MSc/Diploma/Certificate Weather, Climate and Modelling

For students entering in 2005

Awarding Institution:	The University of Reading
Teaching Institution:	The University of Reading
Faculty of Science	Programme length: 12 months
Date of specification:August 2005	
Programme Director:	Dr D.I.F. Grimes (Meteorology)
Board of Studies:	MSc Meteorology
Accreditation:	Approval is being sought from the Royal Meteorological Society for the programme to be regarded as appropriate training for meteorologists seeking the qualification *Chartered Meteorologist.*

Summary of programme aims

The aim of the *Atmosphere, Ocean and Climate* MSc programme is to provide the scientific background for research and other careers across a broad spectrum of meteorology-related science. It focuses particularly on a quantitative description of the physical processes that produce weather, the ways weather systems combine to form climates and the techniques used to simulate weather systems and climate on computers.

Transferable skills

The following transferable skills should be gained by students during this degree programme

- Presentation skills (written and oral)
- Word-processing
- Writing technical reports
- Teamworking
- Statistical methods for analysis and interpretation of data
- Solving numerical problems related to environmental science
- Reviewing and synthesizing information in a specific field of interest
- Practical measurement skills
- Applications of standard software packages (spreadsheets, databases, image analysis) to environmental science
- Accessing academic and technical information via library and online facilities
- Writing computational software to solve mathematical equations.

Programme content

The taught part of the programme is designed as a series of four blocks each of four or five weeks duration with some additional modules. Blocks 1 and 2 are offered in the Autumn Term and Blocks 3 and 4 are offered in the Spring Term.

MSc and Diploma module listing

Module Code	**Module Title**	**Block**	**Core/ Option**	**Credit**	**Level**
Autumn Term					
MTMG01	Introduction to weather systems	1	C	10	M
MTMG02	Atmospheric physics	1	C	10	M
MTMG05	Professional skills (1) - Research Skills	1	C		M
MTMG34	Experiencing the weather	1	C	10	M
MTMW11	Fluid dynamics of the atmosphere and ocean	2	C	20	M
MTMW12	Introduction to numerical modelling	2	C	10	M
MTMG04	Weather & Climate Discussion				M
Spring Term					
MTMW14	Numerical modelling of the atmosphere and oceans	3	C	10	M
MTMW15	Extratropical weather systems	3	O	10	M
MTMG16	Climate change	3	O	10	M
MTMW20	Global circulations of the atmosphere and oceans	3	O	10	M
MTMG38	Remote sensing	3	O	10	M
MTMG49	Boundary processes & micrometeorology	3	O	10	M
MTMG05	Professional skills (2) - Team project		C		M
MAMB10	Theory and Techniques of Data Assimilation	3/4	O	10	M
MTMG19	Tropical weather systems	4	O	10	M
MTMA37	Data Analysis for Weather & Climate Research	4	O	10	M
MTMG41	Applications of meteorology				M
MTMG04	Weather & Climate Discussion				M
MTMG99	Dissertation (MSC), Essay (Diploma)		C	60 (MSc), 30 (Diploma)	M
Summer Term					
MTMG05	Professional skills (3) Forecasting course		C	10	M
MTMG04	Weather & Climate Discussion				M

Notes on module listing

Where a module is taken over more than one term (e.g. MTMG04) the credit weighting is given in the final entry only.

Programme specifications

1. **Specification for MSc**
   Students must complete all core modules (180 credits) and also choose FOUR modules in the Spring Term from those marked optional (40 credits). A dissertation worth 60 credits must be completed by the end of August.

   Total credit value of MSc = 180 credits.

2. **Specification for Diploma**
   Students must complete all core modules (80 credits), then the following two routes are available:

   EITHER:

   Students must choose FOUR modules in the Spring Term from those marked optional (40 credits);

   OR

   Students must choose ONE module in the Spring Term from those marked optional (10 credits) and complete an extended essay worth 30 credits by the end of June.

   Total credit value of Diploma = 120 credits.

3. **Specification for Certificate**
   Students must complete all assessed modules in Blocks 1 and 2 (60 credits) in the Autumn term.

   Total credit value of Certificate = 60 credits.

Part-time/Modular arrangements

Students who wish to do the MSc programme part time over two years may do Blocks 1 and 3 in the first year and Blocks 2 and 4 in the 2nd year. The Team Project and Forecasting Course (MTMG05 Parts (2) and (3)) can be done in either year.

An agreement has been reached with the UK Met Office whereby the four blocks of taught modules taken on a part time basis form the major part of their graduate training programme. This is of great benefit to the MSc programme as it guarantees a significant number of postgraduate students each year who take many of the MSc modules.

Progression requirements

Progression to any block (as defined above) requires students to have attempted all assessments on the preceding blocks.

Summary of teaching and assessment

The programme is in three major sections.

1. The Autumn term (Blocks 1 and 2) provides a broad introduction to the science of meteorology. No prior knowledge of the subject is assumed, but it is expected that students are familiar with the relevant mathematics and physics. Autumn term modules are assessed partly by coursework (including laboratory reports) and partly by examinations taken at the end of the Christmas vacation.

2. More advanced and specialised modules are presented in the Spring Term (Blocks 3 and 4). The "Numerical modelling of the atmosphere and oceans" module MTMW14 is compulsory. The modules are assessed partly by coursework and partly by examination at the end of the Easter Vacation.

An additional component in the Spring Term is the "Team Project" (MTMG05 (2)) undertaken by students working together in small groups. A single week during the term is devoted to researching and presenting this project. Assessment is based on a written report and an oral presentation.

3 The final part of MTMG05 (Forecasting Course) takes place at the beginning of the Summer Term.

From this point on, almost all student time is spent (for MSc students) in preparing a dissertation on a selected topic which must be completed by the 31st August or (for some Diploma students) in preparing an extended essay on a selected topic which must be completed by the end of June.

In both cases, the student chooses the topic in consultation with members of staff.

The MSc dissertation must contain a substantial review of current and recent research in the chosen field and will usually also contain some original research in the form of experimental work and/or data analysis. Students will be asked to give a brief oral presentation on their progress around the end of the summer term.

The Diploma essay will normally be a literature review.

Throughout the year, students are encouraged to attend departmental seminars and are expected to attend the Current Weather Discussion (MTMG04) held weekly in term time. The "Applications of Meteorology" module (MTMG41) is a series of seminars and visits to relevant institutions. While these activities are not examined, they are an important component of the student's education. They contribute to their general understanding and to possible choices of dissertation topic and career.

Much of the teaching on the *Atmosphere, Ocean and Climate* programme is in common with the MSc programmes in Applied Meteorology and Mathematical and Numerical Modelling of the Ocean and Atmosphere. First year PhD students and Met Office staff undergoing training also attend many of the modules, thus class sizes may be as high as 50 in the Autumn Term when all modules are core. In the Spring term when students choose from a range of options, class size is typically 10 to 20.

Programme classification

The University's taught postgraduate marks classification is as follows:

Mark	Interpretation
70 – 100%	Distinction
60 – 69%	Merit
50 – 59%	Good standard (Pass)
40 – 49%	Work below threshold standard (Fail)
0 – 39%	Unsatisfactory Work (Fail)

For Masters Degree

To pass the MSc students must gain an average mark of 50 or more overall including a mark of 50 or more for the dissertation. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 50 credits.*

Students who gain an average mark of 70 or more overall including a mark of 60 or more for the dissertation and have no mark below 40 will be eligible for the award of a Distinction. Those gaining an average mark of 60 or more overall including a mark of 50 or more for the dissertation and have no mark below 40 will be eligible for the award of a Merit.

For PG Diploma

To pass the Postgraduate Diploma students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 50 credits.*

Students who gain an average mark of 70 or more and have no mark below 40 will be eligible for the award of a Distinction. Those gaining an average mark of 60 or more and have no mark below 40 will be eligible for the award of a Merit.

For PG Certificate

To pass the Postgraduate Certificate students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 10 credits.*

***The provision to permit a candidate to be passed overall with a profile containing marks below 40 is made subject to the condition that there is evidence that the candidate applied him or herself to the work of those modules with reasonable diligence and has not been absent from the examination without reasonable cause.**

Oral examination of some or all the candidates will be held at the Examiners' Meeting in September. During the oral examination, candidates are expected to show an

understanding both of the background to their dissertation, and of the general course work.

Admission requirements

Entrants to this programme are normally required to have obtained a good honours degree in a physical, environmental or engineering science. 'A' level physics or mathematics is usually required. Students with other qualifications may be admitted subject to a satisfactory performance in a preparatory course in the preceding year or completion of a self-teaching package in maths and physics. Prior knowledge of meteorology is not essential.

Admissions Tutor:

Dr A. J. Illingworth.

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 Programme Directors, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors, Hall Wardens and the Students' Union.

The Department of Meteorology provides modern laboratory facilities and a field site for teaching purposes. In addition to the central University facilities, the Department has its own PC labs for teaching and student use and a professionally staffed library with copies of all recommended texts and runs of major meteorological periodicals. The Meteorology Department. library houses a learning resource centre with copies of past exam papers, course notes etc.. Adjacent to the library is a purpose-designed student study area.

Learning support is provided by a tutor system and optional class tutorials given with some modules. Each student is assigned a tutor at the start of the programme. Tutorial groups normally consist of three or four students. Weekly tutorials are compulsory during the Autumn term and thereafter may be continued if desired by mutual agreement between tutor and tutees. For team projects and dissertation, guidance is given by a project supervisor.

A self teaching package is available for those students who need remedial support with Maths and Physics. This package is also provided as a pre-course ‘warm-up’ for those students who need to improve their Maths and Physics skills before the start of the programme in October.

Career prospects

The *Atmosphere, Ocean and Climate* MSc has an excellent record in placing graduates in relevant employment. Of the 29 students graduating in the years 1999 and 2000, 27 are working in meteorology or related disciplines. This figure includes 8 graduates employed in the Met Office and 3 working on PhD projects.

Opportunities for study abroad or for placements

Dissertation projects have been successfully arranged in collaboration with a number of institutions including the Met Office, The Centre for Ecology and Hydrology in Wallingford and Westlakes Research Institute in Cumbria.

Educational aims of the programme

The aim of the *Atmosphere, Ocean and Climate* MSc programme is to provide the scientific background for research and other careers across a broad spectrum of meteorology-related science. It focuses particularly on a quantitative description of the physical processes that produce weather, the ways weather systems combine to form climates and the techniques used to simulate weather systems and climate on computers.

Students graduating from this programme should have the knowledge and the technical and computing skills to equip them to carry out quantitative scientific research and technical projects not only within meteorology but also within related areas of environmental science.

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.

Programme Outcomes

Knowledge and Understanding

A. Knowledge and understanding of:	**Teaching/learning methods and strategies**
1. the physical processes which drive the atmospheric system giving rise to weather and climate; 2. the feedback between the Earth's surface and the atmosphere and the impact of these feedback processes on weather, climate and land surface characteristics; 3. methods of modelling and data analysis appropriate to simulating atmospheric and oceanographic processes and an appreciation of the limitations and uncertainties of the measurements and data 4. impacts of weather, climate and climate change on society and ecology 5. advanced, specialist weather and climate topics.	Knowledge and understanding for items 1 to 5 is achieved through lectures, seminars, discussions and tutorials and computer laboratories. Lectures often include problem sheets and guided reading as additional material In addition, knowledge and understanding of measurement techniques (3) is gained through laboratory classes and a field course. In addition to taught modules, item 5 is achieved by independent reading and library searching for the dissertation and team project. **Assessment** Knowledge is tested through written assignments, project reports and examinations as well as oral presentations

Skills and other attributes

B. Intellectual skills - the ability to:	**Teaching/learning methods and strategies**
1. apply knowledge and understanding gained to a variety of familiar and unfamiliar situations; 2. analyse data with a critical awareness of possible weaknesses and uncertainties 3. formulate and test hypotheses 4. show independence and initiative in approaches to problem solving 5. present conclusions clearly to expert and non-expert audiences in written and oral forms 6. critically review, synthesise and evaluate published research.	1, 2 3and 4 are developed by a combination of problem sheets, worked examples, coursework assignments, computing classes project work and dissertation 5 is addressed through lectures, tutorials and also through team project and dissertation reports and presentations. 6 is covered in lectures and through the team project and dissertation. **Assessment** 1 and 2 are assessed through coursework and exams 3, 4 and 5 are mainly assessed through team project and dissertation presentations and reports

C. Practical skills

1. Planning, conducting, and reporting on investigations, including the use of secondary data
2. Collecting, recording and analysing data using appropriate techniques in the field and laboratory
3. Undertake field and laboratory investigations in a responsible and safe manner
4. Referencing work in an appropriate manner

Teaching/learning methods and strategies

Laboratory, IT, field work and field classes are designed to enhance skills 1 and 2. 3 is emphasised through guidelines and advice given to students in connection with practical work and the field course. 4. is emphasised through guidelines issued to students in connection with project and dissertation work.

Assessment

1 and 2 are tested formatively in coursework connected with laboratory and field classes. 3 is not assessed. 4 is assessed in team project and dissertation

D. Transferable skills

1. Communication: the ability to communicate knowledge effectively through written and oral presentations.
2. Numeracy and C & IT: appreciating issues relating to the selection and reliability of field and laboratory data; preparing, processing, interpreting and presenting data; solving numerical problems using computer and non-computer based techniques; using the Internet critically as a source of information.
3. Interpersonal skills: ability to work with others as a team, share knowledge effectively; recognise and respect the views and opinions of other team members.
4. Self management and professional development: study skills, independent learning, time management, personal responsibility and decision making in complex situations
5. Library skills: the effective use of library resources.

Teaching/learning methods and strategies

Skill listed under 1 and 2 are developed throughout most of the programme, but especially through practical work, field course, team project and dissertation . 3 is encouraged through team-working within laboratory, field course and team project. 4 is encouraged throughout the programme and particularly in the team project and dissertation. 5 is covered by a study skills module and practiced in tutorials, team project and dissertation..

Assessment

1 is assessed through coursework, exams, project work and dissertation. 2 is assessed through laboratory, field course and computing modules and in the team project and dissertation.. 3 is indirectly assessed in the field course and team project. 4 and 5 are indirectly assessed in coursework assignments, team project and dissertation

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.