BSc Environmental Science

UCAS code: F851

For students entering Part 1 in 2005

Awarding Institution: The University of Reading
Teaching Institution: The University of Reading
Relevant QAA subject benchmarking group(s): Earth Sciences, Environmental Sciences and Environmental Studies
Programme length: 3 years

Faculty of Science
Date of specification: May 2007
Programme Director: Dr HJ McGoff (SHES)
Programme Adviser: Dr T R Astin (SHES)
Board of Studies: Environmental Sciences

Summary of programme aims and learning outcomes

The programme aims to provide students with a sound scientific understanding of the processes operating in the Earth system, and to apply this science to the understanding of current and future environmental issues. It also aims to provide students with the scientific and transferable skills that are relevant to the application of environmental science in research, industry and other areas such as government policy.

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.

As part of this programme students are expected to have gained experience and show competence in the following transferable skills: IT (word-processing, using spreadsheet and graphical applications programs, scientific programming, internet), scientific writing, oral presentation, experimental methods (laboratory and field), team-working, use of library resources, career planning and management. They will have developed skills in team-working and leadership, and be confident and self-reliant, particularly as a result of experience during field courses and independent fieldwork. They will also have a sound knowledge of fieldwork safety procedure.

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 module credits for each module is listed.

Part 1 (three terms)		*Credits*	*Level*	*Term*
Compulsory modules (40 credits)				
ES1B1	Introduction to Environmental Science	10	C	1
ES1B2	Introduction to Environmental Science Fieldwork	10	C	Easter Vac.
ES1A2	Chemistry and Physics for Environmental Science	10	C	2

And either:

CH1M1	Mathematics M1	10	C	1,3
Or:				
ES1A1	Essential mathematics for Environment and Atmosphere	10	C	1

Optional modules (80 credits)

Students select a minimum of three contributory subjects to Environmental Science, including: Earth Science, Soil Science, Meteorology, Geography, Chemistry, Biology, Rural Environmental Science, Mathematics. They may also chose a language as part of the Institute-wide Language Programme.

Recommended:		*Credits*	*Level*	*Term*
GO1A1	*Earth Structure & Processes*	10	C	1
GO1C2	*Earth History & Evolution*	10	C	2
SS1A1	*Introduction to Soil Science*	10	C	1
SS1A2	*Soils, Land and the Environment*	10	C	2

Others Including:

AM1L10	*Animal Biology*	20	C	1,2
AM1S10	*Introduction to Biology* (OK without A level Biology)	10	C	2
AR1TS1	*Archaeology Practice*	20	C	1,2
AR1P1	*Introduction to World Prehistory*	20	C	1,3
AR1RM1	*Introduction to Historic Archaeology*	20	C	
BI1C10	*Cell Biology and Biochemistry*	10	C	1
BI1C11	*Genetics and Molecular Biology*	10	C	2
BI1M10	*Biodiversity*	10	C	1
BI1Z10	*Ecology*	20	C	2
BI1Z11	*Community Ecology*	10	C	3
CH1C	*Chemistry C* (OK without A level Chemistry)	20	C	1,2,3
CH1I1	*Introduction to Inorganic Chemistry*	20	C	1,2,3
CH1I2	*Descriptive Inorganic Chemistry*	10	C	2
CH1O2	*Fundamental Organic Chemistry*	10	C	1
CH1P2	*Physical Biochemistry*	10	C	1
CH1M2	*Mathematics M2*	10	C	2,3
AS1A	*Communicating with statistics*	20	C	1,2
MA111	*Mathematics for scientists*	20	C	1,2,3
GG1P1	*Physical Geography 1: Climatology and Hydrology*	20	C	1
GG1P2	*Physical Geography 2: Geomorphology and Biogeography*	20	C	2
GO1B1	*Earth Materials*	10	C	1
MT11A	*Introduction to Atmospheric Science*	20	C	1,2
MT11B	*Weather System Analysis*	20	C	1,2
PS1AB2	*Physical Ecology*	10	C	2
PS1BA2	*Plant Development*	10	C	2
PS1BC2	*Introductory Botany*	10	C	2
SS1B2	*Soil Processes and Applications*	10	C	2
IWLP	*Various languages*	20	C	1,2

Part 2 (three terms : 2006-2007)

Compulsory modules (40 or 50 credits)		*Credits*	*Level*	*Term*
ES2A5	*Environmental Systems*	10	I	5
ES2J4	*Skills for Environmental Scientists*	10	I	4
AP2A37	*Practical Nature Conservation*	10	I	5

And one field class from:

AM2Z38	*Field Course (Ecology prerequisites)*	10	I	6
AP2A21	*Rural Environmental Sciences Field Class 1s*	10	I	Summer
AR2U2	*Silchester Field School (AR1TS1prerequisite)*	10	I	Summer
ES2X6	*Earth and Atmosphere Field Class*	10	I	Easter Vac.
GG2FP	*Physical Geography Field Class (GG prerequisites)*	20	I	Summer
MT25E	*Weather Field weekend (MT11A & MT11B prerequisites)*	10	I	Easter Vac.
PS2BF3	*Botany Field Class (PS2BG3 or BIZ11 prerequisite)*	10	I	Summer
SS2A6	*Soil Science Field Class (SS2D4 prerequisite)*	10	I	6

Optional Modules (70 or 80 credits)

Students develop depth in a minimum of two contributory subjects to Environmental Science, including: Geoscience, Soil Science, Meteorology, Geography, Chemistry, Biology, Plant Sciences, Rural Environmental Science, Archaeology, Mathematics. They may also chose a language as part of the Institute-wide Language Programme

<u>Recommended</u>:

Environmental Geochemistry (20 credits)

ES2E4	*Environmental Mineralogy*	10	I	4
CH2A2	*Analytical Chemistry for Environmental Earth and Archaeological Sciences*	10	I	4

Soil Science 1 (20 credits)

SS2D4	*Soils and Soil Development*	10	I	4
SS2D5	*Sustainable Land Management*	10	I	5

<u>Others Including:</u>

Laboratory Methods

GO2N5	*Laboratory Methods in Geoarchaeology (Also taught to MSc Geoarchaeology)*	10	I	5

Geoscience (20 credits)

GO2L4	*Sedimentology & Palaeoclimate Analysis*	10	I	4
GO2M5	*Global Change Through Geological Time*	10	I	5

Soil Science 2 (20 credits)

SS2A4	*Transport Processes in Soils*	10	I	4
SS2E6	*Environmental Monitoring*	10	I	6

Archaeology (20 to 40 credits)

AR2S1	*Archaeological Science*	20	I	4,5

AR2F5	*Techniques in Artefact Interpretation*	10	I	4
AR2F6	*Techniques of skeletal interpretation*	10	I	5
Rural Science and Agriculture (20 to 40 credits)				
AP2EE3	*Environmental Economics (prerequisite AP1EE1)*	10	I	4
AP2A39	*Environment and the Farm Business (prerequisite AP1A02)*	10	I	5
AP2A26	*Forestry and Woodlands*	10	I	4
AP2A25	*Grassland Management*	10	I	4
AP2A38	*Organic Farming*	10	I	4
Plant Sciences (20 to 40 credits)				
PS2BB4	*Evolution and Plant Biodiversity*	10	I	4
PS2BD4	*Plants and the Environment*	10	I	4
PS2BC5	*Ecological Aspects of Environmental Assessment*	10	I	5
PS2BG3	*Flora of the British Isles*	10	I	6
Biology	(20 to 40 credits)			
BI2B31	*Macro Evolution*	10	I	4
BI2Z31	*Micro Evolution*	10	I	5
AM2Z32	*Vertebrate Zoology (AM1Z10 prerequisite)*	10	I	4
AM2Z33	*Animal Behaviour*	10	I	5
AM2Z34	*Invertebrate Zoology*	10	I	4
History and Philosophy of Science (10 or 20 credits)				
PS2NA4	*Introduction to the History and Philosophy of Science* (excludes PS1N45)	10	I	4
PS2N45	*History and Philosophy of Science* (excludes PS2NA4)	20	I	4
Meteorology (20 or 40 credits)				
MT24A	*Atmosphere & Ocean Dynamics*	20	I	4,5
MT2BB	*Atmospheric Physics*	20	I	4,5
Mathematics				
AS2A1	*Statistics for Life Sciences*	10	I	4
MT24C	*Numerical Methods for Environmental Science*	10	I	4
Physical Geography (20 to 40 credits)				
GG2DEG	*Development, Environment and Gender (prerequisite)*	10	I	4
GG2ER	*Energy Resources*	10	I	4
GG2M	*GIS and Mapping*	10	I	4
GG2P1	*Geomorphological Hazards*	10	I	4
GG2P3	*Human Activity and Environmental Change*	10	I	4
GG2P6	*Remote Sensing and Image Processing*	10	I	4
GG2P7	*Fluvial Hydrology & Morphology*	10	I	4
GG2P8	*Biogeography and Ecosystems*	10	I	5
GG2RE	*Resources and the environment*	10	I	5

Environmental Chemistry (20 credits)

CH2P2	*Intermediate Physical Chemistry (prerequisite CH1P1)*	10	I	4
CH2I2	*Inorganic Chemistry (prerequisite CH1I1)*	10	I	5

Part 3 (three terms: 2007-2008)

Compulsory modules (60 credits)		*Credits*	*Level*	*Term*
AP3A87	*Environmental Management*	10	H	7
ES3A8	*Environmental Issues*	10	H	8
ES3PR	*Independent Project*	30	H	7,8
ES3LP	*Library Project*	10	H	7,8

Optional Modules (60 credits)

Recommended:

GO3X8	*Earth Systems Field Class*	10	H	8
ES3C7	*Earth Systems Science*	10	H	8

Others Including:

Geoscience (10 or 20 credits)

ES3B8	*Environmental Geophysics*	10	H	8
GO3H8	*Crime Scene Analysis*	10	H	8

Soil Science (10 to 40 credits)

ES3D7	*Land Evaluation*	20	H	7,8
ES3E7	*Fundamental & Applied Soil Ecology*	10	H	7
SS3A8	*Management of Soil Fertility*	10	H	8

Archaeology (20 or 40 credits)

AR3S1	*Environmental Archaeology and the Cultural Landscape of Prehistory*	20	H	7
AR3S2	*Environment and Landscape in Historic Periods*	20	H	8

Rural Science & Agriculture (20 to 40 credits)

AP3EP3	*Rural Policy & Countryside Planning*	10	H	7
APA44	*Approaches to Sustainable Development*	10	H	8
AP3A68	*Wildlife in the Farming Environment*	10	H	8
AP3A90	*Climate Change & Food Systems*	10	H	8

Biological Sciences (10 to 20 credits)

PS3AB7	*Plants & Climate*	10	H	7
AM3Z75	*Evolutionary Genetics & Phylogeny*	10	H	7

Physical Geography (20 or 40 credits)

GG338	*Mountain Environments*	20	H	7
GG333	*Geographical Information Systems*	20	H	7
GG362	*Water Resources*	20	H	7
GG336	*Managing Environmental Change*	20	H	8

Meteorology (20 to 40 credits)

MT37D	*Remote Sensing Methods & Applications*	10	H	7
MT37F	*Oceanography*	10	H	7
MT38D	*Advanced Analysis of Weather Systems*	10	H	8
MT38B	*Climate Change*	10	H	8

Progression requirements

To gain a threshold performance at Part 1 a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 1, 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. In addition, students shall normally obtain at least 40% in the compulsory modules ES1B1, ES1B2, ES1A2, and either ES1A1 or CH1M1, averaged together.

To gain a threshold performance at Part 2 a student should 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. In addition students shall normally obtain at least 40% in the compulsory modules AP2A37, ES2A5, ES2J4, and a field class module, averaged together.

Summary of teaching and assessment

Teaching is organized in modules that typically involve lectures, problem solving classes, and practical classes. 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%. Parts 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. The Part 3 project involves a substantial component of independent learning, under the supervision and guidance of Project Supervisors. The projects are assessed on the basis of formal reports, oral presentations and development of independent learning skills.

Part 2 contributes one third (33%) of the overall assessment and Part 3 the remaining two thirds (67%).

To be eligible for Honours, students must normally pass Level H modules with a total credit of at least 100.

Admission requirements

Entrants to this programme are normally required to have obtained:
Grade C or better in English Science and Mathematics in GCSE, and UCAS Tariff: *either* 280 points from 3 subjects *or* 320 points from 4 subjects. These must include at least one subject from Maths, Physics, Chemistry, Biology, Geography, Geology or Environmental Science;
Or International Baccalaureat: 31 points including Mathematics and Science;
Or Irish Highers: four grade Bs and one grade C including two sciences.

Admissions Tutor: Dr Samantha Baxter

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.

The providing Departments have well-equipped teaching laboratories, analytical laboratories and dedicated computer laboratories. Substantial collections of earth materials and maps are available for hands-on access by students. Within the providing Departments additional support for students is given through practical and field classes and in the course of the independent project. There is a Course Adviser to offer advice on the choice of modules throughout the programme.

Career prospects
The requirement for environmental scientists with a sound scientific training continues to grow and opportunities for graduates from this course include employment by environmental consultants, water companies and the many offices of national and local government concerned with environmental issues as well as post-graduate study. Private industry is increasingly concerned to employ scientists to help minimise the adverse environmental impact of its activities.

Opportunities for study abroad
Students following this degree programme may transfer to the parallel degree BSc Environmental Science with Professional Experience (F852) and complete an additional year of appropriate experience with a company overseas. Such transfers are only permitted if the student displays the appropriate ability to benefit from such a secondment, has taken appropriate options in Part 2, has the requisite degree of fluency in the foreign language required, and, if suitable industrial experience can be found for the student. Students may also participate in the ERASMUS exchange scheme where one or two terms are spent studying in a European university. Further details are available from the Course Director and the Study Abroad Office.

Educational aims of the programme
The programme aims to provide a thorough degree-level education in Environmental Science, with optional emphases being designed within Pathways, such as Environmental Change, Earth and Atmosphere, Environmental Management, Soil and Water.

Part 1 is designed to provide a sound foundation in Environmental Science, and supporting knowledge of relevant Chemistry, Physics and Mathematics to develop the knowledge and skills required for studying the environmental sciences. Options in mathematics depend on the mathematical skills of the student prior to entry. A wide range of subject options contribute, and shape the particular pathway chosen. Part 2 has a core of compulsory modules to develop further skills and technical experience in the core subject areas, with particular emphasis on environmental management. Options are designed to give depth to knowledge and methodology in key selected subject areas. Part 3 is integrative whilst providing scope for specialisation

through the selection of options and through project work. The latter provides the student with the opportunity to demonstrate their ability to conduct and report on a detailed research investigation, drawing on their understanding of the fundamental concepts in Environmental Science.

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. Earth Systems including the lithosphere, hydrosphere, atmosphere and biosphere 2. Interactions between the processes operating in the different components of the Earth System. 3. The evolution of the Earth and the environment through different time scales, and the evidence for that change → 4. Monitoring and management of natural and human-induced environmental change. 5. Scientific examination of the implications of sustainability and sustainable development. 6. A selected range of optional topics 7. Environmental issues and management with an interdisciplinary and integrative perspective. 8. Fieldwork safety issues and procedures	Underlying knowledge in the essential areas is set out in lectures, in most cases directly supported by illustrative practicals. The essential field experience required for proper understanding is provided by compulsory field courses in Part 1 and Part 2, with additional optional field courses in Part 3. Students conduct an independent project in the form of practical investigation into an environmental topic in Part 3, with support and advice from academic and technical staff. Assessment Most knowledge is tested through a combination of coursework and unseen formal examinations. Dissertations and oral presentations also contribute in Part 3.

Skills and other attributes

B. Intellectual skills – able to:	**Teaching/learning methods and strategies**
1. think logically and critically in a scientific manner 2. analyse and interpret environmental observations and data and recognise and identify issues and problems with that data 3. organise tasks into a structured form 4. understand the current state of knowledge of the environment – a rapidly developing area 5. integrate and apply concepts and principles from one area of environmental science to another 6. recognise the need for professional codes of conduct	Logical and critical thinking is an essential part of interpreting environmental science data and materials, it is embedded throughout the programme. The ability to integrate and apply concepts and principles from one area of the subject to another are intrinsic to high-level performance in the programme. Current developments in environmental science are highlighted by contact with visiting experts in the field in Part 3. Assessment 1 and 2 are assessed indirectly in most parts of the programme, 3 in the course of laboratory and fieldwork. 4 is focused on by courses in Parts 2 and 3, while 5 contributes to more successful work. 6 not directly assessed.

C. Practical skills – able to:	**Teaching/learning methods and strategies**
1. plan, conduct and report on investigations, including the use of secondary data 2. collect, record and analyse data using appropriate field and laboratory techniques 3. reference work in an appropriate manner 4. carry out a risk assessment for field and laboratory investigations 5. consider the impact of field investigations on the environment as well as other interested parties	Observing, recording and interpreting is taught in laboratory and field classes throughout the course. An investigative independent practical project is conducted by the student in Part III, with advice from academic and technical staff. Risk assessment forms an essential part of each field course and any field based project work. Assessment 1 & 2 are tested both formatively in coursework and particularly during the final year projects. summatively in examinations. 2 is assessed by means of coursework and project work, 4 & 5 during field classes and project work.

D. Transferable skills – able to:

1. use IT (word-processing, using standard software and the Internet)
2. understand issues of sample selection, accuracy, precision and uncertainty in field and laboratory work
3. prepare, process , interpret and present data in an appropriate manner, using both quantitative and qualitative techniques
4. communicate scientific ideas in verbal, written and graphic form to a variety of audiences.
5. work as part of a team, identifying individual and collective goals, respecting the views and opinions of others and evaluating both individual and team performances.
6. use library resources
7. manage their time
8. plan their career, developing skills for self-managed and lifelong learning.

Teaching/learning methods and strategies

The use of IT is embedded throughout the programme with special sessions in Part 1 and in the Skills Module in Part 2. Oral presentation and communication skills are developed in various modules, culminating in the Part 3 practical project. Career management is taught in the Part 2 Skills module. Teamworking is particularly emphasised in field courses. Time management is essential for the timely and effective completion of the programme. Library and internet resources are required for the literature review in Part 3, and contribute to the best performances throughout.

Assessment

1, 2, 3 & 4 are assessed through coursework and particularly in the Part 3 project. 5 in field courses, 6 in the Library Project and 8 in the skills module in Part 2. 7 is not directly assessed but contributes to successful performance throughout the programme.

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 processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.