BSc Mathematics and Meteorology   **UCAS code: GF19**

Awarding Institution: The University of Reading
Teaching Institution: The University of Reading
Relevant QAA subject benchmarking group(s):   Mathematics, Statistics and Operational Research and ES3

Faculty of Science   Programme length: 3 years
For students entering Part 1 in 2002   Date of specification: March 04
Programme Director: Dr I. N. James (Meteorology)
Programme Adviser: Dr P. G. Chamberlain (Mathematics)
Board of Studies: Meteorology
Accreditation: Approved by the Royal Meteorological Society as an appropriate academic training for meteorologists seeking the qualification *Chartered Meteorologist*.

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. (For a full statement of the programme aims and outcomes see below.)

Transferable skills

The University's Strategy for Teaching and Learning has identified a number of generic transferable skills which all students are expected to have developed by the end of their degree programme. In following this programme, students will have had the opportunity to enhance their skills relating to career management, communication (both written and oral), information handling, numeracy, problem-solving, team working and use of information technology.

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 "selected" 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 modules credit for and the level of each module are shown after its title.

Part 1 (three terms)   *Credits*   *Level*
Compulsory modules

		Credits	Level
MA11A	*Introduction to Analysis*	20	C
MA11B	*Calculus and Applications*	20	C
MA11C	*Matrices, Vectors and Applications*	20	C
MT11A	*Introduction to Atmospheric Science*	20	C
MT11B	*Weather Systems Analysis*	20	C

Either

MA11D	*Introduction to Algebra*	20	C

or

	Language	20	C

Part 2 (three terms)   *Credits*   *Level*
Compulsory modules

		Credits	Level
MA24A	*Analysis*	20	I
MA24B	*Differential Equations*	20	I
MA24C	*Vectors, Dynamics and Numerical Analysis*	20	I
MT24A	*Atmosphere and Ocean Dynamics*	20	I
MT24B	*Atmospheric Physics*	20	I
MT24C	*Numerical Methods for Environmental Science*	10	I
MT25D	*Skills for Graduates*	10	I

Part 3 (three terms)   *Credits*   *Level*
Compulsory modules

		Credits	Level
MA37A	*Complex Analysis and Calculus of Variations*	20	H
MT37A	*Part 3 Project*	30	H
MT37B	*General Studies*	10	I
MT38B	*Climate Change*	10	H
MT38A	*Global Circulation*	10	H

Optional modules:
(ii) *20 credits from:*

MA3E7	*Boundary Value Problems and Fluid Dynamics* †	20	H
MA3V7	*Control Systems and Fluid Dynamics* ‡	20	H
MA37B	*Topics in Applied Mathematics*	20	H
MA37E	*Numerical Analysis and Dynamical Systems 1*	20	H
MA3N7	*Reaction-Diffusion Theory* ‡	20	M

(iii) *20 credits from:*

MT37C	*Data Analysis Methods in Weather and Climate Research*	10	H
MT37D	*Remote Sensing Methods and Applications*	10	H
MT37E	*Dynamics of Weather Systems*	10	H
MT37F	*Oceanography*	10	H
MT38C	*Numerical Weather Prediction*	10	H
MT38D	*Advanced Weather Systems Analysis*	10	H

(‡ Given in academic years starting in an even-numbered year, † given in academic years starting in an odd-numbered year.)

Progression requirements
To proceed to Part 2 it is sufficient to obtain an average of at least 40% overall, at least 40% in the Part 1 Mathematics modules taken together, at least 40% in the Meteorology modules averaged together, with no module mark below 30%. Marks of less than 30% in a total of 20 credits, except for MA11A, MA11B, MA11C, MT11A, MT11B, will be condoned provided that the candidate has pursued the course for the module with reasonable diligence and has not been absent from the examination without reasonable cause.

To proceed from Part 2 to Part 3 it is sufficient to obtain an average mark of at least 40% in Part 2, with no module mark below 30%. Marks of less than 30% in a total of 20 credits will be condoned provided that the candidate has pursued the course for the module with reasonable diligence and has not been absent from the examination without reasonable cause.

Summary of teaching and assessment
Part 2 contributes one third of the final assessment, and Part the remaining 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.

Transferable skills
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.

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: 260 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 two Bs and a C in three other subjects.
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 other than 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 includes IT Services, which has several hundred computers and the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses 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, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors, Hall Wardens and the Students' Union.

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 Course Adviser to offer advice on the choice of modules within the programme.

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

Educational aims of the programme
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.

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, 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	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:	Teaching/learning methods and strategies
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 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.	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 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 and as part of the module *Topics in Applied Mathematics*. 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, and in the package *Mathematica* taught in Part 1 mathematics. 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, and partly through a PAR tutorial system. 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 expect 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 module and programme handbooks.