

EARTH SCIENCES BA/Geol and MEdSc/ES Programme Specification

1. Awarding institution/body	University of Oxford
2. Teaching institution	University of Oxford
3. Final award	MEarthSc (4-year) or BA (Geology) (3-year)
4. Programme	Earth Sciences
5. UCAS code	F644 (MEdSc/ES) or F642 (BA/Geol)
6. Relevant subject benchmark statement	Earth Sciences, Environmental Sciences and Environmental Studies
7. Accreditation	Geological Society of London
8. Date of programme specification	January 2009

8. Educational aims of the programme

These are built around the QAA framework for higher education qualification and the QAA Subject Benchmark statements.

- To provide a course of the highest academic quality in Earth Sciences in a challenging and supportive learning environment that attracts the very best students from the UK and elsewhere.
- To provide Bachelors degree students with a systematic understanding of core areas and advanced topics in the Earth Sciences; the ability to evaluate primary evidence critically; and the conceptual understanding to marshal and present arguments and solutions based on primary data, theory, and the application of sound reasoning.
- To provide Masters degree students also with a critical awareness of current problems and new insights, much of which is at, or informed by, the forefront of Earth Sciences research, together with a comprehensive understanding of techniques applicable to their own research project, originality and conceptual understanding.
- To develop transferable skills related to problem solving, communication, practical fieldwork, and computing.
- To bring students to a position on graduation that allows them to choose confidently from many different careers, whether within Earth Sciences or not, and enables them to contribute rapidly to their chosen employment.
- In addition those completing the 4-year MEdSc will:

- Build on the core knowledge and training of the BA course and develop a more advanced understanding.
- Undertake a research project that will further develop research skills;
- Be in a position to start graduate study for a research degree at a leading university either in the UK or overseas or pursue a scientifically based career.

9. Programme outcomes

These are built around the QAA Subject benchmark statements.

A. Students will develop a knowledge and understanding of:

- Fundamental principles of physics, chemistry and biology of relevance to the Earth Sciences
- The general holistic, multidisciplinary and interdisciplinary nature of the Earth Sciences
- The integration of field based, experimental and theoretical principles needed for the Earth Sciences
- Mathematical, quantitative and qualitative approaches and their application to problem solving
- Basic computer programming and numerical methods as applied in the earth sciences

Related teaching/learning methods and strategies

- Lectures are the principal means by which the course content is delivered to the students. Lecturers will generally use lectures to outline the areas of knowledge they wish the student to be familiar with, and to emphasise particularly important concepts.
- Practicals supplement and extend the lecture course, and allow the students to determine whether they really understand the content of the lectures. They also give an opportunity to develop key skills.
- Tutorials provide a flexible forum for small-group teaching. A principal function of tutorials is to develop intellectual skills and allow exploration of a subject beyond the confines set in lectures. This can be tailored to the specific interests of the students and the tutor.
- Fieldwork is an integral part of the course structure. The field courses are designed to build upon theoretical and practical knowledge gained in all aspects of the course.
- Mapping Projects allow students to undertake geological mapping of an area, and develop initiative and self-reliance regarding field observations.
- Independent Research introduces students to scientific research first hand, working with a Faculty member.

- Computing involves the manipulation of numerical datasets and interactive comparisons of observation with models.
- Private study particularly during the vacations is both necessary and expected, as it provides opportunities for consolidation and for reading beyond and around the syllabus.

Assessment

Public (university) examinations are taken at the end of the summer term of each year of the course.

The Preliminary Examination is a pass/fail examination covering the foundation topics of the first year in Earth Sciences. The examination comprises four theory papers and a timed practical. It must be passed (a resit is allowed in September) to proceed further on either of the 3- or 4-year courses. The marks do not count towards the degree classification.

There are two Final Honours Schools – the 3 year B.A. (Hons) and the 4-year M.Earth Sci (Hons). Both schools share the same examinations in years 2 and 3. Practical examinations are taken at the end of their 2nd year.

The Final Examination for the 3-year Honour School in Geology is taken at the end of year 3. Students are required to satisfy the examiners in six papers on the Fundamentals of Geology, plus two pieces of independent work, and also in practical examinations. They are required to attend such field courses during each year of study as are approved annually by the Faculty of Earth Sciences, and make available to the examiners, practical notebooks containing records of both field and laboratory courses. Marks from the Second Year practical examination are carried forward.

The Final Examination for the 4-year Honour School in Earth Sciences is taken in two parts. Part A of the examination is taken at the end of Year 3 and is the same as that for the three-year course in Geology. Part B of the examination is taken at a time not less than three terms after Part A, and consists of written papers on four subjects chosen from a list published by the Faculty of Earth Sciences, a report on an advanced practical project or other advanced work.

Formative assessments are carried out within the college context through tutorials, classes and termly examinations (collections) and within the context of the teaching laboratories through practicals.

B. Skills and other attributes

These are built around the QAA Subject benchmark statements.

Students will have the opportunity to develop the following skills during the course:

2. Intellectual skills

- Appreciation of the holistic, multidisciplinary and interdisciplinary nature of the Earth Sciences

- Appreciation of the unity of underlying physical, chemical and biological principles of the Earth Sciences and their interactions in Earth systems processes
- Ability to recognise and use subject-specific theories, paradigms, concepts and principles (such as plate tectonic theory, evolutionary theory, the principle of uniformity)
- Ability to apply knowledge and understanding to address familiar or unresolved and more open-ended problems using fundamental principles
- Ability to collect, analyse, synthesise, summarise and inter-relate a wide range of phenomena and facts, including unresolved observational and complex information, to formulate and test hypotheses and reach conclusions, using both quantitative and qualitative approaches
- Ability to apply appropriate mathematical or numerical techniques to model geological and geophysical phenomena
- Ability to conduct a logical discussion
- Ability to précis scientific arguments and facts and give succinct and written presentations, using IT based methods where appropriate
- Awareness of the importance of creativity and the scientific imagination in formulating hypotheses from careful observations and analyses

3. Practical skills

These are built around the QAA Subject benchmark statements.

- Appreciation of the paramount importance of high quality field observation and practical skills to Earth systems analysis
- Ability to make and record accurate observations of field phenomena at a range of scales from maps to hand specimens, and to be able to analyse and make scientifically rigorous or testable conclusions from these observations
- Ability to make appropriate use of the terminology, nomenclature and classification systems used in the Earth Sciences (such as crystallography, mineralogy, petrography, biological taxonomy and the Linnean system).
- Ability to carry out accurate measurements using a range of techniques and data acquisition systems
- Ability to integrate field work, experimental and theoretical data
- Awareness of the need for safety in the field and practical laboratories, and ability to ensure safe conduct through risk assessment, awareness of rights of access, relevant health and safety regulations and sensitivity of the investigations on the environment and stakeholders

- Ability to plan, conduct and report on an open ended project, including the use of secondary data
- Ability to reference work in an appropriate manner

III. Transferable skills

These are built around the QAA Subject benchmark statements.

A. Communication skills

- Receiving and responding to a variety of information sources (e.g. textual, numerical, verbal, graphical) [LTC] [Tt] (U) (C)
- Communicating effectively and appropriately to a variety of audiences in written, verbal and graphical forms [LTC] [Tt] [M] (U) (C)

B. Problem solving, numeracy and IT skills

- Problem solving in a variety of contexts, and the ability to relate problems to first principles [LTC] [Tt] (U) (C)
- Appreciation of the issue of sample selection, accuracy, precision and uncertainty, including the collection, recording and analysis of data in the field and the laboratory [LTC] [Tt] [M] (P)
- Ability to prepare, process, interpret and present data using appropriate qualitative and quantitative techniques and packages [LTC] [Tt] [M] (U) (C) (P)
- Ability to solve numerical problems using computer and non-computer based techniques [LTC] [Tt] (U) (C) (P)
- Ability to devise and manipulate mathematical and numerical models [LTC] [Tt] (U) (C) (P)
- Familiarity with IT for documentation production and information retrieval [LTC] [Tt] [M] (U) (C) (P)
- Ability to use the Internet critically as a means of communication and a source of information [LTC] [Tt] (C) (P)

C. Interpersonal/Teamwork skills

- Development of organisational skills for practical tasks [LTC] [Tt] [M] (C) (P)
- Ability to identify individual and collective goals and responsibilities and perform in a manner appropriate for these roles [LTC] [Tt] [M] (C) (P)

- Ability to recognise and respect the views and opinions of other team members [LTC] [Tt] (C) [M] (P)
- Ability to evaluate performance as an individual and as a team member [LTC] [Tt] (C) [M] (P)

.D Self management and professional development skills

- Development of the skills necessary for self-managed and lifelong learning (e.g. working independently, time management and organisational skills) [LTC] [Tt] ([M] C) (P)
- Ability to identify and work towards targets for personal, academic and career development [Tt] [M] (C) (P)
- Development of an adaptable and flexible approach to study and work [Tt] [M] (C) (P)
- Foreign language ability (optional for those who wish to maintain or improve a language) [F]

Teaching/Learning methods and strategies

These are built around the QAA Subject benchmark statements

The teaching and learning skills are acquired through the following methods and strategies. Each symbol is shown in brackets in the list above.

LTC: Lectures, tutorials and classes. Most teaching is in the form of lectures and associated practicals. These may be supported by tutorials and classes according to the needs and interests of the student and the tutor.

Tt: Tutorials and writing up in practicals. Tutorials at Oxford hold a very special place in the expansion of personal Graduate Key Skills (such as intellectual development, self-management, powers of communication).

M: writing up of field work, independent mapping project, 3rd year essay, 4th year project. Field-based studies allow students to develop and enhance many of the Graduate Key Skills (such as teamworking, problem-solving, self-management, interpersonal relationships), which are of value to employers and for life-long learning, as do the essay and projects.

F: Foreign language tuition is an option that can be taken in the second and third year and is taught by the University Language Teaching Centre. These skills are not assessed by us.

Assessment

These are built around the QAA Subject benchmark statements.

The teaching and learning skills are assessed by a combination of the following. Each symbol is shown in brackets in the list above.

U: Unseen written examinations and specific practicals in the computer teaching laboratory. Examinations are rigorously overseen by the Examination Schools, where some of the written examinations may be taken.

College examinations (organised centrally as departmental collections) are arranged after the Summer vacation and Christmas vacation for those students not sitting a formal examination that term or year. These marks are for assessment of progress and do not count towards the degree.

C: Tutorial collections at the end of each term and written feedback on field notebooks. Each student will receive or hear written feedback on their tutorial work during the term at end of term collections. At Oxford, the reports are for the assessment of progress and do not count towards the final degree class.

P: Fourth year project and assessed short talks in the department and on field trips. The projects are marked formally. The talks are assessed informally.

10. Programme Structures and Features

These are built around the QAA Subject benchmark statements.

- A four year course leading to the degree of Master of Earth Sciences with honours or a three year course leading to the BA (Hons). The first three years are common to both courses.
- The first year covers multidisciplinary, foundation material in Physics and Chemistry of the Earth, Geological Materials, Earth Surface Processes (including foundation biology), Mathematics and an introduction to practical work and field work. The five Programme Outcomes are introduced here (A1 through lectures, tutorials, practicals and classes, A2-A5 also through field courses). The Preliminary Examination in Earth Sciences (First Public Examination) is taken at the end of the year (with a resit in September) and must be passed to continue on the course.
- The course leading to MEarthSc occupies the remaining three years leading to examinations at the end of each year. The multidisciplinary and interdisciplinary Programme Outcomes are developed here (A1 through lectures, tutorials, practicals and classes, A2-A5 also through field courses).
- The BA (Hons) course takes two years with exams at the end of the year. The multidisciplinary and interdisciplinary Programme Outcomes are developed here (A1 through lectures, tutorials, practicals and classes, A2-A5 also through field courses).
- The programme is enhanced throughout by tutorial teaching, arranged in association with the colleges. Tutorials reinforce understanding of the fundamental principles in physics, chemistry, biology, mathematics, and in Earth Systems Science. They contribute markedly to the development of personal Graduate Key Skills (such as intellectual development, self-management, powers of communication).

Learning: Year 1

Subjects

Earth Sciences 1: Chemistry of the Earth
Earth Sciences 2: Geological Materials
Earth Sciences 3: Earth Surface Processes
Mathematics for Materials and Earth Sciences

Practicals
Problem Classes
Field Programme

Assessment (Preliminary Examination in Earth Sciences)

The four written papers, each of 3 hours, must be passed (pass mark 40%) in one examination. Students failing up to two papers may retake these in September. Failure on more than two papers requires all four to be taken again. Practical work is assessed in examinations, which count as 50% of the marks of two of the written papers. The examiners may award a distinction to those who show special merit across all the tests and have passed all papers at one sitting. The first field trip takes place in Michaelmas Term and the second at Easter, plus four half day excursions in Trinity Term.

Year 2

Subjects

Fundamentals of Geology

Problem Classes
Practical Work
Field Programme
Independent Mapping Project

Assessment (both MEarthSc and BA)

Two practical papers on observational and interpretational techniques are taken at the end of the summer term. Two field trips take place, one in Michaelmas Term and one at Easter. A report on an individual mapping project is undertaken during the summer break and the report submitted at the beginning of Hilary Term of year 3.

Year 3

Subjects

Earth Resources
Geochemistry and Earth Materials
Geophysics
Palaeobiology and Environments

Essay
Practical Work
Field Programme

Assessment (both MEarthSc and BA)

Students have an element of choice as to which major subjects to take this year. An extended essay is to be undertaken in Hilary Term of the third year, and six three hour papers on the fundamental principles of Geology are taken at the end of the summer term. The field trip takes place at Easter each year.

Year 4

Subjects (students choose four courses from the following options)

Anatomy of a Mountain Belt
Planetary Chemistry
Seismology
Palaeobiology
Records of Major Environmental Change in Earth History
Environmental, Rock, and Palaeo-magnetism
Patterns and Process in Pleistocene Climate
Topics in Volcanology
Project

Assessment (MEarthSc)

Four two hour written papers are taken at the end of Trinity (summer) term. The project is undertaken during Michaelmas, Hilary, and Trinity terms of the 4th year and written up for submission to the examiners on Friday of week 4 of Trinity Term.

11. Support for Students and their learning

- All undergraduates reading Earth Sciences have a college tutor responsible for their academic welfare. This person will normally also hold a university teaching post in the Earth Sciences department. In addition to college tutors, College Deans provide more general welfare support and liaise with the University Counselling Service. Most Colleges are able to house most of their undergraduates throughout the course and provide social and sports facilities.
- During the first three years of the Earth Sciences courses, college tutors are responsible for organising the tutorial and class teaching that complements and exercises the material covered in lectures.
- The Department has teaching laboratories and collections for Palaeobiology, Mineralogy and Petrology, and computing; these are available to students at all times. Students on projects will also have access to the research laboratories, under strict supervision.

- All colleges have good library provision and at university level, the Hooke library provides a lending service for science subjects. Undergraduates are also entitled to make use of the Radcliffe Science Library (non-lending research library). The Department also has its own library, with open access, and it is a valuable resource for the students.
- The Department has a Computing Officer and use of IT and the web is continually expanding. Students have access to computers in college and in the teaching laboratories. Many college rooms have internet access. The network of IT resources and support is extensive, especially the Oxford University Computing Services (OUCS), which provides facilities for undergraduates and graduates, plus an extensive range of training programmes.
- Information about the courses is provided in the Undergraduate Course Handbook (distributed at the start of each year to all Earth Science undergraduates in residence) and more information and links to Earth Science sites worldwide are provided by the Earth Science department website (www.earth.ox.ac.uk).
- Advice on course content/options for undergraduates is provided by college tutors.
- Extensive facilities for language development for personal purposes are available through the University Language Centre.
- Regular personal contact between students and tutors ensures that problems are addressed promptly. The University Counselling Service offers a range of assistance.

12. Criteria for Admission

- A-Level mathematics is required. No other specific A-level subjects are required. However experience shows that it is essential to have at least one of Physics or Chemistry at A-level, in addition to Mathematics, and desirable to have all three subjects at A-level (or equivalent). However, candidates lacking one of these core subjects but with an A-level or additional AS-level in Geology, Biology, Further Mathematics, or Geography are also encouraged to apply, as of course are candidates with other qualifications such as the International Baccalaureate, Scottish Highers, etc.
- Applications are made to colleges of the University (undergraduates) or the Department (graduates). Two meetings of all those involved in college interviewing are held in the department to arrange second round interviews and to ensure that the best qualified candidates overall are offered places.
- Tutors are looking for enthusiastic and highly motivated students with the ability to apply basic principles to unfamiliar situations. Offers are made on the basis of a student's academic record, the recommendations of their teachers, and their performance in interviews in December.
- The purpose of the interviews is to determine those students, from an excellent calibre of applicants, who might be seen to benefit from the intensive, multidisciplinary, interdisciplinary and tutorial-based learning of the course.

- The courses require a good level of mathematical competence, but the key requirement is the ability to formulate a problem quantitatively and to be able to extract the consequences from the solution.
- Applicants are expected to meet the University's English Language criteria.

13. Methods for evaluating and improving the quality and standards of learning

- The Mathematics, Physical and Life Sciences Divisional committees ensure the dissemination of best practice between departments.
- The quality of the course is monitored on a regular basis by the Earth Science Faculty (essentially all staff involved in teaching in any capacity) and the Academic Committee. Input to these bodies comes from:
 - Internal Examiner's reports
 - External Examiner's reports
 - Earth Science Joint Consultative Committee (staff-student)
 - Termly student feedback on quality of lectures.
- Student comment on tutorial provision is requested by their colleges and is reviewed by Senior Tutors.
- The External Examiner's Reports and the response of the Department to any issues raised are also considered by the Academic Committee of the Division of Mathematics and Physical Sciences.
- University reviews of the department by the Division and by the Education Policy and Standards Committee of the University happen roughly every five years (on interleaved 10 yearly cycles).
- Issues relating to the improvement of teaching can be raised by the processes of mentoring of new lecturers during the five year probation, by feedback during their Institute for Advancement of University Learning (IAUL) training, and by the appraisal process. These are the responsibility of the Divisional Board.

14. Regulation of assessment

Final Examination

- The final examinations are each conducted by a team of 3 internal examiners plus one external examiner. Examiners are currently nominated by the departmental Academic Committee. Acceptance of these examiners is the responsibility of Faculty. The normal term of duty is two years. Examiners are guided by conventions agreed by the Faculty, endorsed by the Division, and made available to students in the Course Handbook. Oversight of all public university examinations is carried out by the Junior Proctor and staff. Any complaint or application for mitigation must be made through the Proctor.

- The Proctor may also approve the award of a classified BA Degree, in the case of any candidate who has taken the Third Year examination but is unable to complete the Fourth Year course of examination.
- Candidate anonymity is provided by random candidate numbers, known only by Examinations Schools until the final examinations meeting. Dispensation from anonymity has been agreed for the Independent Mapping Project and 4th year Research Project, for practical reasons.
- All Part A and Part B Finals examination material is double marked. Assessors and examiners carefully consider any cases where there is a notable difference between the marks awarded by the two assessors.
- There is an opportunity for candidates who fail any Prelims examinations to resit those papers over the long summer vacation. Part A candidates who fail may be permitted to resit the examination in the following academic year.

The Department has adopted the Divisional template for class descriptors, as outlined below, but also provides its own more detailed guidance to assessors.

Divisional Template for Qualitative Descriptors of Classes

Class I	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts.
Class IIi	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
Class IIii	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
Class III	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
Pass	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.
Fail	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary only.

15. Indicators of quality and standards

- External Examiners Reports
- Reports of external review bodies (see Sec.14)
- Student feedback
- Divisional and QAA Subject Review

- The department has achieved a 5* grade in the last two National Research Assessment Exercises (1996 and 2001)