

ES3003 GIS and Spatial Analysis for Earth Scientists				
SCOTCAT Credits:	15	SCQF level 9	Semester	1
Academic year:	2021-2022			
Planned timetable:	10.00 am - 1.00 pm Mon, Wed (lecture plus lab session) (Weeks 1 - 7)			
This module covers the principles behind, and practical application of digital spatial analysis in Earth Sciences. This includes the analysis of primary and secondary datasets, how to access and import a variety of data types, and the fundamentals of various spatial analytical methods including spatial statistics and modeling within a GIS environment. The module also prepares students for the correct presentation of maps and datasets in the dissertation proposal and thesis.				
Learning and teaching methods of delivery:	Weekly contact: 6 lectures and 14 practicals and support sessions (Weeks 1 - 7).			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Professor C R Bates			
Module teaching staff:	Dr C Bates			

ES3004 Processes and Products in Sedimentary Systems				
SCOTCAT Credits:	15	SCQF level 9	Semester	2
Academic year:	2021-2022			
Planned timetable:	9.00 am - 10.00 am Tue - Thu (lectures), 2.00 - 5.00 pm Mon (practicals). 3 field days (9.00 am - 5.00 pm)			
This core module provides fundamental knowledge and training in describing, studying and interpreting sediments, sedimentary rocks and stratigraphic frameworks. The concepts and methodologies of process sedimentology, stratigraphy and sedimentary petrography will be taught, and training undertaken using fieldwork and practicals. The module serves as preparation for subsequent modules on related topics and for field-based modules, including Advanced Geological Mapping, the Research dissertation, and the fourth-year field course.				
Pre-requisite(s):	Before taking this module you must pass ES2001 and (pass ES2002 or pass ES2003)			
Learning and teaching methods of delivery:	Weekly contact: 3 lectures (x11 wks), 4 practicals (x4 wks), 2 fieldtrips (2 days)			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	Practical Examination = 100%			
Module coordinator:	Dr C V Rose			
Module teaching staff:	Prof T Prave, Dr C Rose			

ES3008 Geochemistry				
SCOTCAT Credits:	15	SCQF level 9	Semester	1
Academic year:	2021-2022			
Planned timetable:	10.00 am Tue and Thu (lectures), 2.00 - 5.00 Fri (practicals)			
<p>This module provides an introduction to geochemistry: the study of the abundance, distribution and circulation of the chemical elements in minerals, rocks, soils, water and the atmosphere. Geochemical tools are a powerful means to study geological, economic, and environmental problems. In the module we study the origin and distribution of the chemical elements in the Earth and solar system and review thermodynamics and kinetics as applied to the Earth system. We apply thermodynamics to make quantitative predictions regarding the outcome of chemical reactions associated with geological processes. We consider the behaviour of elements, in both low temperature environments and planetary interiors. Material covered includes introductory chemistry, chemical bonding, thermodynamics, kinetics, aqueous geochemistry, mineral precipitation and dissolution, CO₂ change, and planetary chemistry. We utilise geochemical tools to constrain changes in geological processes and Earth's environment.</p>				
Pre-requisite(s):	Before taking this module you must have entered honours and passed ES2001 and (ES2002 or ES2003)			
Learning and teaching methods of delivery:	Weekly contact: 2 x 1 hour lectures (8 weeks), 1 x 3 hour practical (8 weeks)			
Assessment pattern:	Practical Examination = 100%			
Re-assessment pattern:	Practical Examination = 100%			
Module coordinator:	Dr J W B Rae			
Module teaching staff:	Dr J Rae, Dr P Savage			

ES3009 Igneous and Metamorphic Petrology				
SCOTCAT Credits:	15	SCQF level 9	Semester	1
Academic year:	2021-2022			
Planned timetable:	9.00 am Tue and Thu (lectures); 2.00 pm - 5.00 pm Mon (practicals)			
<p>This is a core module within the BSc Geology and MGeol Earth Sciences degrees and delivered early in the Honours programme in order to provide a fundamental framework for interpreting major petrological processes acting within the silicate portion of planet Earth. The course focuses on solid-state equilibria, liquid-solid phase equilibria, crystallography, and spatial associations. The module serves as preparation for subsequent modules on related topics and for field-based modules, including Advanced Geological Mapping, Advanced Geochemistry, the Research dissertation, the Alps field course, Advanced Petrogenesis.</p>				
Pre-requisite(s):	Before taking this module you must pass ES2002			
Learning and teaching methods of delivery:	Weekly contact: 2 x 1-hour lectures (x 10 weeks), 3-hour practicals most weeks.			
Assessment pattern:	2-hour Written Examination = 50%, 2 x 2-hour Practical Examination = 50%			
Re-assessment pattern:	2-hour Written Examination = 80%, Coursework = 20%, No Re-assessment if Coursework mark is less than 4			
Module coordinator:	Dr S Mikhail			
Module teaching staff:	Dr S Mikhail, Prof A Finch, Prof R White			

ES3011 Global Biogeochemical Cycles				
SCOTCAT Credits:	15	SCQF level 9	Semester	2
Academic year:	2021-2022			
Planned timetable:	To be arranged.			
<p>Environmental Earth Science is inherently multi-disciplinary, but many environmental science courses focus on specific reservoirs of the Earth system (e.g., the atmosphere, oceans, or continental crust), rather than examining the system as a whole. The study of global biogeochemical cycling crosses these disciplinary boundaries, following specific elements as they are cycled through the Earth surface by physical, chemical, and biological transformations. This module will focus on the cycling of the five elements critical to life on Earth - carbon, oxygen, sulfur, phosphorus, and nitrogen - using examples from both modern and ancient environments and their response to human influence. An emphasis will be placed on the proxies utilised for unravelling these processes in the environment and in the rock record, along with modern quantitative methods used to constrain these cycles.</p>				
Pre-requisite(s):	Before taking this module you must take ES2002 or take ES2003 and take ES3008			
Learning and teaching methods of delivery:	Weekly contact: 2-hour lectures (x 6 weeks and only 1 hour in week 7) and 3-hour practical sessions (x 7 weeks).			
Assessment pattern:	Written Examination (run as internal test in Week 9) = 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 A L Zerkle			
Module teaching staff:	Dr A Zerkle, Dr M Claire, Dr S Mikhail			

ES4007 Petroleum Exploration and Geophysics				
SCOTCAT Credits:	15	SCQF level 10	Semester	1
Academic year:	2021-2022			
Planned timetable:	11.00 am - 1.00 pm Thu (lectures), 2.00 - 5.00 pm Thu (practicals)			
<p>The fundamental concepts, techniques and practices of the hydrocarbon exploration industry are presented. Students will gain a thorough understanding of the geoscience of petroleum exploration, particularly using geophysical methods, and a working knowledge of modern concepts in oil and gas geology.</p>				
Pre-requisite(s):	Before taking this module you must pass ES2001 and (pass ES2002 or pass ES2003)			
Learning and teaching methods of delivery:	Weekly contact: 19 lectures and 4 workshops, 2 practicals and support sessions (Weeks 1 - 10).			
Assessment pattern:	Coursework (Petrel Logging - 50%, Carbonate Workshop - 20%, Wireline Logging Workshop - 10%, North Sea Report - 20%) = 100%			
Re-assessment pattern:	Current Coursework (Petrel Logging) = 50%, Coursework = 50%, No Re-assessment if Coursework mark is less than 4			
Module coordinator:	Professor C R Bates			
Module teaching staff:	Dr R Bates			

ES5005 Isotope Geochemistry: Theory, Techniques, and Applications				
SCOTCAT Credits:	15	SCQF level 11	Semester	1
Academic year:	2021-2022			
Planned timetable:	To be arranged.			
<p>Isotope geochemistry has grown over the last 50 years to become one of the most important fields in the Earth sciences. The growth in the importance of isotope geochemistry reflects its remarkable success in solving fundamental problems in mantle formation, ore genesis, hydrology, hydrocarbon formation, crustal evolution, planetary formation, geochemical cycles, hydrothermal circulation, ocean circulation, and climate and environmental change. In this module, we will explore the theory of isotopes and their fractionation, including kinetic, equilibrium, and Rayleigh fractionation. We will also use case studies and applications of isotopes to interesting problems across Earth Sciences including the evolution of the atmosphere, the formation of the solar system and planets, and climate and carbon cycle reconstructions. These case studies will introduce concepts such as clumped isotopes, isotope mass balance, mass independent fractionation, and radionuclide disequilibria.</p>				
Pre-requisite(s):	Current BSc Students SHOULD PASS ES3008 or pass (ch1401, CH1402 and CH2501)			
Learning and teaching methods of delivery:	Weekly contact: 2 x2-hour lectures (x 5 weeks), 3-hour practical sessions (x 3 weeks)			
Assessment pattern:	2-hour Practical (Open Book) Examination = 50%, Coursework = 50%			
Re-assessment pattern:	2-hour Practical (Open Book) Examination = 80%, Coursework = 20%			
Module coordinator:	Dr P S Savage			
Module teaching staff:	Dr A Burke, Dr P Savage, Dr A Zerkle + other SEES staff			

ES5010 Advanced Geochemistry				
SCOTCAT Credits:	15	SCQF level 11	Semester	2
Academic year:	2021-2022			
Planned timetable:	To be arranged.			
<p>The objective of this course is to provide students with skills in some of the more advanced topics in geochemistry that are not commonly discussed in introductory courses. Examples of topics taught in recent years include geochemical processes in 'extrem</p>				
Pre-requisite(s):	Before taking this module you must take ES3008			
Learning and teaching methods of delivery:	Weekly contact: 33 hours in total over the semester, composed of a combination of lectures and 2-3 hour practicals.			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	2-hour Written Examination = 80%, Coursework = 20%, No Re-assessment if Coursework mark is less than 4			
Module coordinator:	Dr E E Stueeken			
Module teaching staff:	Other SEES staff and/or external lecturers			

ES5011 The Compositions of Natural Waters and Sedimentary Rocks				
SCOTCAT Credits:	15	SCQF level 11	Semester	1
Academic year:	2021-2022			
Planned timetable:	To be arranged.			
This module introduces the interactions between water, rock, soil and sediment. We study the theory and concept of sedimentary rock composition and how to predict solute and contaminant transport. We study key aqueous pollutants (e.g. metals, radionuclides, nutrients), their behaviour in different waters (speciation, mobility, bioavailability and toxicity) and methods of remediation.				
Pre-requisite(s):	Before taking this module you must pass ES3008. Undergraduate students without the prerequisite but with a suitable Chemistry background should be considered			
Learning and teaching methods of delivery:	Weekly contact: Total of 16 hours of lectures, 12 hours of practicals, one field trip and interviews.			
Assessment pattern:	2-hour Written Examination = 40%, Coursework (including Technical Brief, Media Interview and Qualitative analysis exercise) = 60%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr N Allison			
Module teaching staff:	Dr N Allison, Mr A Black (Groundwater Science Ltd)			

ES5012 Biogeochemistry				
SCOTCAT Credits:	15	SCQF level 11	Semester	2
Academic year:	2021-2022			
Planned timetable:	To be arranged.			
Earth's surface environment is tightly regulated by biogeochemical processes. The biosphere directly influences the composition of Earth's atmosphere, ocean chemistry, and global climate, through the cycling of nutrients and other elements. This module will examine the role of biogeochemical processes in controlling Earth surface chemistry, and their possible influence on deep Earth reservoirs. Emphasis will be placed on feedbacks between the geosphere, atmosphere, and biosphere over geologic time, and how these interactions have both contributed and responded to important transitions in Earth history (e.g., the Great Oxidation Event, global glaciations). We will also highlight current geochemical (e.g., stable isotope ratios) and numerical (e.g., modelling) techniques used to constrain these interactions in both modern and ancient (rock record) systems.				
Learning and teaching methods of delivery:	Weekly contact: 2 x 1-hour lectures and 3-hour practical sessions.			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	100% continual assessment.			
Module coordinator:	Dr A L Zerkle			
Module teaching staff:	Dr A Zerkle, Dr M Claire, Dr S Mikhail			

ES5013 Advanced Petrogenesis

SCOTCAT Credits:	15	SCQF level 11	Semester	1
Academic year:	2021-2022			
Planned timetable:	10.00 am Mon and Tue (lectures). 10.00 - 1.00 pm Wed or Fri (practicals)			
<p>Rocky planets, like Earth, comprise of a metallic core with a rocky mantle and crust topped with a gaseous atmosphere. The focus of this course is the genesis of the rocky mantle and crust, termed the silicate Earth, and its relationship to small-scale to planetary-wide processes. The silicate Earth primarily comprises igneous and metamorphic rocks. This module explores the nature of the magmatic and metamorphic processes that characterise the Earth from the immediate subsurface to the base of the mantle. We focus on the petrology and geochemistry of the minerals and rocks created, and the evolution of composition as a function of time and depth. Students completing this module will understand how magmatic systems operate from melting source, through ascent to the plumbing systems in the immediate subsurface. The response of the crust to dynamic changes in pressure and temperature will also be explained along with the methods used to determine these. The course will develop key skills in identifying rocks, interpreting geochemical data, and using geochemical and thermodynamic methods to unravel rock histories. Students will also be shown how these data can be used to understand any and all rocky bodies in the cosmos, from Earth to exoplanets.</p>				
Pre-requisite(s):	Before taking this module you must take ES3009			
Learning and teaching methods of delivery:	Weekly contact: 19 lectures, 15 hours of laboratory work, 18 hours of field-related study over the semester			
Assessment pattern:	2-hour Written Examination = 50%, 3-hour Practical Examination = 50%			
Re-assessment pattern:	2-hour Written Examination = 100%, No Re-assessment if Coursework mark is less than 4			
Module coordinator:	Professor A A Finch			
Module teaching staff:	Prof A Finch, Prof R White and Dr S Mikhail			

ES5014 The Chemistry of the Solar System

SCOTCAT Credits:	15	SCQF level 11	Semester	2
Academic year:	2021-2022			
Planned timetable:	To be arranged			
<p>The solar system is a chemically-diverse place, and this module uses aspects of geoscience, chemistry and physics to investigate the physiochemical processes that led to its current diversity. This module will introduce you to established and cutting-edge theories that explore the composition of the pre-solar nebula, the formation of the Sun, the planets and asteroids - and the processes that determine their current chemical compositions.</p>				
Learning and teaching methods of delivery:	Weekly contact: 2 lectures (x 9 weeks), 1 practical class (x 9 weeks), 2 seminar classes (x 2 weeks)			
Assessment pattern:	Coursework = 50%, Practical Examination = 50%			
Re-assessment pattern:	Practical Examination = 100%			
Module coordinator:	Dr P S Savage			
Module coordinator Email:	pss3@st-andrews.ac.uk			
Module teaching staff:	Dr Paul Savage, Dr Robert Steele, Dr Mark Claire, Dr Christiane Helling, Dr Claire Cousins, Dr Nicholas Gardiner, Dr Sami Mikhail			

ES5031 Statistics and Analytical Sciences			
SCOTCAT Credits:	5	SCQF level 11	Semester 2
Academic year:	2021-2022		
Planned timetable:			
<p>This module is designed to provide MSc Geochemistry students with thorough training in Statistics and methods of data analysis used in Earth Sciences. The module comprises a series of combined lecture-practical classes. These will cover both statistical concepts (distributions, accuracy and precision, error propagation, Monte Carlo simulations etc.) and applied data manipulation (using spreadsheets and the statistical programming language R). Weekly practical classes will put the lecture material into a practical context and comprise 40% of the module grade. Students will undertake a data analysis and modelling project which will comprise 60% of the module grade. The module will give students the necessary training to allow them to excel in their own data analysis during their research dissertations.</p>			
Learning and teaching methods of delivery:	Weekly contact: 1 hour lecture (8 weeks), 2 hour practicals (8 weeks)		
Assessment pattern:	Coursework = 100%		
Module coordinator:	Dr R C J Steele		

ES5050 Special Topics in Geochemistry			
SCOTCAT Credits:	15	SCQF level 11	Semester 2
Academic year:	2021-2022		
Availability restrictions:	Available to General Degree students with the permission of the Honours Adviser		
Planned timetable:	Lecture - Thursday, Practical - Wednesday		
<p>This module is based around current hot topics in Earth and planetary science research. It will introduce cutting-edge science questions about planetary bodies in the solar system and of course Earth. It will address how our planet has evolved from a ball of molten rock to the habitable blue planet it is today, and some of the major changes in its chemistry, biosphere, and climate that have happened along the way. Topics will vary from year to year, depending on staff participating in the module and the advances in Earth science research. This module is research-led, requiring that you read, digest, and discuss a number of topical papers each week. For some of these topics there is no given answer; instead you gain an in-depth understanding of the current state of research. Topics are introduced in lectures and then discussion seminars, organised around student presentations, are designed to encourage debate and critique of the arguments presented in the research papers.</p>			
Pre-requisite(s):	Undergraduate Students SHOULD PASS ES2001 AND PASS ES2002 AND PASS ES2003		
Learning and teaching methods of delivery:	Weekly contact: 8 hours of lectures and 24 hours of seminars over the semester.		
Assessment pattern:	Practical Examination (Oral Presentations) = 60%, Written Examination = 40%		
Re-assessment pattern:	Written Examination = 100%		
Module coordinator:	Dr J W B Rae		
Module teaching staff:	Dr James Rae + other SEES staff		

ES5051 Geochemistry Field Excursion				
SCOTCAT Credits:	15	SCQF level 11	Semester	2
Academic year:	2021-2022			
Planned timetable:	2 weeks of field work and post-trip analysis in April			
Field sampling and laboratory analysis of natural samples are an important part of a geochemists' toolkit. This module will introduce the skills necessary for planning and executing a successful field campaign, developing best practice field skills in documenting the geological and environmental controls on a geochemical problem, and how to select and take samples. This forms the introduction to methodologies and training in applied environmental problems. Specific environmental problems will be identified, and researched in detail before a one-week field excursion to Rio Tinto in southern Spain, a world-famous mining locality with associated environmental pollution and remediation.				
Learning and teaching methods of delivery:	Weekly contact: Occasional seminar, 6 hours of lectures and labs in Week 10 and week long field trip in Week 11.			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr M Claire			
Module teaching staff:	Dr M Claire, Dr A Zerkle			

ES5099 Research Project				
SCOTCAT Credits:	60	SCQF level 11	Semester	Full Year
Academic year:	2021-2022			
Planned timetable:	To be arranged.			
The MSc Research Project Module provides the student with an opportunity to undertake an independent project based on original research. Each student chooses a topic of interest and is able to work under the supervision of an active research group within the University, and/or with an external academic or industrial partner. The research project involves project formulation, proposal writing and analytical design, as well as data integration and interpretation. The results are presented as oral presentations, as a poster as part of a conference, and in a dissertation.				
Learning and teaching methods of delivery:	Weekly contact: introductory lectures, presentations and supervisory meetings.			
Assessment pattern:	Coursework (10,000 word dissertation + other elements) = 100%			
Re-assessment pattern:	No Re-assessment available			
Module coordinator:	Dr P S Savage			
Module teaching staff:	Dr P Savage/Dr E Stueeken + other SEES members			

ES5300 Core to Crust Ore Genesis - High Temperature				
SCOTCAT Credits:	15	SCQF level 11	Semester	1
Academic year:	2021-2022			
Planned timetable:	To be arranged			
<p>This module explores ore deposits that form in high-temperature environments, extending from mantle processes to the upper crust. Current genetic models of ore deposits are reviewed with an emphasis on the geological processes required to create them. Deposit types discussed may include some or all of diamond formation, magmatic Ni-Cu and PGE-Cr, Cu and Sn porphyry, skarn, Rare Earth Element (REE) and iron oxide copper gold (IOCG). Laboratory exercises involve geological problem solving using a mineral exploration industry focus involving the examination of representative suites of samples.</p>				
Pre-requisite(s):	Acceptance to year 5 of a M-level programme in the School of Earth & Environmental Sciences			
Learning and teaching methods of delivery:	Weekly contact: 1 lecture x 10 weeks, 1 seminar x 10 weeks, 1 practical x 4 weeks			
Assessment pattern:	2-hour Written Examination = 50%, Practical Examination = 50%			
Re-assessment pattern:	2-hour Written Examination = 80%, Practical Examination = 20%			
Module coordinator:	Professor A A Finch			
Module teaching staff:	Prof A Finch and Dr N Gardiner			

ES5301 Exploration to Estimation				
SCOTCAT Credits:	15	SCQF level 11	Semester	2
Academic year:	2021-2022			
Planned timetable:	To be arranged.			
<p>This module explores the fundamental targeting, geochemical and geophysical concepts used by the mineral exploration industry, and introduces resource estimation concepts. Students will learn the basic concepts of mineral exploration by focusing on different aspects including geochemical, biogeochemical, and geophysical exploration methods. Each section discusses the theoretical background necessary and introduces relevant analytical techniques. This module also aims to familiarise students with basics of mineral resource estimation. A 2-day field trip is included to look at mineralization potential within Scotland.</p>				
Pre-requisite(s):	Student must have gained entrance to the MGeol or MSc Strategic Earth Resources			
Learning and teaching methods of delivery:	Weekly contact: 2 lectures (x 11 weeks), 1 practical (x 2 weeks)			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	2-hour Practical Examination = 100%			
Module coordinator:	Dr N J Gardiner			
Module teaching staff:	Dr N Gardiner, Dr C Cousins, Dr R Bates, Dr E Stueeken, Dr W Hutchison			

ES5302 Core to Crust Ore Genesis - Low Temperature				
SCOTCAT Credits:	15	SCQF level 11	Semester	2
Academic year:	2021-2022			
Availability restrictions:	Enrolment is limited to MSc students in Mineral Resources and Geochemistry and to MGeol students			
Planned timetable:	To be arranged			
This module explores ore deposits that form in low-temperature environments, extending from the upper crust to the critical zone at Earth's surface, including topics such as physical and chemical properties of hydrothermal fluids, volcanogenic and sedimentary sulphide deposits, iron manganese oxides, evaporites, and soil-hosted ores. The material will be delivered through a combination of lectures and hands-on practicals.				
Pre-requisite(s):	Student must have gained entrance to the mgeol or msc mineral resources or geochemistry programmes			
Learning and teaching methods of delivery:	Weekly contact: Each week includes 2 lectures (x 10 weeks) and 1 practical (x 8 weeks) or 1 seminar (x 2 weeks)			
Assessment pattern:	Written Examination (run as internal test in Week 9) = 50%, Coursework = 30%, Practical Examination = 20%			
Re-assessment pattern:	Practical Examination = 100%			
Module coordinator:	Dr E E Stueeken			
Module teaching staff:	Dr E. Stueeken and other SEES staff			

ES5305 Applied Digital Field Methods				
SCOTCAT Credits:	30	SCQF level 11	Semester	1
Academic year:	2021-2022			
Availability restrictions:	Priority for the module will be given to the students enrolled in the MSc in Mineral Resources. Extra spaces will be allocated on a first-come-first-serve basis.			
Planned timetable:	To be confirmed			
This module aims to train students to use a suite of modern software packages and field tablet computers to conduct geological fieldwork. The module focuses on creating and interpreting surface and underground maps and drill core logs using computers, a skill that is not core at undergraduate level but is sought by employers across the mineral resource, hydrocarbon, hydrogeological and environmental sector. Module assessment is based upon the reproducibility and organization of field data (notes, logs and maps), the interpretation of these data, data presentation, group participation and a series of technical reports.				
Learning and teaching methods of delivery:	Weekly contact: 1 x 2 hr lecture (x12 weeks), 1 x 3 hr lab (x11 weeks). Three field excursions, one is a 5-day excursion. Some field excursions will be during the weekend.			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	No reassessment is offered			
Module coordinator:	Dr W McCarthy			
Module coordinator Email:	wm37@st-andrews.ac.uk			
Module teaching staff:	Dr W McCarthy, Dr C Cousins, Dr W Hutchison			

ES5306 Field Excursion				
SCOTCAT Credits:	10	SCQF level 11	Semester	2
Academic year:	2021-2022			
Planned timetable:	To be arranged			
<p>The 'Field Excursion' is a 10 credit (6-8 day) geological field course with the primary aim of studying regional geology and associated mineralization, and to visit active mining operations. The course is ideally abroad, and for 2021 we are targeting South Africa, but this may change in future location depending on staffing and available mining operations. The principal aim of the course, which is run after the main bulk of the MSc teaching at the end of Semester 2, is to consolidate the learning in a practical way. This will be achieved by visiting active mines and/or known mineralization of a variety of deposit types (e.g., mafic-hosted PGE; alluvial Au; diamonds; BIF), and to look at the associated regional geology. An additional benefit where relevant will be to observe and understand active mining operations, e.g. extraction, processing etc.</p>				
Pre-requisite(s):	Student must have gained entrance to the msc in strategic earth resources			
Learning and teaching methods of delivery:	Weekly contact:			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	Practical Examination = 100%			
Module coordinator:	Dr N J Gardiner			
Module teaching staff:	Dr Nicholas Gardiner, Dr Eva Stueeken			

ES5307 Global Resource Challenges				
SCOTCAT Credits:	15	SCQF level 11	Semester	Full Year
Academic year:	2021-2022			
Planned timetable:	To be arranged			
<p>The resource industry needs to develop and evolve during the 21st century to respond the new challenges of both a growing, developing global population, and the shift to a low-carbon economy. It is important that geoscientists planning on a career within the resource industry are both aware of these challenges, and the strategies to meet them. Accordingly, this new unique module will focus on the 'bigger picture' around mining. It will cover key topics, which may include some of: the economic drivers behind the resource industry; societal issues especially with respect to developing nations; the ethical face of mining; environmental challenges in opening and operating a mining project, and remediation during and after closure. The course includes an environmentally-focused fieldtrip to study mine drainage issues and/or water chemistry.</p>				
Pre-requisite(s):	Student must have gained entrance to the msc in strategic earth resources			
Learning and teaching methods of delivery:	Weekly contact: This module includes a 4 day field trip.			
Assessment pattern:	Coursework = 60%, Practical Examination = 40%			
Re-assessment pattern:	Practical Examination = 100%			
Module coordinator:	Dr M Claire			
Module teaching staff:	Mark Claire, James Rae, Andrew Burke, Tim Raub			

ID5011 Geographic Information Systems for Environmental Management			
SCOTCAT Credits:	15	SCQF level 11	Semester 1
Academic year:	2021-2022		
Planned timetable:	To be arranged (Weeks 1 - 5)		
<p>This module provides an introduction to Geographic Information systems and their use in environmental problem solving. The module will be taught through a series of lectures, tutorials, laboratory classes and individual projects. The module will be assessed through class exercises and the final, short individual project. Students will be introduced to methods of acquiring, storing, analysing and displaying (2D and 3D) spatial digital data using the ArcGIS data package. An introduction to data manipulation and statistical techniques on a variety of environmental examples will be given. The module is taught within the School of Geography and Geosciences but incorporates datasets and analysis techniques used in earth and environmental science, biology, archaeology, and mathematics.</p>			
Pre-requisite(s):	Requires a basic ability in computer skills (basic word processing, spread sheet analysis) gained through SALTIRE if not demonstrated		
Learning and teaching methods of delivery:	Weekly contact: 6 lectures and 14 practicals and support sessions (Weeks 1 - 6).		
Assessment pattern:	Coursework = 100% (portfolio 70%, Individual Project 30%)		
Re-assessment pattern:	Resubmission of failed item(s) of Coursework		
Module coordinator:	Professor C R Bates		