BSc Computational Mathematics **UCAS code: G1G4**
For students entering Part 1 in 2015/6

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Mathematics, Statistics and Operational Research
Faculty:	Science Faculty
Programme length:	3 years
Date of specification:	06/Apr/2017
Programme Director:	Dr Peter Chamberlain
Programme Advisor:	Dr Hong Wei
Board of Studies:	School of Mathematical and Physical Sciences
Undergraduate	
Accreditation:	Accredited by the Institute of Mathematics and its applications to meet the educational requirements of the Chartered Mathematician designation when followed by subsequent training and experience in employment to obtain competencies to those specified by the QAA for taught masters degrees.
Optional placement variation(s):	with Placement Experience

Summary of programme aims
The programme aims to provide a thorough degree-level education in Mathematics, with some emphasis on the computational aspects, along with topics from Computer Science which will support this and provide an appreciation of wider issues. It aims to produce mathematicians who have some experience of numerical techniques, an appreciation of wider computational issues and a range of appropriate subject-specific and transferable skills.

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, information handling, numeracy ,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, and career planning and management.

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 optional 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 per module and the level of each module are shown after its title.

Part 1 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA1RA1	Real Analysis I	20	4
MA1FM	Foundations of Mathematics	20	4
SE1FA11	Fundamentals and Applications of Computing	20	4
SE1PR11	Programming	20	4
MA1CA	Calculus	20	4
MA1LA	Linear Algebra	20	4

Part 2 (three terms)

Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA2GS	General Skills	10	5
MA2MIP	Mathematics in Practice	10	5
MA2PDE	Partial Differential Equations	10	5
MA2NA1	Numerical Analysis I	10	5
MA2RA2	Real Analysis II	10	5
MA2ALG	Algebra I	10	5
MA2VC	Vector Calculus	10	5
MA2ODE	Ordinary Differential Equations	10	5
SE2OS11	Operating Systems	10	5
SE2EA11	Essential Algorithms	10	5
SE2JA11	Programming with Java	20	5

Year abroad/Year away/Additional year (three terms)
Compulsory modules

MA2PY	Industrial Placement Year	120	5

The placement should not normally be shorter than nine months full-time and students will be assessed in the form of an end-of-year project.

Part 3 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA3NA2	Numerical Analysis II	10	6

And take one of either

Code	*Module Title*	*Credits*	*Level*
MA3PRO	Project	10	6
Or			
MA3PAL	Peer Assisted Learning	10	6

Optional modules:
(i) At least 30 credits from the following:

Code	*Title*	*Credits*	*Level*
MA3AGT	Applied Graph Theory	10	6
MA3Z7	Number Theory	10	6
MA3AST	Applied Stochastic Processes	10	6
MA3MB	Mathematical Biology	10	6
MA3DS	Dynamical Systems	10	6
MA3CV	Calculus of Variations	10	6
MA3FM	Fluid Mechanics	10	6
MA3CEC	Cryptography and Error Correcting Codes	10	6
MA3PD2	Partial Differential Equations II	10	6
MA3WW	Water Waves	10	6

(ii) At least 40 credits from the following

Code	*Title*	*Credits*	*Level*

CS3VR16	Virtual Reality	10	6
CS3IA16	Image Analysis	10	6
CS3EC16	Evolutionary Computation	10	6
CS3DM16	Data Mining	10	6
CS3CS16	Concurrent Systems	10	6
BI3MM16	Machines in Motion	10	6
CS3IS16	Information Security	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 weighted 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 obtained a weighted average of at least 40% over the modules MA1CA, MA1LA, MA1FM, MA1RA1 and obtain a weighted average of at least 40% over the modules SE1FA15, SE1PR11 and obtain marks of at least 30% in 120 credits.

To gain a threshold performance at Part 2, a student shall normally be required to achieve:
(i) a weighted average of 40% over 120 credits taken at Part 2;
(ii) marks of at least 40% in individual modules amounting to not less than 80 credits; and
(iii) marks of at least 30% in individual modules amounting to not less than 120 credits.
In order to progress from Part 2 to Part 3, a student must achieve a threshold performance.

Students are required to pass the professional/placement year in order to progress on the programme which incorporates the professional/placement year. Students who fail the professional/placement year transfer to the non-placement year version of the programme.

Summary of Teaching and Assessment
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 both lectures and problems. The assessment is carried out within the University's degree classification scheme, details of which are in the programme handbooks. The pass mark in each module is 40%. Modules in Part 1 and 2 are assessed by a mixture of coursework and formal examination. There are some modules which are assessed wholly by coursework and others wholly by examination; the details are given in the module descriptions.

Admission requirements
Entrants to this programme are normally required to have obtained:

- UCAS Tariff: A Level: ABB including grade A in A Level Mathematics;
- International Baccalaureate: 30 points including 6 in Higher Mathematics

Equivalent qualifications are acceptable.

Admissions Tutor: Dr Calvin Smith

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 contributing departments additional support is given though practical classes in Part 1. The development of problem-solving skills is assisted by provision of model solutions to problems. There is a Programme Adviser to offer advice on the choice of modules within the programme.

Career learning

Career prospects
In recent years, students who have followed this programme have pursued careers in software development, teaching, as an actuarial trainee, trainee chartered accountant, in teaching, business analysis, the army and postgraduate study.

Opportunities for study abroad
There are currently no opportunities for Study Abroad on this programme.

Placement opportunities
A version of this programme which includes a maxi placement is available (BSc Computational Mathematics with a Placement Year).

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. The fundamental concepts and techniques of calculus, analysis, algebra and numerical mathematics 2. The use of the basic techniques of mathematics in applicable areas of mathematics, such as differential equations and numerical analysis 3. A selection of more specialist optional topics 4. A mainstream programming language 5. Software engineering and theoretical issues in Computer Science	The knowledge required for the basic topics is delineated in formal lectures supported by problem sets for students to tackle on their own. In Part 1 these are supported by tutorials and practical classes through which students can obtain feedback on their non-assessed work. Feedback on programming is initially given through tutorials and formative assessed work. In the later parts of the course students are expected to work at additional problems on their own and

seek help when required, using the office hours of staff. Where appropriate, model solutions are provided for problems set.

Assessment
Most knowledge is tested through a combination of coursework and unseen formal examinations, although 4 is principally assessed by coursework. Dissertations and oral presentations also contribute in other parts of the programme.

Skills and other attributes

B. Intellectual skills - *able to:*	**Teaching/learning methods and strategies**
1. Think logically 2. Analyse and solve problems 3. Organise tasks into a structured form 4. Evaluate 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. Conduct independent study of a chosen topic and report on the results	Logic is an essential part of the understanding and construction of mathematical proofs and structured computer programs and is embedded throughout the programme. The quality of a solution to a problem is substantially determined by the structure of that response; analysis, synthesis, problem solving, integration of theory and application, and knowledge transfer from one topic to another are intrinsic to high-level performance in the programme. The rapid evolution of modern Computer Science forms part of optional modules in Part 3. *Assessment* 1- 3 are assessed indirectly in most parts of Mathematics, while 5 contributes to the more successful work. 6 is assessed in the numerical analysis project report. 4 contributes to some Computer Science options.
C. Practical skills - *able to:*	**Teaching/learning methods and strategies**
1. Understand and construct mathematical proofs 2. Formulate and solve mathematical problems 3. Program a computer in a structured and effective way 4. Analyse numerical methods and respond to the issues of accuracy, stability and convergence 5. Write a report on a chosen topic	Mathematical proof is taught in Part 1 lectures and reinforced in practical classes. Problem solving is introduced in lectures in Part 1 and forms a large part of subsequent Mathematics. Numerical analysis courses introduce and develop the ideas of accuracy, stability and convergence, illustrated by practical tasks. Parts 1 and 2 Computer Science modules introduce various styles of programming and discuss their advantages. *Assessment* 1 and 2 are tested both formatively in coursework and summatively in examinations. 3 is assessed practically through coursework and the principles through formal examination. 4 and 5 are assessed through coursework and examination, also through the project report.
D. Transferable skills - *able to:*	**Teaching/learning methods and strategies**
1. Use IT (word-processing, using standard and mathematical software) 2. Communicate scientific ideas	The use of IT is embedded throughout the computational side of the course. Team work and career planning are part of the modules Mathematics

3. Give oral presentations
4. Work as part of a team
5. Use library resources
6. Manage time
7. Plan their career

in Practice and General Skills. Communication skills are the focus of two modules in Part 2, and these are deployed in the final year project. Time management is essential for the timely and effective completion of the programme. Library resources are required for work within the skills modules and the final year project, and contribute to the best performances throughout.

Assessment

1 and 2 are assessed through coursework. 3 - 5 and 7 contribute assessed coursework towards the Part 2 modules General Skills and Mathematics in Practice, and 2, 3 and 5 also in the project. The other skills are not necessarily directly assessed but their effective use will enhance performance in later modules.

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.