**MMath Mathematics** **UCAS code: G103**
**For students entering Part 1 in 2011/2**

| | |
|---|---|
| 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: | 12/May/2014 |
| Programme Director: | Dr Karen Ayres |
| Programme Advisor: | Dr Karen Ayres |
| 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. |
| 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* |
|---|---|---|---|
| MA1AN1 | Analysis I | 20 | 4 |
| MA1CAL | Calculus Methods | 20 | 4 |
| MA1VM | Vectors and Matrices | 10 | 4 |
| MA1AL1 | Algebra I | 20 | 4 |
| MA1OD1 | Ordinary Differential Equations I | 10 | 4 |
| MA1LIN | Linear Algebra | 10 | 4 |
| AS1G | Probability | 10 | 4 |

Students should choose additional modules to make a total of 120 credits in Part 1. Students are encouraged to select 20 credits from the Mathematics and Statistics modules:

| | | | |
|---|---|---|---|
| MA1GEO | Geometry | 10 | 4 |

| | | | |
|---|---|---|---|
| MA1SW | Scientific Writing and Mathematical Programming | 10 | 4 |
| AS1F | Statistical Inference | 10 | 4 |
| AS1H | Statistical Methods | 10 | 4 |
| AS1E | Exploring Your Data | 10 | 4 |

*OR any other approved module(s)*

Students who have taken MA1AN1, MA1CAL, MA1VM and MA1OD1 in Part 1 may follow this programme. Students who have also taken MA1AL1 must take MA2LA in place of MA2DY, and then take MA3DY in Part 3 as an option. Students who have not taken MA1AL1 must take MA2AL1 and MA2LA in place of MA2AL2, MA2DY and MA2ASV, and take MA3AL2, MA3DY and MA3ASV in Part 3 as three of their Part 3 options.

**Part 2 (three terms)**

*Compulsory modules*

| *Code* | *Module title* | *Credits* | *Level* |
|---|---|---|---|
| MA2AN2 | Analysis II | 20 | 5 |
| MA2COM | Communicating Mathematics | 20 | 5 |
| MA2OD2 | Ordinary Differential Equations II | 10 | 5 |
| MA2PD1 | Partial Differential Equations I | 20 | 5 |
| MA2AL2 | Algebra II | 10 | 5 |
| MA2DY | Dynamics | 10 | 5 |
| MA2VC | Vector Calculus | 10 | 5 |
| MA2NA1 | Numerical Analysis I | 10 | 5 |
| MA2ASV | Analysis in Several Variables | 10 | 5 |

**Students who have not taken MA2ASV, MA2DY or MA2NA1 in Part 2 because of transferring from other mathematics programmes may nevertheless follow this programme. Students who have not taken MA2ASV must self-study the material and demonstrate through formative assessment that they have achieved the learning outcomes before being allowed to transfer.**

**Year abroad/Year away/Additional year (three terms)**

*Compulsory modules*

| | | | |
|---|---|---|---|
| MA2PY | Industrial Placement Year | 120 | 0 |

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* |
|---|---|---|---|
| MA3CA1 | Complex Analysis I | 10 | 6 |
| MA3PR | Part 3 Project | 10 | 6 |
| MA3TLA | Topology and Linear Analysis | 20 | 6 |
| MA3MTI | Measure Theory and Integration | 10 | 6 |

*Optional modules:*

*(i) Select 70 credits from List A below (those who did not take MA2AL2 must take MA3AL2 as an option):*

List A

| | | | |
|---|---|---|---|
| MA3CA2 | Complex Analysis II | 10 | 6 |
| MA3Z7 | Number Theory | 10 | 6 |
| MA37K1 | Algebra | 10 | 6 |
| MA3CEC | Cryptography and Error Correcting Codes | 10 | 6 |
| MA3A7 | Galois Theory | 20 | 7 |
| MA3NA2 | Numerical Analysis II | 10 | 6 |
| MA3IBP | Initial and Boundary value Problems | 10 | 6 |
| MA3CV | Calculus of Variations | 10 | 6 |
| MA3AGT | Applied Graph Theory | 10 | 6 |
| MA3DS | Dynamical Systems | 10 | 6 |
| MA3AM1 | Asympototic Methods I | 10 | 7 |
| MA3MDE | Mathematics for the Digital Economy | 10 | 6 |
| MA3CM | Classical Mechanics | 10 | 6 |
| MA3FM | Fluid Mechanics | 10 | 6 |
| MA3ASP | Applied Stochastic Processes | 10 | 7 |
| ST3OR | Operational Research | 10 | 6 |
| MA3WW | Water Waves | 10 | 6 |
| MA3PT | Probability Theory | 10 | 7 |
| MA3PD2 | Partial Differential Equations II | 10 | 6 |
| MA3FA1 | Functional Analysis I | 10 | 6 |

*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*

**Part 4 (three terms)**
*Compulsory modules*

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

Optional Modules
*(ii) Additional Level 6 or 7 Mathematics modules totalling 80 credits, of which sufficient must be at Level 7 to ensure a total of at least 120 credits at Level 7 overall. These should be selected from List A above or List B below:*
List B

| | | | |
|---|---|---|---|
| MA4FA2 | Functional Analysis II | 10 | 7 |
| MA4NSO | Numerical Solution of Ordinary Differential Equations | 10 | 7 |
| MA4NSP | Numerical Solution of Partial Differential Equations | 10 | 7 |
| MA4XJ | Integral Equations | 10 | 7 |
| MA4AM2 | Asymptotic Methods II | 10 | 7 |
| MA4ANT | Analytic Number Theory | 10 | 7 |
| MA4ST | Spectral Theory | 10 | 7 |
| MA4SMA | Statistical Mechanics and Applications | 10 | 7 |
| MA4DA | Theory and Techniques of Data Assimilation | 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% in the Part 1 Mathematics modules MA1CAL, MA1OD1, MA1AN1 and MA1VM taken together, with at least 30% in each of those modules. 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 and qualify for the DipHE a student shall normally be required to achieve an overall weighted 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 weighted average of 50% over 120 credits taken in Part 2 (of which not less than 100 credits should normally be at level 5 or above).

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.

**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. 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: 340 points including grade A 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.
In computing your UCAS points total, we will count all A levels and any additional As levels including Key Skills and General Studies

**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 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**
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<br>2. The use of the basic techniques of mathematics in applicable areas of mathematics, such as differential equations, mechanics, coding theory and numerical analysis<br>3. The application of theoretical ideas<br>4. A selection of more specialist optional topics<br>5. A deeper insight into specialist areas of mathematics and its applications<br>6. Project work on an advanced topic, forming a substantial independent investigation<br>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.<br>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.<br><br>*Assessment*<br>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<br>2. Analyse and solve problems | Logic is an essential part of the understanding and construction of mathematical proofs and is |

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

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:*

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

**Teaching/learning methods and strategies**

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:*

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

**Teaching/learning methods and strategies**

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.**