MMath Mathematics **UCAS code: G103**
For students entering Part 1 in 2008/9

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:	11/Aug/2011
Programme Director:	Dr Karen Ayres
Programme Advisor:	Dr Titus Hilberdink
Board of Studies:	School of Mathematical and Physical Sciences
Undergraduate Accreditation:	This programme is approved to meet the educational requirements of the Chartered Mathematician designation awarded by the Institute of Mathematics and its Applications.

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 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 (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*
MA11A	Introduction to Analysis	20	4
MA11B	Calculus and Applications	20	4
MA11C	Matrices, Vectors and Applications	20	4
MA11D	Introduction to Algebra	20	4

and other modules with a total credit of 40. No further Mathematics modules may be taken in Part 1.

Students who have taken MA11A, MA11B, MA11C, AS1A and AS1B or who have taken MA11A, MA11B, MA11C, together with 60 credits of Economics or Psychology, or 40 credits of Meteorology plus a Language may follow this programme. Such students must take MA24G in Part 2 in place of MA2AL and MA2DY, and then take MA3AL and MA3DY in Part 3 as two of their Part 3 options.

Part 2 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA24F	Communicating Mathematics	20	5
MA24L	Differential Equations and Fourier Series	20	5
MA24A	Analysis	20	5
MA2LA	Linear Algebra	10	5
MA2CT	Coding Theory	10	5
MA2VC	Vector Calculus	10	5
MA2NA	Numerical Analysis	10	5
MA2AL	Algebra	10	5
MA2DY	Dynamics	10	5

Part 3 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA37L	Analysis and Topology	20	6
MA3CA	Complex Analysis	10	6
MA3CV	Calculus of Variations	10	6

Optional modules:
(i) Additional modules totalling 80 credits selected from:
List A

MA37K1	Algebra	10	6
MA3LI	The Lebesgue Intergral	10	6
MA3NLE	Analysis of Numerical Techniques for Linear Equations and Eigenvalue Problems	10	6
MA3DS	Dynamical Systems	10	6
MA3C7	Boundary-value Problems	10	6
MA3HM	History of Mathematics	10	6
MA3W7	Control Systems	10	6
MA3Z7	Number Theory	10	6
MA3A7	Galois Theory	20	7
MA3NIO	Analysis of Numerical Techniques for Integration and Ordinary Differential Equations	10	6
MA3CM	Classical Mechanics	10	6
MA3MB	Mathematical Biology	10	6
MA3FM	Fluid Mechanics	10	6
MA3AM1	Asymptotic Methods	10	6
MA3ASP	Applied Stochastic Processes	10	7
MA3SM	Modelling of Soft Matter	10	7
MS3MDE	Mathematics for the Digital Economy	10	6
AS3D	Operational Research Techniques	20	6

Students who took MA24G in Part 2 must also take MA3AL and MA3DY to fulfil necessary requirements.
Note that most modules have pre-requisites and co-requisites which students must undertake. Information regarding pre-requisites and co-requisites can be found in the appropriate module description. Students on four

year programmes need to be especially aware of any pre- and co-requisites of Part 4 modules when selecting Part 3 options.

Part 4 (three terms)
Compulsory modules

Code	*Module title*	*Credits*	*Level*
MA4XA	Fourth Year Project	40	7
MA4XB	Advanced Topics in Mathematics	20	7

(ii) Additional Level H or M Mathematics modules totalling 40 credits, of which sufficient must be at Level M to ensure a total of at least 120 credits at level M overall. These should be selected from list A or list B below. (Your choice should not clash with your selections to fulfil requirement (i) above.)
List B

MA4XD	Modern Analysis	10	7
MA4XE	Numerical Solutions of Differential Equations	20	7
MA4AM2	Asymptotic Methods II	10	7
MA4XJ	Integral Equations	10	7
MA4PT	Probability Theory	10	7
MA4ANT	Analytic Number Theory	10	7
MA4FEM	Finite Element Methods	10	7
MA4DA	Theory and Techniques of Data Assimilation	10	7
MA4ST	Spectral Theory	10	7

(iii)Additional modules at Level H or M to make a total of 120 credits in Part 4. These modules can be selected from lists A or B above, or from elsewhere in the University.

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 C (or 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 obtain an average of least 40% in the Mathematics modules MA11A, MA11B, MA11C, MA11D taken together, with at least 30% in each of those modules.

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 and achieve an overall average of 60% over 120 credits taken in Part 2 (of which not less than 100 credits should normally be at level I (or 5) or above).

Students should be aware that, as there are no progression requirements from Part 3 to Part 4, students do not have the automatic right to resit failed Part 3 exams.

Part 2 contributes 20% of the final assessment, Part 3 30% and Part 4 the remaining 50%.

Summary of Teaching and Assessment
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:

Grade C or better in English in GCSE; and achieved
UCAS Tariff: A Level: 320 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 As in two other subjects and C in a third.
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.

Admissions Tutor: Dr Graham Williams

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 Student Employment, Experience and Careers Centre (SEECC), 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. 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 tutorials in Parts1 and 2. The development of problem-solving skills is assisted by extensive provision of model solutions to problems, where appropriate. There is a Course Adviser to offer advice on the choice of modules within the programme.

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 or for placements
Although there are no formal arrangements for the MMath Mathematics programme, informal arrangements may be possible.

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	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.

substantial independent investigation 7. More advanced material which draws together mathematical ideas from more than one area	*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 5. 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 one 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

contribute assessed coursework towards the Part 2 module Communicating Mathematics, and 2, 3 and 5 also in the project. The other skills are not 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.