BSc Biomedical Engineering and Cybernetics **UCAS code: H655**
For students entering Part 1 in 2008/9

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Engineering
Faculty:	Science Faculty
Programme length:	3 years
Date of specification:	10/Aug/2010
Programme Director:	Dr Richard Mitchell
Programme Advisor:	Dr Virginie Ruiz Dr William Harwin
Board of Studies:	Cybernetics
Accreditation:	Institution of Engineering and Technology; Institute of Measurement and Control

Summary of programme aims
The programme aims to develop the students' knowledge of the theory and practice of biomedical engineering and cybernetics. The programme is distinctive in that it concentrates on the biomedical aspects of the interdisciplinary subject of Cybernetics.

The programme aims to combine an understanding of human and biological systems in general, but with particular relevance to biomedical engineering; to appreciate relevant modern technology and techniques; to produce good practically oriented cybernetists whose systems grounding allows them to work in an industrial or academic environment, as individuals or as part of a team. The programme is distinctive in that it concentrates on the biomedical engineering aspects of the interdisciplinary subject of Cybernetics.

Transferable skills
During the course of their studies at Reading, all students will be expected to enhance their academic and personal transferable skills in line with the University's Strategy for Learning and Teaching. 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 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 credits for each module is shown after its title.

Part 1 (three terms)
Compulsory modules

Module	*Title*	*Credits*	*Level*
SE1CA5	Cybernetics and its Application	20	4
SE1CB5	Engineering Mathematics	20	4
SE1EA5	Electronic Circuits	20	4
SE1EB5	Computer and Internet Technologies	20	4
SE1SA5	Programming	20	4
SE1SB5	Software Engineering	20	4

Part 2 (three terms)
Compulsory modules

Module	*Title*	*Credits*	*Level*
SE2P6	Engineering Applications	20	5
CY2H6	Further Computer Systems	10	5
CY2E7	Biomedical Systems	10	5
CY2F7	Medical Engineering and Experimentation	10	5
CY2G2	Signals	10	5
CY2I7	Virtual Anatomy	10	5
EE2C2	Digital Circuit Design	10	5
CY2D9	Neural Nets	10	5
CY2K9	Neuroscience	10	5
CY2A9	Control Systems	10	5
CY2C9	Control and Measurement	10	5

Part 3 (three terms)
Compulsory modules

Mod Code	*Module Title*	*Credits*	*Level*
CY3P2	Cybernetics Project	30	H
SE3Z10	Social, Legal and Ethical Aspects of Science and Engineering	10	H
CY3E2	Biological Cybernetics	10	H
CY4I7	Biomechanics	10	M
CY3K7	Bionics	10	H

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

CY3A2	Computer Controlled Feedback Systems	20	6
CY3B9	Machine Intelligence	10	6
CY3F8	Virtual Reality	10	6
CY3G2	Modern Heuristics	10	6
CY3J8	Machines in Motion	10	6
CY3L2	Mechatronics	10	6
CY2N9	Mechanical Design	10	5
CS3U7	Image Analysis	10	6
EE3A2	Digital Signal Processing	10	6
CY4G2	Biomedical Instrumentation	10	7
CY4M8	Medical Image and Signal Processing	10	7
LAXXX	Institution Wide Language Programme	20	

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.

A student must obtain at least 40% in their project CY3P2 to be eligible for honours. Part 2 contributes one third of the final degree assessment and Part 3 contributes two thirds.

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, for instance the Part 3 project, are assessed only as coursework.

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: 280 points with grade C or better in Maths (A) and preferably in Biology (A-Sub)
International Baccalaureat: 30 points including 6 in Higher Mathematics.
Equivalent qualifications are acceptable.

Admissions Tutor: Dr Faustina Hwang

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 Directorate. The Student Services Directorate 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), 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 website (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 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
Biomedical engineering is a discipline now recognised as having an important role to play in academia, industry, and the National Health Service. As such career opportunities are varied and often challenging. Graduates may wish to further their training with the IPEM, which governs the professional aspect of non-clinical staff within the Health Service and work in hospitals. Career prospects in industry for Biomedical Engineers and Cybernetists tend to be very good as the course is very relevant to today's technology orientated society and, because the course is not dependent upon any one industry, graduates are also employed in a variety of areas other than healthcare industry. Cybernetics 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, together with other appropriate educational requirements, apply for Chartered Engineer status.

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. Appropriate mathematical techniques to help model and analyse systems 2. Science underlying cybernetic systems 3. Information technology 4. Systems design 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 (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 general cybernetic systems 2. Analyse and solve cybernetic 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 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:*	**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. Design, build and test a system 5. Research into cybernetic problems 6. Use project management methods 7. 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 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 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.