MMath Mathematics **UCAS code: G103**
For students entering Part 1 in 2013/4

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:	4 years
Date of specification:	10/Apr/2015
Programme Director:	Dr Karen Ayres
Programme Advisor:	Dr Karen Ayres
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.
Optional placement variation(s):	with Placement Experience

Summary of programme aims
The MMath programme aims to provide the foundation needed for those intending to become professional mathematicians. It achieves this by including a range of topics underlying the main areas of modern work in the subject together with a wide selection of specialist courses studied in depth, along with 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 (both written and oral), information handling, numeracy, team working, 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.
By the end of the programme students are expected to have gained experience and show competence in the following transferable skills: IT (word-processing, using standard and mathematics software), scientific writing, oral presentation, team-working, problem-solving, use of library resources, time-management and career management and planning.

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*
MA1FM	Foundations of Mathematics	20	4
MA1MM1	Mathematical Methods I	20	4
MA1MM2	Mathematical Methods II	10	4
MA1LIN	Linear Algebra	10	4

Selected modules
Students following this programme in Part 1 need to take the following core and optional modules: student stransferring to this programme after Part 1 are permitted to have taken up to 60 credits of their joint subject according to their joint programme specification.
Core modules (students must take 40 credits)

Mode Code	Module Title	Credits	Level
MA1RA1	Real Analysis I	20	4
ST1PD	Probability and Distributions	10	4
MA1ALG	Algebra I	10	4

Plus choose 20 credits from:

MA1GEO	Geometry	10	4
MA1MMP	Modelling and Mathematical Physics	10	4
ST1AS	Applied Statistics	10	4
ST1SIM	Statistical inference and Modelling	10	4
PH101	Physics of the Natural World	20	4
LA1XXX	IWLP Language Module	20	4

Part 2 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA2ODE	Ordinary Differential Equations	10	5
MA2PDE	Partial Differential Equations	10	5
MA2GS	General Skills	10	5
MA2MIP	Mathematics in Practice	10	5
MA2VC	Vector Calculus	10	5
MA2VAD	Vector Analysis and Differential Equations	20	5
MA2NA1	Numerical Analysis	10	5
MA2CA1	Complex Analysis I	10	5
Plus either			
MA2AL2	Algebra II	10	5
Or			
MA2ALG	Algebra I	10	5
Plus either			
MA2RA2	Real Analysis II	10	5
MA2PTI	Probability Theory I	10	5
Or			
MA2RAX	Real Analysis	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*
MA3PR	Part 3 Project	10	6
MA3TLA	Topology and Linear Analysis	20	6
MA3MTI	Measure Theory and Integration	10	6

Optional Modules
(i) Select at least 60 credits from:

MA3CA2	Complex Analysis II	10	6
MA3Z7	Number Theory	10	6

MA3CEC	Cryptography and Error Correcting Codes	10	6
MA3AGT	Applied Graph Theory	10	6
MA3A7	Galois Theory	20	7
MA3NAT	Numerical Analysis II	20	6
MA3CV	Calculus of Variations	10	6
MA3DS	Dynamical Systems	10	6
MA3MB	Mathematical Biology	10	6
MA3CM	Classical Mechanics	10	6
MA3FM	Fluid Mechanics	10	6
ST3OR	Operational Research	10	6
MA3WW	Water Waves	10	6
MA3PD2	Partial Differential Equations II	10	6
MA3FA1	Functional Analysis I	10	6

(ii) Select at most 20 credits from (*those who did not take MA2AL2 in Part 2 must take MA2AL2 as an option in Part 3).*

MA2AL2	Algebra II	10	6
ST3MVA	Multivariate Data Analysis	10	6
ST3ED	Experimental Design	10	6
ST3GLM	Generalised Linear Models	10	6
ST3BDA	Bayesian Data Analysis	10	6
ST3CTS	Computational Techniques in Statistics	10	6

Part 4 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA4XA	Fourth Year Project	40	7

Optional modules
Choose 80 credits from:

MA4FA2	Functional Analysis II	10	7
MA4NSO	Numerical Solution of Ordinary Differential Equations	10	7
MA4NSP	Numerical Solution of Partial Differential Equations	10	7
MA4AM	Asymptotic Methods	20	7
MA4XJ	Integral Equations	10	7
MA4ANT	Analytic Number Theory	10	7
MA4OT	Operator Theory	10	7
MA4SMA	Statistical Mechanics and Applications	10	7
MA4DA	Theory and Techniques of Data Assimilation	10	7
MA4SP	Stochastic Processes	10	7
MA4PDE	Advanced Partial Differential Equations	10	7
ST4ECT	Epidemiology and Clinical Trials	10	7

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 4 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 obtain a weighted average of least 40% over the modules MA1MM1, MA1MM2, MA1LIN, MA1FM and obtain marks of at least 30% in 120 credits.
Although not a requirement, students on the MMath course should be aiming to achieve a **50% average in Part 1.**

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 shall normally be required to achieve a threshold performance at Part 2 and achieve an overall weighted average of 50% over 120 credits taken in Part 2. Students who fail to progress are permitted one re-sit examination in each module in which they obtain less than 50%. For any module passed in a re-sit examination the maximum mark carried forward into the final degree classification will be the higher of (a) the first attempt mark and (b) the lower of 40 and the mark achieved in the re-examination. Students who do not meet the requirements for progression on the MMath but gain a threshold performance at Part 2 are eligible to transfer to BSc Mathematics.

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.

In order to progress from Part 3 to Part 4, a student shall normally be required to achieve an overall weighted average of 40% over 120 credits taken in Part 3, and a mark of at least 30% in individual modules amounting to not less than 100 credits. Students who fail to progress are permitted one re-sit examination in each module in which they obtain less than 40%. For any module passed in a re-sit examination the maximum mark carried forward into the final degree classification will be the higher of (a) the first attempt mark and (b) the lower of 40 and the mark achieved in the re-examination. Students who do not meet the requirements for progression to Part 4 will be eligible for the award of BSc Mathematics, provided they have achieved a threshold performance. The classification for the BSc programme will be based on one third of the overall weighted average in Part 2 and two-thirds of the overall weighted average in Part 3.

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

Integrated Masters programmes (MEng, MMath, MChem, etc)
Part 2 20%
Part 3 30%
Part 4 50%
Teaching is organised in modules that typically involve both lectures and problems. Modules 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: AAB including grade A in A Level Mathematics; or
- International Baccalaureat: 35 points including 6 in Higher Mathematics.

Equivalent qualifications are acceptable.

Admissions Tutor: Dr Steve Langdon

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

Career learning

Career prospects
MMath Mathematics graduates typically find employment in areas involving applications of the subject or research as well as finance, management services and teaching. Recent graduates from this programme entered jobs as risk analyst (engineering consultancy company), Scientific Officer (DERA), tax processor, PhD training and banking.

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

Placement opportunities
A version of this programme to include a maxi placement is available. Students undertaking a maxi placement spend a year in industry between the second and third taught year and will be transferred to a 5-year programme. This year does not contribute to the final degree classification.

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, dynamics and numerical mathematics 2. The use of the basic techniques of mathematics in applicable areas of mathematics, such as differential equations, mechanics, coding theory and numerical analysis 3. The application of theoretical ideas 4. A selection of more specialist optional topics 5. A deeper insight into specialist areas of mathematics and its applications 6. Project work on an advanced topic, forming a substantial independent investigation 7. More advanced material which draws together mathematical ideas from more than one area	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. 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 the project is assessed through its report and an oral presentation. 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. Integrate theory and applications 5. Transfer appropriate knowledge and methods from one topic within the subject to another 6. Plan, conduct and write a report on a substantial independent project	Logic is an essential part of the understanding and construction of mathematical proofs and is embedded throughout the programme. The quality of solutions 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. *Assessment* 1- 3 are assessed indirectly in most parts of Mathematics, while 4 and 5 contribute to the more successful work. 6 is assessed in the project dissertation.

C. Practical skills - *able to:*	**Teaching/learning methods and strategies**
1. Understand and construct mathematical proofs 2. Formulate and solve mathematical problems 3. Analyse numerical methods and respond to the issues of accuracy, stability and convergence 4. Plan, execute and report on a substantial project, and defend the result	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. *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 is assessed through the project dissertation and its oral presentation.

D. Transferable skills - *able to:*	**Teaching/learning methods and strategies**
1. Use IT (word-processing, using standard and mathematical software) 2. Communicate scientific ideas 3. Give oral presentations 4. Work as part of a team 5. Use library resources 6. Manage time 7. Plan their career	The use of IT is embedded throughout the computational side of the course. Team work and career planning are part of one Part 2 module. Communication skills are the focus of a module 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 the small project within one Part 2 module 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 module 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.