MEng Cybernetics

UCAS code: H654

For students entering Part 1 in 2004

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 profile: 30/03/07
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)		*Credits*	*Level*
Compulsory modules			
CY1A2	*Cybernetics and Its Application*	20	C
SE1A2	*Introduction to Computer Systems*	10	C
CS1G2	*Introduction to Algorithms*	10	C
SE1B2	*Systems and Circuits*	20	C
EG1C2	*Engineering Mathematics*	20	C
EE1A2	*Electronic Devices and Telecoms*	20	C
and either both			
CS1A2	*Programming 1*	10	C
CS1B2	*Programming 2*	10	C
or both			
CS1C2	*Introductory Programming 1*	10	C
CS1D2	*Introductory Programming 2*	10	C

Part 2 (three terms)		*Credits*	*Level*
Compulsory modules			
CY2A2	*Control and Measurement*	20	I
CY2C2	*Control Systems*	20	I
CY2D2	*Neurocomputation*	20	I
SE2A2	*Signals and Telecoms*	20	I
SE2B2	*Further Computer Systems*	20	I
SE2P4	*Engineering Applications*	20	I

Part 3 (three terms)		*Credits*	*Level*
Compulsory modules			
CY3P2	*Cybernetics Project*	30	H
CY3A2	*Computer Controlled Feedback Systems*	20	H
CY3B2	*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 – choose modules worth 20 credits from the following			
CY3D2	*Measurement Systems*	10	H
CY3E2	*Biological Cybernetics*	10	H
CY3F2	*Virtual Reality*	10	H
CY3G2	*Modern Heuristics*	10	H
CY3L2	*Mechatronics*	10	H
CY4E2	*Bionics*	10	M
EE3A2	*Digital Signal Processing*	10	H
EE3C2	*Digital & Data Communications*	20	H
	Language from IWLP	20	H

Part 4 (three terms)		*Credits*	*Level*
Compulsory modules			
SE4P6	*MEng Research Project*	40	M
CY4A2	*Advanced Control*	20	M

Optional modules must be chosen to give a total of 120 credits. These must be chosen from the following except, subject to timetabling restrictions, students can also choose up to 20 credits of Part 3 optional modules they have not already taken.

CY4B2	*Mind as Motion*	10	M
CY4D2	*Terahertz Technology*	10	M
CY4G2	*Biomedical Instrumentation*	10	M
CY4I7	*Biomechanics*	10	M
CY4J2	*Manipulator Robotics*	10	M
CY4K7	*Learning Classifier Systems*	10	M
EE4H7	*Wireless Communications and Networking*	20	M
SE4G2	*Advanced Digital Signal Processing*	10	M
MMM380	*Practice of Entrepreneurship*	20	M

Progression requirements

In order to progress from Part 1 to Part 2 students must:

- Achieve an overall average of 40% over 120 credits taken in Part 1
- Achieve a mark of at least 30% in each module taken.

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.

To be eligible for honours the student must obtain an overall average mark of at least 40% and at least 40% in both the Part 3 project and the Part 4 project.

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: 300 points with grade B or better in Mathematics and Physics, or equivalent
International Baccalaureat: 32 points including 6 in Higher Mathematics; or
Irish Leaving Certificate: BBBBB including B or better in Maths and Physics

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, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors, Hall Wardens and the Students' Union.

Within the providing Department 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 Course 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 Computer Science, Cybernetics and Electronic Engineering produces a Handbook for Students, which provides general information about the staff and facilities within the school.

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 Department or at other Universities.
Graduates from this programme may, after a period of professional experience, apply for Chartered Engineer status.

Opportunities for study abroad

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:	**Teaching/learning methods and strategies**
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.	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:	**Teaching/learning methods and strategies**
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.	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.