UNIVERSITY OF LEICESTER

Study Abroad

Modules in Geology

2022/23 Academic Year

MODULE NAME: The Rock Cycle - Our Dynamic Earth

MODULE CODE: GL1101

MODULE DESCRIPTION: Click to open.

CREDITS: 30

PERIOD: Academic Year

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

By the end of this module successful students will be able to:

• Outline the formation of the solar system, origin of elements and evolution of our planet Earth over time

• Define and link the main processes responsible for the formation and transformation of the three principle rock types and understand the holistic relationship and interplay between Earth's various layers

• Discuss rocks and minerals in terms of physical and chemical principles. Describe and identify common igneous, metamorphic and sedimentary rocks in hand specimen and thin section, and produce illustrated, technical descriptions and interpretations

• Use simple mathematical equations to calculate physical conditions in the Earth, mineral properties and interpret igneous, metamorphic and sedimentary processes

• Work effectively as part of a small team and reflect on experience of developing transferable skills

COORDINATOR: Marc Reichow

TEACHING AND LEARNING METHODS:

Lectures, workshops and practical classes

PRE-REQUISITES:

TOTAL MODULE HOURS: 300

ASSESSMENT METHODS:

Tests, project and poster

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Principles of Geophysics

MODULE CODE: GL2108

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Academic Year

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

• Understand the principles of different geophysical methods

• Use scientific computing software, e.g. Matlab

• Conduct a geophysical survey and check the quality of the data

• Relate geophysical measurements to structures within the Earth

COORDINATOR: Catherine Greenfield

TEACHING AND LEARNING METHODS:

Field demonstration of geophysical equipment and measurement procedures, lectures on geophysical methods, computer based practicals

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Exam, practical, coursework, assessed practical

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Micro to Macro: from rock properties to plate tectonics

MODULE CODE: GL1102

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

By the end of this module, students should be able to:

- Re-arrange and solve equations describing the physical properties of the Earth's Interior

- Plot and use graphs to determine the rate of change of physical properties

- Manipulate data using appropriate computer software

- Have knowledge of, and describe, theories, concepts and principles associated with plate tectonics and the structural features of the Earth's Interior

- Present the analysis of geophysical data within a report, using professionally produced diagrams and writing.

- Consider and discuss uncertainties relating to geophysical data and methods

COORDINATOR: Stewart Fishwick

TEACHING AND LEARNING METHODS:

Lectures, workshops and practical classes

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Exam, MCQ, Practical

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Palaeobiology and the Stratigraphic Record: evolution and diversity through time

MODULE CODE: GL1103

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

By the end of the module, students should be able to:

-Identify the major groups of fossil invertebrates, and recall their modes of life, geological age ranges, and characteristic palaeoenvironments [test, exam and coursework]

-Describe the scientific utility of fossils in stratigraphy and palaeobiology [test, exam]

-Apply the principles of biostratigraphy and palaeoenvironmental reconstruction to help interpret a rock succession [test, exam]

-Outline the geological history of the UK as recorded in the stratigraphic record [exam]

COORDINATOR: Tom Harvey

TEACHING AND LEARNING METHODS:

Lectures, practical classes, demonstrations and work sheets

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Examination and Coursework

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Magmatic and Metamorphic Processes

MODULE CODE: GL2103

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

• Describe the formation of igneous and metamorphic rocks from a variety of tectonic settings

• Describe some processes that are responsible for generating the range of igneous and metamorphic rocks and their textures

• Describe and identify a range of minerals, igneous rocks and metamorphic rocks in hand specimen and thin section

• Draw and interpret rock assemblages, mineral compositions and phase relationships on binary and ternary diagrams

• Evaluate geochemical data pertaining to igneous systems

COORDINATOR: Marc Reichow

TEACHING AND LEARNING METHODS:

Workshops, including introductory lectures followed by practical classes

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Examination and coursework

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Background reading and research in preparation for workshops.

MODULE NAME: Mineral Resources for Net-Zero Carbon 1

MODULE CODE: GL2106

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

• List the chemical formulae of common ore minerals.

• Understand the principles and terminology of reflected light microscopy and use a reflected light microscope to accurately observe ore minerals and their textures

• Describe and identify the common ore minerals and their textural relationships in hand specimen, and reflected light and some in transmitted light. Explain the origin of the textures and paragenesis.

• Record information for revision and final report in an electronic practical folder.

• Describe the mineralogy, ore textures and geological and tectonic relationships of specified simple mineral deposits, and use these features to predict likely areas of mineralization.

• Explain societal uses of the ores produced, in particular metals used in low carbon energy technologies and the economic and environmental implications of extraction.

• Discuss the competing ideas for the genesis of these deposits.

COORDINATOR: Gawen Jenkin

TEACHING AND LEARNING METHODS:

Integrated workshop sessions for learning about basic mineral deposit types.

An initial intensive lecture and practical course equips the students with the requisite skills to then undertake independent team project work.

Formative feedback during the module is given by a) advice in workshop sessions, b) peer and self-assessment of practical books of specific practicals, c) multiple-choice tests.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Coursework MCQ, Exam, Coursework Practical Folder

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Major Events in the History of Life

MODULE CODE: GL2107

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

• By the end of this module, typical students should be able to outline some of the major evolutionary innovations and macroecological events in the history of life on Earth and their impact on the biosphere.

• Students will be able to outline key evolutionary concepts describing the way in which life has evolved through the course of Earth history. Examples may include: adaptive radiation and biodiversification, functional morphology, mass extinction events, the importance of exceptionally-preserved deposits, human evolution and the Cambrian explosion.

• Students will be able to evaluate data that is used to indicate extinction events.

• Students will be able to communicate a scientific message to a non-scientific general audience through video

• Students will be able to assess life modes within a community of fossils

COORDINATOR: Sarah Gabbott

TEACHING AND LEARNING METHODS:

Lectures, practical classes, demonstrations and work sheets including directed extra reading.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Written exam, You-tube video, Group project with individual report

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Environmental Geoscience

MODULE CODE: GL3102

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- Demonstrate the methods used to investigate or quantify the environment and environmental baselines, and discuss their limitations

- Describe the main modes of exposure of humans to potentially harmful environmental agents.

- Discuss the physic-chemical mechanisms of pollution (such as acid rain, ozone depletion)

- Critically assess the data for contamination in various environments.

- Outline and describe the range of environmental impacts that result from anthropogenic modification of the natural environment (e.g. by mining, urbanization or agriculture).

- Describe environmental mitigation techniques (such as waste disposal) and critically evaluate their necessity and usefulness.

COORDINATOR: Daniel Smith

TEACHING AND LEARNING METHODS:

Asynchronous narrated presentations, computer based practical exercises, synchronous Q&A sessions, and independent study.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Examination and Practical Exercises

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Independent reading, practical exercises and associated software exercises, exam technique session

MODULE NAME: Diversity and Evolution of Vertebrates

MODULE CODE: GL3111

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- use cladistic terminology to describe phylogenetic patterns

- outline basic patterns of relationships and character acquisition, and evaluate hypotheses of the ecological/functional transitions involved in the origins of major chordate crown groups (e.g. vertebrates, gnathostomes, actinopterygians, tetrapods, birds, and mammals)

- recognize and interpret vertebrate specimens (fossils and skeletons), and present the results of analysis as a short report

COORDINATOR:

TEACHING AND LEARNING METHODS:

Lectures, laboratory practical classes, directed reading, demonstrations, project supervision, independent research.

PRE-REQUISITES: GL2107

TOTAL MODULE HOURS:

ASSESSMENT METHODS:

Examination and Coursework - reports

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Two components:

Guided reading associated with lectures;

Hands-on work with palaeontological specimens accompanied by background research using a variety of sources (internet, text books and specialist primary literature) to produce a report that ident

MODULE NAME: Crustal Dynamics

MODULE CODE: GL3118

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 1

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

- Outline the major magmatic and tectonic processes involved in the formation of modern continental crust.

- Compare and contrast modern and ancient styles of crustal generation on Earth.

- Critically evaluate different methods of assessing crustal growth through Earth history using geochronology, geochemical techniques, open access geological databases, and discuss current scientific debate around the record of crustal growth through time.

- Understand geophysical techniques to describe and evaluate differences in the styles and mechanisms of deformation in continental and oceanic crust.

- Discuss how tectonically driven deformation and orogenesis in the continents influences silicate weathering and the Earth's hydrosphere on geological timescales.

COORDINATOR: Andrew Miles

TEACHING AND LEARNING METHODS:

Lectures, practicals, workshops and independent study

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Coursework

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Directed reading related to the topics covered together with additional and related topics including new developments in the field. Attendance at online and in person seminars, including university-based and externally-hosted where possible. Completion of

MODULE NAME: Natural Resources and Energy for the 21st Century

MODULE CODE: GL1104

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On completion of this module, successful students should be able to:

o Demonstrate a broad knowledge of natural resource types including metalliferous, energy, water and renewable resources.

o Recall key definitions relating to natural resources and formulae of common ore minerals/hydrocarbons.

o Illustrate formation processes of natural resources using diagrams.

o Evaluate the economic, environmental and social sustainability of natural resource exploitation using case studies.

o Integrate a range of geological data to determine sub-surface structures and potential resource distribution.

o Demonstrate use of equations in determining common properties of natural resources.

o Work in pairs or small groups to synthesis geological, social, economic and environmental information using appropriate computer software to produce a presentation.

o Use computer software to geospatially analyse data to map geological, environmental and social data relating to natural resources.

COORDINATOR: David Holwell

TEACHING AND LEARNING METHODS:

Lectures, practical classes, small group work, independent research, guided independent study in preparation for lectures and discussions.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Exam, Group Practical, Formative

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Software familiarisation exercises; independent reading

MODULE NAME: Geological Maps and Structures

MODULE CODE: GL1105

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

• Outline and understand basic stratigraphic relationships

• Define the major classes of geological structure and be able to recognise and classify these on geological maps

• Extrapolate 3D geology from a 2D map

• Construct geological cross-sections

• Define the geological history of a map

• Use computer software to design your own 3D geological block models

• Locate yourself on a map and understand how to use compass bearings and pacings in order to mark features on a base map

COORDINATOR: Sarah Lee

TEACHING AND LEARNING METHODS:

Workshops and field exercise

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Exam, Practical, Formative (within practicals and fieldwork training)

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Introduction to Geochemistry

MODULE CODE: GL2101

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, a typical student should be able to:

• Demonstrate knowledge of the principles of inorganic geochemistry that control the budgets of elements in different Earth reservoirs e.g. crust, mangle, seawater and atmosphere.

• Demonstrate an understanding of fractionation and what effect it has on elemental and isotopic signatures.

• Understand the difference between elemental and isotopic chemistries.

• Have an appreciation of the main geochronological tools available to geochemists and understand radioactivity

• Be able to discuss trends in the evolution of the Earth's mantle and ocean, and be able to assess the processes that have led to its present day balance

• Undertake simple calculations and work with (manipulate, analyse, synthesize, critically assess) a range of geochemical data used as proxies for key Earth and ocean processes

• Learn to justify arguments based on quantifiable data and value judgements

• Work independently and in teams to analyse and present information on selected Earth processes, within a report.

COORDINATOR: Tiffany Barry

TEACHING AND LEARNING METHODS:

The module will combine guided, independent learning for formal information necessary to learn for the module with Q & A tutorials, and practical sessions to develop deeper understanding of concepts and independent questioning of data. A range of literature styles will be explored, along with writing practices and scientific writing skills. Practicals will provide a range of skills and learning opportunities to reinforce material in the module and elsewhere in the degree.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Examination, Report

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Structure and Tectonics

MODULE CODE: GL2102

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- Identify and describe, quantitatively, common geological structures
- Explain deformation processes that create major rock structures
- Discuss and quantify principles of stress and strain
- Plot and interpret structural datasets
- Discuss theories, paradigms, concepts, and principles concerned with tectonics
- Synthesise multidisciplinary datasets to build deformation histories

COORDINATOR: Gawen Jenkin

TEACHING AND LEARNING METHODS:

Interactive lecture-practical sessions will introduce concepts of stress and strain, quantitative description of tectonic structures, and methods of structural data plotting, reduction, and interpretation. Structural plotting and display will be combined with GIS techniques, to develop data visualization techniques.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Essay and practical based exam questions, practical assessment and group presentation

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

MODULE NAME: Depositional Processes and Environments

MODULE CODE: GL2105

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

• Describe a depositional environment, its component subenvironments, and the key depositional processes that operate in that environment

• Describe how an environment may evolve through time and the resulting sedimentary succession

• Interpret depositional environments by combining observations from sedimentary data including: mineralogy, textures & structures (in hand specimen, thin section and field images), graphic sedimentary logs, palaeoflow measurements & fossils

• Apply knowledge of processes and depositional environments and use stratigraphic techniques to interpret and correlate multiple sedimentary logs.

COORDINATOR: Sarah Lee

TEACHING AND LEARNING METHODS:

The approach is a mixture of lectures; short and long practical exercises; guided scheduled practical work; teamwork practicals; independent study

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

The assessment will be two of three essay questions and hopefully a practical element, though I can't confirm if that will be possible yet. Even if the practical element is not possible, the ILO's will still be able to be achieved.

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Guided independent study will involve completion of activities provided throughout the course, as well as further reading and activities suggested by the instructor

MODULE NAME: Planetary Science

MODULE CODE: GL3106

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- Discuss, describe & have knowledge of planetary exploration, structures, geochemical evolution, and thermodynamic processes.

- Describe how geophysical techniques are used to investigate planetary bodies within the solar system

- Use and manipulate equations in assessing & describing planets

- Construct, a professional written presentation that describes cutting edge scientific research in a form suitable for a lay audience

- Establish good small group working practices in order to provide background scientific information

COORDINATOR: Stewart Fishwick

TEACHING AND LEARNING METHODS:

Lectures and guided workshops, which may involve further discussions / seminars, or practical work

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Coursework

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Reading of scientific literature, practical / computational work on datasets, preparation of individual written reports

MODULE NAME: Reflection Seismology

MODULE CODE: GL3107

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- List, describe use and assess the effectiveness of the techniques used in 2D seismic reflection data processing

- Design and small-scale seismic survey

- Demonstrate a knowledge of and apply the range of mathematical techniques available for analysis and filtering of digital time series data

- Process seismic data to produce a stacked section

- Prepare a technical report to a high standard (i.e. with correct spelling, grammar, sentence and paragraph construction and illustrated clearly).

COORDINATOR: Stewart Fishwick

TEACHING AND LEARNING METHODS:

Students follow a course of lectures and practical work covering the theory and practice of seismic reflection methods, averaging 2 x 1-hour lectures and 3 hours practical per week. During this they will be trained to process seismic data using a commercial standard seismic reflection data processing system (Landmark Promax or equivalent). Using this they will process example data. Private study time should be spent reinforcing the knowledge and skills being delivered. They will be advised on the production of a processing report and have an opportunity to examine an actual example of commercial practice.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Coursework

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Revision of mathematical techniques, processing seismic data, report writing.

MODULE NAME: Geological Application of Microfossils

MODULE CODE: GL3108

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- Identify and describe a range of different microfossils

- Identify the biostratigraphy of a microfossil assemblage

- Determine the palaeoecology of a microfossil assemblage

- Critically appraise microfossil data used to establish past environment

- Write a concise, report on a bespoke microfossil dataset

COORDINATOR: Mark Williams

TEACHING AND LEARNING METHODS:

Lectures, demonstrations, guided laboratory work, technical report writing

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Examination

Coursework - report

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Reading research papers, datasets and external websites as supplied via Blackboard. Guided microfossil analysis.

MODULE NAME: Mineral Exploration, Economics and Sustainability

MODULE CODE: GL3109

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- Be aware of the major techniques used in mineral exporation

- Recognize and identify the presence and nature of orebodies on the basis of geochemical and geophysical data

- Review and analyse large datasets using relevant software programs

- Calculate economic metrics applicable to mineral resources, such as net present value, internal rate of return and payback period.

- Rank and critically evaluate different projects or project scenarios in terms of financial risk

- Critically evaluate data quality

- Summarise their work within a concise, professional style report

COORDINATOR: David Holwell

TEACHING AND LEARNING METHODS:

Lectures, laboratory practical classes (including software demonstrations and workshops), independent project work, project based workshops and surgeries.

PRE-REQUISITES:

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Coursework project – exploration

Coursework project - evaluation

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

- Analysis of data provided to students weekly in independent time.

- Browsing financial (commodities) news for contemporary information on industry.

- Software familiarization activities

MODULE NAME: Archaeological Geophysics Field Course

MODULE CODE: GL3115

MODULE DESCRIPTION: Click to open.

CREDITS: 15

PERIOD: Semester 2

DEPARTMENT: Geology

INTENDED LEARNING OUTCOMES:

On successful completion of the module, students should be able to:

- Understanding of capabilities of different geophysical methods

- Ability to plan geophysical fieldwork

- Ability to measure geophysical data and perform quality control

- Relate geophysical measurements to structures within the Earth

- Use computer based analysis methods on geophysical data

COORDINATOR: Catherine Greenfield

TEACHING AND LEARNING METHODS:

Field demonstration of geophysical equipment and measurement procedures, guided acquisition of new geophysical data, workshop on modern geophysical analysis methods and guided computer based analysis of field data

PRE-REQUISITES: GL2108

TOTAL MODULE HOURS: 150

ASSESSMENT METHODS:

Pre-survey Planning Document and Final Report

GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:

Preparation of pre-survey report and final report, analysis of geophysical data, revision of previous lectures