School of Earth & Environmental Sciences

Earth & Environmental Sciences (ES) modules

ES1001 Planet Earth

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<th>SCOTCAT Credits:</th>
<th>20</th>
<th>SCQF Level</th>
<th>Semester</th>
<th>1</th>
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<tr>
<td>Academic year:</td>
<td>2018/9</td>
<td></td>
<td></td>
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<tr>
<td>Planned timetable:</td>
<td>12.00 noon - 1.00 pm Mon - Fri</td>
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This module provides a foundation into the study of Earth and environmental sciences. The key elements of the planet will be introduced. The bulk structure of the solid Earth (and the other planets of our solar system), and the dynamic hydrosphere and atmosphere will be covered from planetary to atomistic scales. Practical and transferable skills will be developed in tutorials and laboratory exercises which include the identification of minerals and rocks both in hand specimen and using microscopes. Fieldwork will be introduced as two half-day excursions. University-level study skills associated with this module include working in groups, poster and written presentations, advanced use of the University's internet and library facilities for data acquisition, and critically assessing scientific data and reports.

Learning and teaching methods of delivery: Weekly contact: 5 lectures, tutorials and skills sessions, and 1 x 2-hour practical (x 11 weeks); 7-hours fieldwork in total.

Scheduled learning: 77 hours  
Guided independent study: 123 hours

Assessment pattern:  
As defined by QAA:  
Written Examinations = 50%, Practical Examinations = 30%, Coursework = 20%

As used by St Andrews:  
2-hour Written Examination = 50%, 2-hour Practical Examination = 30%, Coursework = 20%

Re-assessment pattern:  
2-hour Written Examination = 80%, Coursework = 20%, No Re-assessment if Coursework mark is less than 4

Module coordinator: Dr C V Rose

Module teaching staff: Earth and Environmental Sciences staff

ES1002 Earth Resources and Environment

<table>
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<tr>
<th>SCOTCAT Credits:</th>
<th>20</th>
<th>SCQF Level</th>
<th>Semester</th>
<th>2</th>
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<tr>
<td>Academic year:</td>
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<td>Planned timetable:</td>
<td>12.00 noon - 1.00 pm Mon - Fri; 2.00 pm - 4.00 pm Thu and Fri</td>
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This module builds on the understanding of planet Earth gained in ES1001, with an underlying theme of the Earth's resources and environment. The processes in action at different tectonic settings (volcanism, metamorphism etc) and the natural hazards induced by these processes leads into Earth resources (metals, hydrocarbons and energy) and the applied nature of Earth Sciences in problem-solving resource and environmental issues. Key skills for Earth and environment scientists are developed and the module includes a 4-day residential field excursion to the northeast of Scotland around Easter.

Pre-requisite(s): Before taking this module you must pass ES1001

Anti-requisite(s) You cannot take this module if you take GG1012

Learning and teaching methods of delivery: Weekly contact: 5 lectures, tutorials and 1 x 2-hour practical (x 11 weeks), plus 40 hours of fieldwork over the semester.

Scheduled learning: 117 hours  
Guided independent study: 83 hours

Assessment pattern:  
As defined by QAA:  
Written Examinations = 50%, Practical Examinations = 25%, Coursework = 25%

As used by St Andrews:  
2-hour Written Examination = 50%, 2-hour Practical Examination = 30%, Coursework = 20%

Re-assessment pattern:  
2-hour Written Examination = 80%, Coursework = 20%, No Re-assessment if Coursework mark is less than 4

Module coordinator: Dr C V Rose

Module teaching staff: Earth and Environmental Sciences staff
This module introduces students to Earth Science using the geological history of Scotland as a case study. This is a four-week course that focuses on applying scientific method through collection and interpretation of field data collected by students. An emphasis is placed on identifying the distinction between data and interpretation, thinking in four dimensions and hypothesis testing. No prior knowledge of geology is required. Scotland is the ideal natural laboratory; it offers classic exposures of a variety of rock types relevant to key periods of time throughout three billion-years of Earth’s history. The taught content of the module includes lectures, practical classes and field excursions. Assessments are comprised of written exams (multiple choice/short answer questions, an illustrated essay), a lab exam, field notebook presentation, participation in group discussions and written reports.

Pre-requisite(s):
Currently enrolled in a third level institution. Completion of at least one year in a third level institution. Letter of recommendation from this institution / obtained at a 3.0 gpa in one science subject.

Learning and teaching methods of delivery:
Weekly contact: Each week of this module will typically consist of 7 hrs of lectures - lab classes. In addition students will take part in an average of 9 of fieldwork each week. Students are expected to completed the directed reading assignments and read outside of this literature in their own spare time.

Assessment pattern:
As defined by QAA:
Written Examinations = 35%, Practical Examinations = 15%, Coursework = 50%

As used by St Andrews:
2-hour Written Examination = 35%, Practical Examination = 15%, Coursework = 50%

Re-assessment pattern:
3-hour Written Examination = 100%

Module coordinator: Dr W McCarthy
Module teaching staff: Module teaching staff: Dr William McCarthy, Dr Sebastian Fischer
### ES2001 Dynamic Earth: The Earth System

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<th>Semester</th>
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<td>Academic year:</td>
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<tr>
<td>Planned timetable:</td>
<td>10.00 am - 11.00 am Mon - Fri; 2.00 pm - 5.00 pm Tue</td>
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This module reflects an up-to-date approach to understanding of the behaviour of the solid Earth and its interaction with the atmosphere and biosphere and beyond. It will provide detailed training in some of the processes acting at or near the Earth’s surface (for example the dynamics of erosional processes). The evolution of the planet as a whole (including the evolution of life) from magma oceans in the early Earth to the present day will be covered in detail. Practical and theoretical training in geophysical methods for probing the near surface of the Earth will be provided.

**Pre-requisite(s):** Before taking this module you must pass ES1001 and pass ES1002

**Learning and teaching methods of delivery:**
- **Weekly contact:** 5 lectures and 1 x 3-hour laboratory per week, and occasional tutorials; 16 hours fieldwork
- **Scheduled learning:** 96 hours
- **Guided independent study:** 204 hours

**Assessment pattern:**
- **As defined by QAA:**
  - Written Examinations = 50%, Practical Examinations = 30%, Coursework = 20%
- **As used by St Andrews:**
  - 2-hour Written Examination = 50%, 3-hour Practical Examination = 30%, Coursework = 20%

**Re-assessment pattern:**
- 2-hour Written Examination = 80%, Coursework = 20%, No Re-assessment if Coursework mark is less than 4

**Module coordinator:** Dr T D Raub

**Module teaching staff:** Earth and Environmental Sciences staff

### ES2002 Dynamic Earth: Magma, Minerals and Metamorphism

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<td>Academic year:</td>
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<td>Planned timetable:</td>
<td>10.00 am - 11.00 am Mon, Wed, Fri; 2.00 pm - 5.00 pm Tue</td>
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This module focuses on the geology of the solid Earth and high temperature processes in the Earth’s interior. The mineral building blocks of the Earth will be covered in detail, as well as volcanic and metamorphic processes and geodynamics. A key component of this course is the residential field course to central Spain around the time of the Easter vacation, where independent field mapping will be introduced.

**Pre-requisite(s):** Students should normally have taken ES2001 or have special permission.

**Anti-requisite(s):** You cannot take this module if you take GS2012

**Learning and teaching methods of delivery:**
- **Weekly contact:** 3 lectures and 1 x 3-hour laboratory per week and occasional tutorials; 64 hours fieldwork.
- **Scheduled learning:** 120 hours
- **Guided independent study:** 188 hours

**Assessment pattern:**
- **As defined by QAA:**
  - Written Examinations = 30%, Practical Examinations = 50%, Coursework = 20%
- **As used by St Andrews:**
  - 2-hour Written Examination = 50%, 2-hour Practical Examination = 20%, Coursework = 30%

**Re-assessment pattern:**
- 2-hour Written Examination = 80%, Coursework = 20%, No Re-assessment if Coursework mark is less than 4

**Module coordinator:** Dr W McCarthy

**Module teaching staff:** Prof. Adrian Finch, Prof. Richard White, Dr Sami Mikhail, Dr Paul Savage, Dr William McCarthy.
This module focuses on the low temperature processes that occur in the outer envelopes of the Earth, including land-atmosphere interactions, glacial processes, tectonic geomorphology, geomicrobiology and oceanography. Relationships between physical, chemical and biological processes occurring along Earth’s surface, and their impact on climate, will be explored using case studies. A key component of this course will be fieldwork to sites of environmental interest developing field skills in water/sediment sampling and analysis, and unravelling contaminant flow-patterns.

**Pre-requisite(s):** Before taking this module you must pass ES2001

**Learning and teaching methods of delivery:** Weekly contact: 3 x 1-hour lectures and 1 x 3-hour laboratory per week; 12 hours of tutorials and 16 hours fieldwork over the semester.

**Assessment pattern:**

- **As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%
- **As used by St Andrews:** 2-hour Written Examination = 50%, Coursework = 50%

**Re-assessment pattern:** 2-hour Written Examination = 80%, Coursework = 20%, No Re-assessment if Coursework mark is less than 4

**Module coordinator:** Dr R J S Wilson

**Module teaching staff:** Earth and Environmental Sciences staff
Interdisciplinary (ID) module

**ID1006 Astrobiology: The Search for Life in the Universe**

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<th>SCOTCAT Credits:</th>
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<td>2018/9</td>
<td>Planned timetable:</td>
<td>1.00 pm</td>
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This module aims to lead students through the scientific quest for the origin of life on Earth and the prospect for finding life on other planets, both in our solar system and on habitable worlds elsewhere in the Galaxy. The course will cover diverse topics in biology, geology, astronomy and chemistry, which comprise the field of astrobiology. We will also discuss the societal implication of detecting life outside Earth. The course will start by studying the origins and evolution of life on Earth and will use this as a framework for how to search for life in our Solar System and beyond. Due to the wide range of scientific topics covered, the course will be suitable for non-science majors as well as those in the sciences. A key component of the course will be to examine science as a way of knowing by looking at the scientific process, how scientific theories are developed and refuted, and discuss the burden of proof for extraordinary claims.

**Learning and teaching methods of delivery:**

<table>
<thead>
<tr>
<th>Weekly contact:</th>
<th>Lectures (2 hours x 11 weeks) Practical sessions (1 hour x 11 weeks) Oral presentation (3 hours x 3 weeks)</th>
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<tbody>
<tr>
<td>Scheduled learning:</td>
<td>42 hours Guided independent study: 158 hours</td>
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**Assessment pattern:**

- **As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%
- **As used by St Andrews:** 2-hour Written Examination = 50%, Coursework = 50%
- **Re-assessment pattern:** 2-hour Written Examination = 80%, Coursework = 20%

**Module coordinator:** Dr M Claire

**Module teaching staff:** Dr A Macartney, Dr M Claire and Dr S Rugheimer