

BSc Computational Science

UCAS code: G430

For students entering Part 3 in 2009

Awarding Institution:

University of Reading

Teaching Institution:

University of Reading

Relevant QAA subject benchmarking group(s):

Computing

Faculty of Science

Programme length: 3 years

Date of specification: March 2009

Programme Director: Professor VN Alexandrov

Programme Adviser: Dr GT McKee

Admissions Tutor: Dr MP Evans

Board of Studies: Computer Science

Accreditation: *The BCS will be approached for accreditation of this programme.*

Summary of programme aims

This programme aims to prepare students for a career in the computer industry, with a particular emphasis on high-performance computing and applications. Graduates will be well qualified to play a disciplined and creative part in a research, development or support environment.

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 credits for each module is shown after its title.

Part 1 (three terms)

Credits

Compulsory modules

SE1SA5	<i>Programming</i>	20 C
SE1SB5	<i>Software Engineering</i>	20 C
SE1SC5	<i>Computer Science Roadmap</i>	20 C
SE1EB5	<i>Computer and Internet Technologies</i>	20 C
MA11B	<i>Calculus and Applications</i>	20 C
MA11C	<i>Matrices, Vectors and Applications</i>	20 C

Part 2 (three terms)*Compulsory modules*

CS2F7	<i>Object Oriented Design</i>	10 I
CS2G7	<i>Essential Algorithms</i>	10 I
CS2M7	<i>Further Algorithms</i>	10 I
CS2H6	<i>Programming Techniques for Advanced Architectures</i>	10 I
CS2J7	<i>Programming with Java</i>	10 I
CS2K7	<i>XML and Web Technologies</i>	10 I
MA24L	<i>Differential Equations and Fourier Series</i>	20 I
MA24J	<i>Vector Calculus and Numerical Analysis</i>	20 I

Students select a total of 20 credits from one of the following groups of modules:

Either both:

CS2B6	<i>Operating Systems</i>	10 I
CS2C6	<i>Computer Architecture</i>	10 I

Or both:

CS2A6	<i>Compilers</i>	10 I
CS2TD7	<i>Databases</i>	10 I

Or:

CS2L7	<i>Human Computer Interaction</i>	10 I
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And either

CS2R7	<i>Space Robotics</i>	10 I
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Or

CS2Q7	<i>Artificial Intelligence</i>	10 I
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Part 3 (three terms)*Compulsory modules*

SE3Z5	<i>Social, Legal & Ethical Aspects of Science & Eng.</i>	20 H
CS3Q2	<i>Computer Science Final Year Project</i>	30 H
CS3G6	<i>Mathematical Modelling</i>	10 H
CS3E6	<i>Distributed Computing</i>	10 H
CS4B2	<i>Parallel Algorithms</i>	10 M
MA3DS	<i>Dynamical Systems</i>	10 H
MA3NIO	<i>Analysis of Num. Tech. for Integ. & Ord. Diff. Eqns</i>	10 H

Optional modules

Students select a total of 20 credits from the following modules:

SE3C9	<i>Computer Networks</i>	20 H
CS3H7	<i>Concurrent Systems</i>	10 H
CS3J2	<i>Computer Graphics I</i>	10 H
CS3K7	<i>Data Mining</i>	10 H
CS3L2	<i>Neural Computation</i>	10 H
CS3M6	<i>Evolutionary Computation</i>	10 H
CS3U7	<i>Image Analysis</i>	10 H
CS3V7	<i>Visual Intelligence</i>	10 H
CS3W7	<i>Multi-Agent Systems</i>	10 H
CS3Y7	<i>Robot Systems</i>	10 H
MA3W7	<i>Control Systems</i>	10 H
MA3C7	<i>Boundary Value Problems</i>	10 H
MA3D7	<i>History of Mathematics and Applications</i>	10 H
CS4E7	<i>Computational Robotics</i>	10 M

Progression requirements

To gain a threshold performance at Part 1 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% in any of the compulsory Part 1 modules.

To gain a threshold performance at Part 2 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 (CS3Q2) to be eligible for honours.

Part 2 contributes one third of the overall assessment and Part 3 the remaining two thirds.

Summary of teaching and assessment

Teaching is organised in modules that typically involve both lectures and practical work. Most modules are assessed by a mixture of coursework and formal examination. However, some modules are assessed only as coursework, while others are assessed solely by examination. Details are given in the relevant module descriptions.

Admission requirements

Entrants to this programme are normally required to have obtained:

Grade C or better in English in GCSE; and achieved

UCAS Tariff: A Level: 300 points including grade B in A Level Mathematics; or

International Baccalaureat: 30 points including 6 in Higher Mathematics; or

Advanced GNVQ: Merit in one of the following subject areas: Engineering, Information Technology or Science, accompanied by A Level Mathematics Grade B or

Scottish Highers: Grade A in Mathematics and two Bs and a C in three other subjects.

Irish Leaving Certificate: Grade A in Mathematics and three Bs and a C in four other subjects

Two AS grades are accepted in place of one A-Level except in Mathematics.

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 Adviser, Study Advisors, Hall Wardens and the Students' Union.

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 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 Systems Engineering produces a Handbook for Students, which provides general information about the staff and facilities within the school.

Career prospects

Students have the opportunity to take up careers in many areas of the Computing industry. These range from small start-up companies to multi-nationals and several graduates have started their own businesses. Others have joined research groups in university and industry, the public service, and the teaching professions.

Opportunities for study abroad

N/A

Educational aims of the programme

To develop the students' knowledge of the theory and practice of modern computer science, necessary for them to secure employment as professional software engineers in a wide variety of industries; to encourage their critical and analytical skills; and to develop their skills in applying theoretical concepts to the practice of computer systems design.

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. software engineering and theoretical issues in Computer Science.
2. a range of programming languages and environments.
3. information technology.
4. appropriate mathematical techniques, including the use of mathematics as a tool for communicating results, concepts and ideas.
5. business context.
6. engineering practice.

Teaching/learning methods and strategies

The knowledge required for the basic topics is obtained via lectures, exercises, practicals, assignments and project work.

Appropriate IT and other software packages are taught.

Practical demonstrators 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.

Assessment

Most knowledge is tested through a combination of practicals, assignments and formal examinations. Students write reports on many assignments, and also make oral presentations of their work.

Skills and other attributes

B. Intellectual skills – able to:

1. select and apply appropriate computer based methods, mathematical and scientific principles for analysing general systems.
2. analyse and solve problems.
3. organise tasks into a structured form.
4. understand the evolving state of knowledge in a rapidly developing area.
5. transfer appropriate knowledge and methods from one topic within the subject to another.
6. plan, conduct and write a report on a project or assignment.
7. prepare an oral presentation.

Teaching/learning methods and strategies

Appropriate software, 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.

Assessment

Skills 1-5 are assessed partly by examination, though sometimes also by project or assignment work. Skills 6 and 7 are assessed as part of project work.

C. Practical skills – able to:

1. use appropriate software tools.
2. program a computer to solve problems.
3. use relevant software and analyse the results critically.
4. design, build and test a system.
5. research into computer science problems.
6. utilise project management methods.
7. present work both in written and oral form.

Teaching/learning methods and strategies

Software 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.

Practicals and projects are used to teach about skill 3, and projects are used for skills 4, 5, 6 and 7.

Assessment

Skills 1 and 5 are tested in coursework and in examinations. Skills 2, 5 and 7 are tested by assignments and projects, 3 is assessed in practicals and sometimes in projects, Skills 4, 5 and 6 are assessed through project work.

D. Transferable skills – able to:

1. use software 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

Software tools are taught partly in lectures, mainly through practical sessions and assignments.

Data skills are acquired in laboratory and projects. Creativity and innovation and problems 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 software tools and 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.