P9	MEng Group Project	30	H
CY3A2	Computer Controlled Feedback Systems	20	H
CY3B9	Machine Intelligence	10	H
CY3C2	State Space	10	H
CY3H2	Non-Linear and Optimal Control	10	H
SE3Z5	Social, Legal and Ethical Aspects of Science and Engineering	20	H

#### Optional modules must be chosen to give a total of 120 credits

CY3D2	Measurement Systems	10	H
CY3E2	Biological Cybernetics	10	H
CY3F8	Virtual Reality	10	H
CY3G2	Modern Heuristics	10	H
CY3J8	Machines in Motion	10	H
CY3L2	Mechatronics	10	H
CY3K7	Bionics	10	H
EE3A2	Digital Signal Processing	10	H
SE3C9	Computer Networking	20	H
LAXXX	Language from IWLP	20	H

### Part 4 (three terms)

Credits Level

#### Compulsory modules

SE4P6	MEng Research Project	40	M
CY4A2	Advanced Control	20	M
SE4R9	Research Studies	10	M
SE4S9	Law and Management	10	M

#### Optional modules must be chosen to give a total of 120 credits.

CY4B2	Mind as Motion	10	M
CY4C9	Advanced Neural Networks	10	M
CY4D2	Terahertz Technology	10	M
CY4F8	Swarm Intelligence and Artificial Life	10	M
CY4G2	Biomedical Instrumentation	10	M
CY4I7	Biomechanics	10	M
CY4J9	Manipulator Dynamics and Haptics	10	M
CY4K7	Learning Classifier Systems	10	M
EEM23	Wireless Communications and Networking	20	M
SEM21	Advanced Digital Signal Processing	10	M
MMM038	Practice of Entrepreneurship	20	M

### 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 C level 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%.

To gain a threshold performance at Part 2 and qualify for the DipHE a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 2, and a mark of at least 30% in individual modules amounting to not less than 100 credits. In order to progress from Part 2 to Part 3, a student shall normally be required to achieve a threshold performance at Part 2 and achieve an overall average of 60% in the 120 credits taken in Part 2. A student whose average is below 60% may be qualified for the BSc Cybernetics & Control Engineering degree.

### **Summary of teaching and assessment**

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, in particular the Part 3 and Part 4 projects, are assessed only as coursework. Details are given in the relevant module description.

A student must obtain at least 40% in both their projects (SE3P9 and SE4P6) to be eligible for honours.

Part 2 contributes 20% of the final degree assessment, Parts 3 and 4 each contribute 40%.

### **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

UCAS Tariff: 320 points with grade B or better in Mathematics and Physics or Electronics, or equivalent

International Baccalaureat: 32 points including 6 in Higher Mathematics.

Equivalent qualifications are acceptable.

Admissions Tutor: Dr Will Browne

### **Support for students and their learning**

University support for students and their learning falls into two categories. Learning support includes IT Services, which has several hundred computers and the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses 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 the Student Services Centre. The Student Services Centre is housed in the Carrington Building and includes the Careers Advisory Service, the Disability Advisory Service, Accommodation Advisory Team, Student Financial Support, Counselling and Study Advisors. Student Services has a Helpdesk available for enquiries made in person or online ([www.risisweb.reading.ac.uk](http://www.risisweb.reading.ac.uk)), or by calling the central enquiry number on (0118) 378 5555. 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 on everything from accommodation to finance. The Carrington Building is open between 8:30 and 17:30 Monday to Thursday (17:00 Friday and

during vacation periods). Further information can be found in the Student Diary (given to students at enrolment) or on the Student website ([www.reading.ac.uk/student](http://www.reading.ac.uk/student)).

Within the providing School additional support is given through 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 of Systems Engineering produces a Handbook for Students, which provides general information about the staff and facilities within the school, and other aspects of the University.

### **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 or at other Universities.

Graduates from this programme may, after a period of professional experience, apply for Chartered Engineer status.

### **Opportunities for study abroad or for placements**

N/A

### **Educational aims of the programme**

The programme aims to combine an understanding of systems in general, both technological and biological, with a knowledge of relevant modern technologies, theories and techniques; to produce good practically oriented cybernetists whose systems grounding allows them to work in an academic, research or industrial environment, as individuals or as part of a team. This programme is distinctive in that it describes both the technological and biological aspects of Cybernetics, thus reflecting Wiener's definition that Cybernetics applies both to the 'animal and the machine'.

## 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:**

1. Appropriate 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.
4. Design of systems, including relevant design methods, and the use of appropriate technology.
5. Management and business practices, including finance, law, marketing and quality control
6. Engineering practice.

#### **Teaching/learning methods and strategies**

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 (mainly open book in parts 3 and 4); students write reports on most assignments after part 1, and oral presentations are also assessed.

### *Skills and other attributes*

#### **B. Intellectual skills – able to:**

1. Select and apply appropriate scientific principles, mathematical and computer based methods for analysing cybernetic systems.
2. Analyse and solve cybernetic problems.
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, conduct and write a report on a project or assignment.
8. Prepare an oral presentation.

#### **Teaching/learning methods and strategies**

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 Cybernetics 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:

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. Design, build and test a system.
5. Research into cybernetic problems.
6. Manage projects.
7. Present work.

**Teaching/learning methods and strategies**

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.

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, innovation 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 processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.**