**BSc Cybernetics**                                                 **UCAS code: H651**
**For students entering Part 1 in 2011/12**

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| 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: | 15/May/2013 |
| Programme Director: | Dr Virginie Ruiz |
| Programme Advisor: | Dr John Bowen |
| | Dr Victor Becerra |
| Board of Studies: | UG Systems Engineering |
| 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'.

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 cyberneticists 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'.

**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 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*

| 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 |

*Optional modules:*

| Code | Module title | Credits | Level |
|------|--------------|---------|-------|
| SE1FC11 | Fundamentals of Computing | 20 | 4 |
| LA1XX1 | Institution Wide Language Programme | 20 | 4 |

## Part 2 (three terms)
*Compulsory modules*

| Code | Module title | Credits | Level |
|------|--------------|---------|-------|
| SE2SM11 | System Design and Project Management | 20 | 5 |
| SE2SP11 | Signal Processing | 20 | 5 |
| SE2EM11 | Embedded Microprocessors and Digital Systems | 20 | 5 |
| SE2CS11 | Control Systems | 10 | 5 |
| SE2NE11 | Neuroscience | 10 | 5 |
| SE2SD11 | Sensors and Devices | 10 | 5 |
| SE2NN11 | Neural Networks | 10 | 5 |
| SE2RM11 | Robots and Mechanics | 10 | 5 |

*Optional modules:*

| Code | Module title | Credits | Level |
|------|--------------|---------|-------|
| SE2RS11 | Robotic Systems | 10 | 5 |
| SE2TE11 | Telecommunications | 10 | 5 |
| SE2MI11 | Machine Intelligence | 10 | 5 |

## Part 3 (three terms)
*Compulsory modules*

| Code | Module title | Credits | Level |
|------|--------------|---------|-------|
| SE3IP11 | Individual Project | 40 | 6 |
| SE3SL11 | Social, Legal and Ethical Aspects of Science and Engineering | 10 | 6 |
| SE3SI13 | System Identification and Control | 10 | 6 |
| SE3SS13 | State Space and Frequency Response | 10 | 6 |

*Optional modules*
*Select 40 credits from:*

| Code | Module title | Credits | Level |
|------|--------------|---------|-------|
| SE3LM11 | Law and Management | 10 | 6 |
| SE3MH11 | Modern Heuristics | 10 | 6 |
| SE3ME11 | Mechatronics | 10 | 6 |
| SE3MM11 | Machines in Motion | 10 | 6 |
| SE3VR11 | Virtual Reality | 10 | 6 |
| SE3IA11 | Image Analysis | 10 | 6 |
| SE3SE11 | Sustainable Electrical Energy | 10 | 6 |
| SE3MS11 | Measurement Systems | 10 | 6 |
| SE3AE11 | Analogue Electronics | 10 | 6 |
| SE3BI11 | Bionics | 10 | 6 |

**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%.

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 whose average is 60% or greater may be qualified for the MEng Cybernetics degree.

A student must obtain at least 40% at first attempt in their project SE3IP11 and achieve 80 credits in their Final Part with a mark of at least 40.

**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

**Three-year programmes**
Part 2 one-third
Part 3 two-thirds

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 Mathematics and Physics or Electronics, or equivalent
International Baccalaureat: 30 points including 6 in Higher Mathematics.
Equivalent qualifications are acceptable.

**Admissions Tutor:** Dr Ben Potter

**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 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, together with other appropriate educational requirements, apply for Chartered Engineer status.

### Opportunities for study abroad or for placements

Students who wish to undertake a year-long industrial placement may be eligible to transfer to the BSc Cybernetics with Industrial Year. The placement normally takes place between Parts 2 and 3 of this degree programme.

### 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:*

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.

**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 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.**