

BSc Mathematics and Meteorology
For students entering Part 1 in 2014/5

UCAS code: GF19

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Mathematics, Statistics and Operational Research, and ES3
Faculty:	Science Faculty
Programme length:	3 years
Date of specification:	10/Apr/2015
Programme Director:	Dr Karen Ayres
Programme Advisor:	Dr Peter Inness Dr Karen Ayres
Board of Studies:	School of Mathematical and Physical Sciences
Undergraduate	
Accreditation:	Approved by the Royal Meteorological Society as an appropriate academic training for meteorologists seeking the qualification <i>Chartered Meteorologist</i> . 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. with Placement Experience
Optional placement variation(s):	

Summary of programme aims

The programme aims to provide the student with a good general mathematical education and a broad knowledge of modern meteorology and environmental physical science, with emphasis on the physics of the Earth's atmosphere and oceans. This is achieved by providing core material in the first two years and then in the third year a blend of courses, some giving an overview of a broad area and others studying a particular topic in depth, along with scientific and other transferable skills that are relevant to the application of environmental science in general.

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, spreadsheet and graphical applications programs, scientific programming, internet), 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 and the level of each module are shown after its title.

Part 1 (three terms)

Compulsory modules

<i>Mod Code</i>	<i>Module Title</i>	<i>Credits</i>	<i>Level</i>
MT11C	Introduction to Meteorology	20	4
MT11D	Weather and Climate Fundamentals	20	4
MA1FM	Foundations of Mathematics	20	4
MA1CA	Calculus	20	4
MA1LA	Linear Algebra	20	4

Optional modules

Choose 20 credits from:

PH101	Physics of the Natural World	20	4
MA1ALG	Algebra I	10	4
MA1GEO	Geometry	10	4
MA1MM	Mathematical Modelling	10	4
ST1PD	Probability and Distributions	10	4
MT12C	Skills for Environmental Science	20	4

Part 2 (three terms)

Compulsory modules

<i>Code</i>	<i>Module title</i>	<i>Credits</i>	<i>Level</i>
MA2RA1	Real Analysis I	20	5
MA2ODE	Ordinary Differential Equations	10	5
MA2PDE	Partial Differential Equations	10	5
MT24A	Atmosphere and Ocean Dynamics	20	5
MA2VC	Vector Calculus	10	5
MT24B	Atmospheric Physics	20	5
MT25D	Skills for Graduates	10	5
MT24C	Numerical Methods for Environmental Science	10	5

Optional Modules

Choose one of:

<i>Code</i>	<i>Module Title</i>	<i>Credits</i>	<i>Level</i>
MA2MM	Mathematical Modelling	10	5
MA2ALG	Algebra I	10	5
MA2AL2	Algebra II	10	5
MA2PT1	Probability Theory	10	5
MA2MPH	Mathematical Physics	10	5

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

Compulsory modules

MA2PY	Industrial Placement Year	120	5
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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 placement.

Part 3 (three terms)

Compulsory modules

<i>Code</i>	<i>Module title</i>	<i>Credits</i>	<i>Level</i>
MA3CA1	Complex Analysis I	10	6
MT37B	General Studies	10	6
MT38B	Climate Change	10	6
MT38A	The Global Circulation	10	6
MA3RA2	Real Analysis II	10	6

Optional modules

Chose either Option 1 or Option 2:

Option 1:

MA3PR	Part 3 Project	10	6
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Plus

(i) Choose 30 credits from

MT37D	Remote Sensing Methods and Applications	10	6
MT37E	Dynamics of Weather Systems	10	6
MT24E	Forecasting: Practice and presentation*	10	5
MT38C	Numerical Weather Predictions	10	6
MT37F	Oceanography	10	6
MT38E	Atmospheric Electricity	20	6

* This module is subject to an upper limit of 16 students.

(ii) choose 30 credits from

MA3CV	Calculus of Variations	10	6
MA3DS	Dynamical Systems	10	6
MA3ASP	Applied Stochastic Processes	10	7
MA3NAT	Numerical Analysis II	20	6
MA3CEC	Cryptography and Error Correcting Codes	10	6
MA3FM	Fluid Mechanics	10	6
MA3MB	Mathematical Biology	10	6
MA3WW	Water Waves	10	6
MA3PD2	Partial Differential Equations II	10	6
ST3MVA	Multivariate Data Analysis	10	6
MA3AGT	Applied Graph Theory	10	6
MA3Z7	Number Theory	10	6

Option 2:

MT37A	Part 3 Project	30	6
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Plus

Choose 40 credits from:

MA3CV	Calculus of Variations	10	6
MA3DS	Dynamical Systems	10	6
MA3ASP	Applied Stochastic Processes	10	7
MA3CEC	Cryptography and Error Correcting Codes	10	6
MA3NAT	Numerical Analysis II	20	6
MA3FM	Fluid Mechanics	10	6
ST3MVA	Multivariate Data Analysis	10	6
MA3AGT	Applied Graph Theory	10	6
MA3WW	Water Waves	10	6
MA3MB	Mathematical Biology	10	6
MA3PD2	Partial Differential Equations II	10	6
MA3Z7	Number Theory	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 obtain a weighted average of at least 40% over the modules MA1CA, MA1LA, MA1FM and obtain a weighted average of at least 40% over the modules MT11C, MT11D 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.

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

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. In Part 3 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 in GCSE Physics or Combined Science if not taken at A-Level; and achieved

- UCAS Tariff: ABB including grade A in A Level Mathematics; or
- International Baccalaureat: 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-session 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 providing Departments additional support is given through practical classes and problem solving classes. The Department of Meteorology Library holds all textbooks used in connection with the programme, and also contains a Learning Resource Centre containing additional material such as course notes, reprints of important papers, and past examination papers. 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 gone into jobs as actuarial trainee, trainee chartered accountant, teaching, business analyst and postgraduate study.

Opportunities for study abroad

There are no formal arrangements for studying abroad on the Mathematics and Meteorology programme (but see programme specification for the 4-year MMet Meteorology programme, which includes one year of advanced study at the University of Oklahoma, USA).

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 4-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:

1. The fundamental concepts and techniques of calculus, analysis, linear algebra, dynamics 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. The application of physical and mathematical methods to the description, modelling and prediction of physical phenomena in the atmosphere and oceans
4. Impacts of weather, climate and climate change on society and ecology
5. A selection of more specialist optional topics in mathematics and the Earth's climate system

Teaching/learning methods and strategies

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. For the more specialist topics this is enhanced through self-learning based on guided reading, problem solving and project work. The knowledge required for 5 is gained from weekly discussion classes during part 3. Feedback on most of 1 - 3 is provided through formative assessed work.

Assessment

Most knowledge is tested through a combination of coursework and unseen formal examinations. Dissertations and oral presentations also contribute in other parts of the programme.

Skills and other attributes

B. Intellectual skills - able to:

1. Think logically
2. Analyse and solve problems
3. Recognise and use subject-specific theories, paradigms, concepts and principles
4. Analyse, synthesise and summarise information critically

Teaching/learning methods and strategies

Logic is an essential part of the understanding and construction of mathematical proofs is embedded throughout the mathematics programme. The quality of a solution to a problem is substantially determined by the structure of that response; analysis, synthesis, problem solving, integration of

5. Apply knowledge and understanding to address familiar and unfamiliar problems
6. Collect and integrate evidence to formulate and test hypotheses
7. Conduct independent study of a chosen topic and report on the results
8. Appreciate moral and ethical issues relating to the subject area

theory and application, and knowledge transfer from one topic to another are intrinsic to high-level performance in the programme.

Most modules are designed to develop 1- 5. 4 - 6 are enhanced through the use of coursework assignments, fieldwork and project work. 6 and 7 are promoted mainly by project work. 8 is addressed in discussion classes.

Assessment

1- 4 are assessed indirectly in most parts of Mathematics, while 5 contributes to the more successful work. 7 is assessed in the project report. 8 is assessed by a general paper.

C. Practical skills - able to:

1. Understand and construct mathematical proofs
2. Formulate and solve mathematical problems
3. Plan, conduct, and report on investigations, including the use of secondary data
4. Write and defend a report on a chosen topic
5. Reference work in an appropriate manner
6. Analyse numerical methods and respond to the issues of accuracy, stability and convergence

Teaching/learning methods and strategies

1 is taught in Part 1 lectures and reinforced in practical classes. 2 is introduced in lectures in Part 1 and forms a large part of subsequent mathematics. 3 is emphasised through guidelines and advice given to students in connection with practical work. 4 and 5 are emphasised through guidelines issued to students in connection with project work. Numerical analysis courses introduce and develop the ideas in 6, which are illustrated by practical tasks.

Assessment

1 and 2 are tested both formatively in coursework and summatively in examinations. 3 and 4 are assessed through the project dissertation and its oral presentation.

D. Transferable skills - able to:

1. Use IT (word-processing, using standard and mathematical software, scientific programming)
2. Communicate scientific ideas
3. Give oral presentations
4. Interpersonal skills: ability to work with others and share knowledge effectively; recognise and respect the views and opinions of other team members
5. Use library resources
6. Use the internet critically as a source of information
7. Apply self management and professional development: study skills, independent learning, time management, identifying and working towards targets for personal, academic and career development

Teaching/learning methods and strategies

The use of IT is common throughout the programme. 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 final year project, and contribute to the best performances throughout.

Assessment

1 and 2 are assessed through coursework. 5 is enhanced partly through the provision of a Career Development Skills module during part 2. 5 is partly assessed through 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.