School of Geography, Earth and Environmental Sciences

Module Descriptions For International Students 2015/16

All Years/Programmes

Year 1: all Programmes

Module Information (* Submission dates are an indication only and may be subject to change)

03 18196	**ESCM101**	**Earth Systems and Sedimentary Rocks**	**20 credits**
Level: C	**Semester: 1 & 2**	**Module Leader: Paul Anderson**	
NB: This module is only available to those students who will be in attendance for the full academic year.			
Prohibited combination with: GGM102 Earth and Ecological Systems			
Description:	The module is interdisciplinary in nature and provides a basic framework of knowledge and understanding of the natural science of Planet Earth. There is an emphasis on the interconnectedness of the lithosphere, hydrosphere, atmosphere and biosphere through flows of mass and energy, as demonstrated for example in the climate system. The processes of landscape evolution and sediment accumulation are given a broad coverage and are completed by a practical introductory course on sedimentary rocks. The utility of an understanding of present processes as a guide to interpreting the past and predicting the future is stressed.		
Learning Outcomes:	By the end of the module the student will be able to: • Understand the concepts of system analysis as applied at different scales to the Earth • Appreciate the links between internal and external Earth processes on various timescales • Understand the main features of the Earth's climate system and the associated links between atmosphere and hydrosphere • Identify the links between geographic positioning, climate, biomes and soils • Understand the modification of landscapes under the influence of physical forces and chemical processes and identify characteristic landforms. • Relate the properties of sediments to processes in terrestrial and marine environments of deposition • Understand the controls on Earth's climate history and the nature and risk from global • catastrophes • Be able to relate the properties of sedimentary rocks to their processes of formation • Be able to identify common types of sediments, sedimentary rocks and associated structures		
List of module topics:	Earth Systems Geosphere Atmosphere and Climate Hydrosphere-Geosphere interactions Ice and oceans in a changing climate Sedimentary rocks and processes		
Key Skills:	To develop a basic understanding of Earth systems and sedimentary rocks		

Delivery:	30 one-hour lectures and 10 two-hour practical classes – Practical classes will be repeated to accommodate all students
Assessment:	Two Canvas examinations (total 3 hours) (100%) – exam after semester one is based entirely on lecture component (90 mins = 50%); exam after semester two is based on lecture and practical content (90 mins = 25% + 25%).
Assessment Submission dates *	January and June exams
Essential Texts:	**Key Text** – Compiled by School of Geography, Earth and Environmental Science (2009) Earth Systems. A Person Custom Publication. **Key Text (sedimentology)** – Nichols, G. D. (2009) *Sedimentology and stratigraphy*. Oxford: Wiley-Blackwell Other Reading: Barry, RG & Chorley, RJ (1998) *Atmosphere, Weather and Climate* 7th edition London, Routledge Briggs, D et al (1997) *Fundamentals of the Physical Environment*, Routledge. Ernst, WG (ed.) (2000) *Earth Systems* CUP Huggett, RJ (1998) *Fundamentals of Biogeography*, Routledge Kump, LR, Kasting, JF & Crane, RG (1999) *The EarthSystem*, Prentice-Hall McGregor, GR & Nieuwolt, S (1998) *Tropical Climatology*, J. Wiley, Chichester. Press, F & Siever, R (2001) *Understanding Earth* 3rd edition, Freeman Robinson, PJ. and Henderson-Sellers, A (1999) *Contemporary Climatology*, 2nd edition, Longman, London Strahler, AN and Strahler, AH (2003) *Modern Physical Geography*, J. Wiley and Sons Summerfield, MA, (1991) *Global Geomorphology*, Longman

03 26360	ESCM103	Earth History	10 credits
Level: C	**Semester: 1 & 2**	**Module Leader: Jason Hilton**	
NB: This module is only available to those students who will be in attendance for the full academic year.			
Description:	Providing an introduction to the principles of stratigraphy. These principles are developed within the framework of the geological history of the British Isles. At key points, case studies are presented that develop deeper understanding of the relationship between global climates, geological processes and the development of life and biogeochemical cycles on earth.		
Learning Outcomes:	Recount the major systems of the geological timescale and provide an indication of the main outcrop of those units within the UK Explain the relationship between changing climates and geological processes at a global to local scale Relate the British stratigraphical record to climatic and plate tectonic changes Understand key events in Earth History and link these to likely causal mechanisms		
List of module topics:	• The geological timescale • Rock Cycle, facies, lithstratigrpahy, chronostratigrpahy, and biostratigraphy • Tectonics, orogenies and dating • Precambrian-Cambrian Earth History • Snowball Earth and the Cryogenian • The Ediacaran • Ordovocian to Devonian Earth History History of the Ordovician system: Charles Lapworth and the Birmingham connection • Great Ordovician biodiversification event • Terrestrialisation and Berner cycles • Carbonferous to Permian Earth History • The nature and causes of Mass Extinction • Triassic to Jurassic Earth History • Cretaceous to Cenozoic Earth History • Cenozoic climates and palaeoceanography • Ocean Anoic Events, Paleocene-Eocene Thermal Maximum, Zachos isotope curve • Quaternary deposits and Fred Shotton – the Birmingham connection • Revision session		
Key Skills:	Essay writing; Critical evaluation of published data		
Delivery:	17 hours of lectures		
Assessment:	1.5 hour examination comprising 1 seen essay question (40%) and 5 short answer questions (30%); 1 hour MCQ examination (30%)		
Assessment Submission dates *	Examinations in main examinations period, with MCQ immediately before the main exam period depending on computer cluster availability.		
Essential Texts:	The geology of England and Wales / edited by P.J. Brenchley and P.F. Rawson - 2nd ed. - London: Geological Society, 2006 - 1862391998 (hbk)1862392005 (pbk)9781862391994 (hbk)9781862392007 (pbk) Geological history of Britain and Ireland / edited by Nigel Woodcock, Rob St - Oxford : Blackwell Science, 2000 – 0632036567 University of Birmingham. Earth Systems. 3rd Edition. 2013. Pearsons		

03 24920	ESCM104	Deformation processes and Maps	10 credits
Level: C	**Semester: 2**	**Module Leader: Carl Stevenson**	
Description:	This module represents a progression from **Geological structures and tectonics** in semester 1, where advanced map interpretation and more complex aspects of structural geology such as stress and strain and strain analysis are introduced. Thus topics build on elementary structural geology with a focus on geological map interpretation and prepare students for year 2 (level I) Continental Deformation, the Pembrokeshire field course and independent mapping projects. Geological maps are a 2D representation of 3D geology – the intersection of geological structures with the Earth's surface. At one level, they are a means of recording those rock types that crop out at the surface and of inferring their presence in areas of poor exposure. However, they also represent a powerful means of interpreting the geological history of an area, and constitute scientific hypotheses in their own right. The ability to interpret geological maps in three dimensions, or four dimensions if one considers the time component, is thus a fundamental component of being a geologist. In addition this module considers the deformation processes that result in complex geological structures and focuses on stress, strain and rheology as a means to understand this. There are therefore experiments that demonstrate and test ideas about this included alongside map interpretation		
Learning Outcomes:	• Understand the relationship between stress and strain • develop advanced interpretations of geological structures • Interpret more advanced geological maps		
List of module topics:	• Stress and Strain • Rheology and deformation • Stratum contours • Folds on Maps • Faults on Maps • Unconformities and maps • Igneous intrusions and maps		
Key Skills:	• Structural geology • Map interpretation • Quantitative lab work • Quantitative map interpretation		
Delivery:	30 hours (30-40 minute lecture followed by practical class each week)		
Assessment:	100% coursework: Coursework folder includes a number of class exercises plus 2 independent map exercises - A check list is provided during term Opportunities for formative assessment include advice and feedback during class from staff and demonstrators One piece of work is handed in for detailed formative feedback Any work can be sent to the module leader for advice or feedback during term time.		
Assessment Submission dates *	Week 1 semester 3		
Essential Texts:	Lisle, R. J. 2004. *Geological structure and maps. A practical guide*. Elsevier: Amsterdam, third edition, 106 pp. ISBN: 0 7506 5780 4. The book is also available free as pdfs through Science Direct at: http://site.ebrary.com/lib/bham/docDetail.action?docID=10180810 (from University computers) McClay, K. 1991. *The mapping of geological structures*. John Wiley and Sons: Chichester, 168 pp. ISBN: 0 471 93243 4.		

03 00747	ESCM107	Introduction to Palaeontology	10 credits
Level: C	**Semester: 2**	**Module Leader: Ivan Sansom**	
Description:	The module will introduce invertebrate macrofossils and trace fossils, and their modes of preservation. Topics dealt with include the classification, morphology and modes of life and geological importance of trilobites, brachiopods, molluscs, graptolites, echinoderms and corals. Trace fossils are dealt with in terms of their classification and evidence for organism:sediment interactions		
Learning Outcomes:	By the end of the module the student should be able to: • Identify and classify the commoner types of invertebrate macrofossils and trace fossils; • Describe, in basic terms, their modes of preservation; • Demonstrate how fossils can be used in biostratigraphy, can aid inference of sedimentary environnment, and can be used in palaeogeographical reconstruction		
Delivery:	10 hours lectures 20 hours practicals and workshops		
Assessment:	1.5 hr exam (60%) Practical (40%)		
Assessment Submission dates	TBC		
Essential Texts:	Benton & Harper, *Basic Palaeontology* (1997) Clarkson, *Invertebrate Palaeontology & Evolution (4th edn)* (1998)		

03 24921	ESCM109	Geological Structures and Tectonics	10 credits
Level: C	**Semester: 1**	**Module Leader: Tim Reston**	
Description:	*Aims:* To introduce structural geology and plate tectonics The module introduces the key geological structures, explains how they form and how they can be recognised and analysed to provide and understanding of the deformation history of a region.		
Learning Outcomes:	By the end of the module, students should understand how geological structures (folds, faults, shear zones etc) form and be able to recognise, describe and analyse a wide range of geological structures, to interpret basic maps, to draw cross-sections and to plot and analyse data on stereonets.		
List of module topics:	• Structural geology: an introduction • Map interpretation • Faults • Fault rocks • Folds • Rheology • Small-scale structures • Stereonets • Introduction to plate tectonics: continental drift and seafloor spreading • Subduction zones and plate driving mechanisms • Mountain-building.		
Key Skills:	Map analysis; section construction, stereonet construction, 3D visualisation, pattern recognition		
Delivery:	10 hours lectures, 20 hours practical work		
Assessment:	90 minute online exam (January)		
Essential Texts:	Fossen, H. 2010 *Structural Geology* CUP, UK		

03 23324	ESCM135	Earth Materials and Internal Processes	20 credits
Level: C	**Semester: 1 & 2**	**Module Leader: Seb Watt**	

NB: Only available to students studying for a full academic year (10 credit version available in Sem 1 – see ESCM137)

Description:	Geochemistry of planet Earth, solar and meteorite studies and composition of the primtive solar nebula. Mineral structure and composition with particular reference to the main rock-forming mineral groups. X-ray diffraction studies of minerals. Magmas: origins and mechanisms of production in various global tectonic settings. Magma ascent, and processes operating in magma chambers. Fractional crystallization. Emplacement of magmas at high crustal levels and the extrusion of volcanic material. Major and trace element geochemistry; the use of one- and two-component phase diagrams in understanding magma origins and evolution; applications of radiogenic isotopes. Identification of rocks and minerals in hand specimen. Introduction to the use of the petrological microscope.
Learning Outcomes:	By the end of the module, students should: • be able to apply geochemical principles • to understand the composition and genesis of igneous rocks • be able to identify common minerals and rocks in hand specimen • use the petrological microscope to identify minerals in igneous, metamorphic and sedimentary rocks
List of module topics:	• Topic 1 Materials – A Global Perspective (2 lecs) • Topic 2 Materials – Minerals (7 lecs) • Topic 3 Materials – Mineral Identification using X-rays (1 lec) • Topic 4 Materials - Magmas, plutonic landforms, volcanic landforms and volcanic products (1 lec) • Topic 5 Internal processes – Origins of Magmas (3 lecs) • Topic 6 Internal processes - Ascent and Emplacement of Magmas (2 lecs) • Topic 7 Internal Processes – What Trace Elements tell us (2 lecs) • Topic 8 Internal Processes – What radiogenic Isotopes tell us (2 lecs) Lab practicals involve hand specimen identification of rocks and minerals and, principally, examination of thin sections of rocks using the petrological microscope.
Key Skills:	Identification of minerals and rocks in hand specimen. Use of the petrological microscope to identify minerals and to recognise a wide range of igneous rocks and some metamorphic and sedimentary rocks. Use of geochemical and experimental data to support models of magma genesis and magmatic evolution – particularly to become competent in the use of one and two component phase diagrams and chemical variation diagrams.
Delivery:	Lectures - 20hours Lab practicals - 40 hours
Assessment:	60% examination :- one two hour paper. This is split into two sections (A and B) one on materials and one on internal processes. Students to answer 2 questions from each section) 40% class test:- involving hand specimens of rocks and minerals and thin sections of rocks linked to a problem map or cross section. Taken in the final week of term
Assessment Submission dates *	Test Semester 1 week 11
Essential Texts:	Brownlow, A.H. 1996 Geochemistry Hall, A. 1995 Igneous petrology Klein, C., Phillpots, A.R. 2013 Earth Materials and Internal Processes Cambridge University Press A.Hall 1995

03 27220	ESCM137	Earth Materials	10 credits
Level: C	**Semester: 1**	**Module Leader: Seb Watt**	
Description:	Composition of the Solar System and the precursor solar nebula. Earth's composition; distribution of the elements in a differentiated Earth. The structure, chemistry and physical properties of minerals. The main families of minerals, based on the complex $[SiO_4]^{4+}$ anion. Identification of minerals in hand specimen and using X-ray techniques. Rock identification, classification and nomenclature. Igneous intrusive and extrusive rocks –geometry and occurrences. Introduction to the petrological microscope and the common rock forming minerals in thin section.		
Learning Outcomes:	By the end of the module, students should: • Demonstrate a basic understanding of the overall chemical composition of the Earth and the major processes regulating distribution of the elements • identify and describe the commoner types of rocks and rock-forming minerals • appreciate how mineral properties are controlled by chemistry and structure		
List of module topics:	• Topic 1 Materials – A Global Perspective (2 lecs) • Topic 2 Materials – Minerals (7 lecs) • Topic 3 Materials – Mineral Identification using X-rays (1 lec) • Topic 4 Materials - Magmas, plutonic landforms, volcanic landforms and volcanic products (1 lec)		
Key Skills:	Identification of minerals and rocks in hand specimen. Use of the petrological microscope to identify minerals and to recognise a wide range of igneous rocks and some metamorphic and sedimentary rocks. Use of geochemical and experimental data to support models of magma genesis and magmatic evolution – particularly to become competent in the use of one and two component phase diagrams and chemical variation diagrams.		
Delivery:	Lectures - 11 hours Lab practicals - 14 hours		
Assessment:	90 minute Exam (60%), Practical test (40%)		
Assessment Submission dates *	Test week 11		
Essential Texts:	Brownlow, A.H. 1996 Geochemistry Hall, A. 1995 Igneous petrology Klein, C., Phillpots, A.R. 2013 Earth Materials and Internal Processes Cambridge University Press A.Hall 1995		

03 27375	**ESCM138**	**Ecology and Data Analysis**	**10 credits**
Level: C	**Semester: 1 & 2**	**Module Leader: Mick Riley**	
NB: This module is only available to those students who will be in attendance for the full academic year.			
Description:	This module provides an introduction to ecology and statistics in the context of environmental data.		
Learning Outcomes:	By the end of the course, students should be able to: • Evaluate the concept of biodiversity • Identify the main patterns in plant and animal distributions found in the natural world today • Understand the ecological processes that have shaped those patterns • Use basic computing applications to perform data organisation and statistical analysis tasks • Critically analyse and present scientific information and data in an appropriate format		
List of module topics:	Specifics to be confirmed 10 lectures on Ecology 10 lectures on Data Analysis and statistical methods and applications		
Key Skills:	Data analysis and numeracy		
Delivery:	20 hours lectures		
Assessment:	Ecology: Multiple Choice Exam Data Analysis assessment: TBA		
Assessment Submission dates *	TBC		
Essential Texts:	Colinvaux, P, (1993) *Ecology 2*. Wiley. Gaston, KJ & Spicer, JI (2004) *Biodiversity: an Introduction*. Blackwell, Oxford.		

03 23434	**GGM101**	**Contemporary Human Geography**	**20 credits**
Level: C	**Semester: 1 & 2**	**Module Leader: Lloyd Jenkins**	
NB: A 10-credit version of this module (03 26642), that can be taken in either semester, is available. Please contact the School.			
Description:	**Semester 1 :** The course will begin with an introduction of its aims and content and discuss the nature of human geography as an academic discipline. Subsequent sections will consider some current issues and debates in historical geography, environmental geography, urban geography and political geography. **Semester 2:** These sections will consider some current issues and debates in cultural geography, development geography, economic geography, and social geography. The semester will finish with a conclusion to the course, revision meetings and a discussion of the type of exam to be expected.		
Learning Outcomes:	By the end of semester 1, students will: • have achieved a basic understanding of the nature of human geography at degree level • be able to identify some key themes and concepts within human geography's sub-disciplines, with particular reference to historical geography, environmental geography, cultural geography and political geography • understand human geography as a discipline rooted in real-world issues By the end of semester 2, students will: • have achieved a broader understanding of the scope and changing nature of human geography at degree level • be able to identify some key themes and concepts within human geography's sub-disciplines, with particular reference to urban, development, economic and social geography •be able to relate basic conceptual understandings within human geography to real world issues • have established a solid foundation for progression to Level 2 human geography courses		
List of module topics:	Social Geography Cultural Geography Political Geography Urban Geography Historical Geography Development Geography Environmental Geography Economic Geography		
Key Skills:	Critical evaluation and application of geographical concepts Group work		
Delivery:	36 hours lectures		
Assessment:	One 2000 word essay (33%) end of semester 1 One two-hour examination (67%). Question A is a seen question. Part B choose and analyse one of 4 examples.		
Assessment Submission dates *	Course work Semester 1 wk 11		
Essential Texts:	Cloke P, Crang P and Goodwin M, (2012), *Introducing Human Geographies,* (2nd edn), Arnold, London Daniels, PW, Bradshaw, MJ, Shaw DJB and Sidaway JD (eds), (2010), *Human Geography: Issues for the Twenty-First Century*, (4th edn), Pearson, London		

03 18195	**GGM102**	**Earth and Ecological Systems**	**20 credits**
Level: C	**Semester: 1 & 2**	**Module Leader: Nick Kettridge**	
NB: This module is only available to those students who will be in attendance for the full academic year.			
Prohibited combination with: ESCM101 Earth Systems and Sedimentary Rocks			
Description:	The module is interdisciplinary in nature and provides a basic framework of knowledge and understanding of the natural science of Planet Earth and its biota. There is an emphasis on the interconnectedness of the lithosphere, hydrosphere, atmosphere and biosphere through flows of mass and energy, as demonstrated for example in the climate system. The processes of landscape evolution and sediment accumulation are given a broad coverage and there is an extended introduction to biogeography, global diversity and ecological processes. The utility of an understanding of present processes as a guide to interpreting the past and predicting the future is stressed.		
Learning Outcomes:	By the end of the module the student will be able to: • Understand the concepts of system analysis as applied at different scales to the Earth • Appreciate the links between internal and external Earth processes on various timescales • Understand the main features of the Earth's climate system and the associated links between atmosphere and hydrosphere • Identify the links between geographic positioning, climate, biomes and soils • Understand the modification of landscapes under the influence of physical forces and chemical processes and identify characteristic landforms. • Relate the properties of sediments to processes in terrestrial and marine environments of deposition • Understand the controls on Earth's climate history and the nature and risk from global catastrophes • Evaluate the concept of biodiversity Identify the main patterns in plant and animal distributions found in the natural world today • Understand the ecological processes that have shaped those patterns • Evaluate the interlinkages between elements of the global environmental system		
st of module topics:	Earth Systems Geosphere Atmosphere and Climate Hydrosphere-Geosphere interactions Ecosphere Ice and oceans in a changing climate		
Key Skills:	Developing depth and breadth of physical geography systems		
Delivery:	40 hours lectures		
Assessment:	Two Canvas examinations (total 3 hours) (100%)		
Assessment Submission dates*	Exams take place in January and in the main summer exam session		

Essential Texts:	Key Text – Compiled by School of Geography, Earth and Environmental Science (2009) *Earth Systems*. A Pearson Custom Publication. Barry, RG & Chorley, RJ (1998) *Atmosphere, Weather and Climate* 7th edition London, Routledge Briggs, D et al (1997) *Fundamentals of the Physical Environment*, Routledge. Colinvaux, P, (1993) Ecology 2. Wiley Ernst, WG (ed.) (2000) *Earth Systems* CUP Huggett, RJ (1998) *Fundamentals of Biogeography*, Routledge Gaston, KJ & Spicer, JI (2004) *Biodiversity: an Introduction*. Blackwell, Oxford. Kump, LR, Kasting, JF & Crane, RG (1999) *The Earth System*, Prentice-Hall McGregor, GR & Nieuwolt, S (1998) *Tropical Climatology*, J. Wiley, Chichester. Press, F & Siever, R (2001) *Understanding Earth* 3rd edition, Freeman Robinson, PJ. and Henderson-Sellers, A (1999) *Contemporary Climatology*, 2nd edition, Longman London, Strahler, AN and Strahler, AH (2003) *Modern Physical Geography*, J. Wiley and Sons Summerfield, MA, (1991) *Global Geomorphology*, Longman White, ID, Mottershead, DN and Harrison, SJ (1992), *Environmental Systems*, Chapman and Hall

03 23436	**GGM103**	**Global Environmental Issues**	**20 credits**
Level: C	**Semester: 1 & 2**	**Module Leader: Chris Bradley**	
NB: A 10-credit version of this module (03 27622), that can be taken in either semester, is available. Please contact the School.			
Description:	This 20-credit module examines the conflict between the use of natural resources, growing environmental degradation and increasing population. It considers the difficulty in distinguishing human impacts from natural environmental changes, and examines a number of specific environmental issues grouped within the **themes** of '**Water**', '**Environment and Society**' '**Human Impact**', '**Big Rivers**', '**Ecological Issues**', '**Nanotechnology**', '**Disasters**' and '**Climate Change**'.		
Learning Outcomes:	by the end of the module you will be able to: 1. Understand the social and economic forces driving environmental change; 2. Have a basic understanding of selected environmental hazards; 3. Recognise the nature of short-term and long-term human impacts on the environment; 4. Be familiar with the distinctive problems associated with the urban environment; 5. Assess the literature to reach objective judgements on the significance of selected environmental issues.		
List of module topics:	**Semester 1:** The first semester provides the background to studying environmental problems, by exploring the historical context, and the significance of the global population increase. A series of linked lectures examine themes including water, and environment and society and human Impact **Semester 2:** The second semester examines human impacts on the environment in more detail, considering the effects on ecological systems, on 'big rivers' and issues associated with our changing climate		
Key Skills:	• Understanding of the importance of multi- and inter-disciplinary science when seeking to understand environmental problems • The contribution that Physical Geography can make to addressing global environmental issue In addition, the module will develop: • Intellectual skills: in synthesising a diverse and fast-evolving subject. • Communication skills: in presenting concise summaries of selected environmental issues		
Delivery:	38 hours of lectures		
Assessment:	2,000 word essay (33%) 2 hour examination, essay style, 2 questions (67%)		
Assessment Submission dates *	Essay Week 9 Semester 1.		
Essential Texts:	Harris, F. 2012. Global Environmental Issues. 2nd Edition. Wiley-Blackwell 358pp Middleton, N. 2008. The Global Casino: an Introduction to Environmental Issues. Hodder Education, 5th Edition, Routledge. 640pp. UNEP 2012. GEO5. Global environment outlook. Environment for the future we want 558pp		

03 23139	GGM106A	Mapping the Midlands	10 credits
Level: C	**Semester: 1**	**Module Leader: Lloyd Jenkins**	
Description:	Mapping the Midlands will introduce students to cartographic basics and the use of GIS for computer mapping through a series of projects looking at the human geography of the Midlands. A series of formal lectures will outline the principles: • History of mapping • Projections and coordinate systems, integration with GPS • The Map Communication Model and modes of representation • Vector & raster data basics Students will complete three projects, supported through six weeks of lab classes following the four weeks of lectures: Formal training in the use of lab-based GIS will give a good foundation for students to undertake exercises in the use of field-based GIS as part of 106B Physical Environments of Birmingham.		
List of module topics:	History of mapping Projections and coordinate systems, integration with GPS The Map Communication Model and modes of representation Vector & raster data basics		
Key Skills:	• Basic choropleth mapping using census data for Birmingham • Overlay and analysis of historical maps • Mapping of data collected as part of a field survey of house condition within Selly OakUnderstand the basic principles underlying map making • Use of number of different mapping techniques within ArcGIS • Acquire data from a variety of online sources • Apply these skills in a series of independent projects		
Delivery:	4 hours of lectures 20 hours of computer lab drop-in sessions.		
Assessment:	1. Mapping two self-selected variables from the census dataset. (Formative) 2. Description of urban change post-1870 for a selected area of the West Midlands, 1000 words with illustrations (50%) 3. Two maps based on a house condition survey of Selly Oak with 1000 word critical commentary (50%)		
Assessment Submission dates *	Project 1: Semester 1, Week 6 Projects 2 and 3: Semester 2, Week 1		

03 08547	GGM106B	Physical Environment of Birmingham	10 credits
Level: C	**Semester: 2**	**Module Leader: Warren Eastwood**	
Description:	This module aims to provide a practical introduction to some of the field, laboratory and analytical techniques (including the use of mobile technologies) required to investigate forms, patterns and processes in the physical environment. Field data will be collected on campus and within easy distance of the University. Data will also be extracted from secondary sources (e.g. maps) and generated by laboratory experimentation. These data form the basis for group project work focused on mapping systems, meteorology and biogeography. These group exercises are supported by a series of introductory lectures covering: scientific approaches to geographical enquiry, experimental design, field instruments and techniques, measurement accuracy and precision, and interpretation and analysis of field data. This course forms a good foundation for all Year 2 and 3 physical geography modules.		
Learning Outcomes:	• Have a basic understanding of scientific approaches to geographical enquiry • Have gained key observational skills, experience with field equipment and techniques for 'laboratory'-based work through mapping, meteorology and biogeography applications • Be aware of the need for accuracy and precision in data collection and basic methods for analysis and interpretation of primary (field) and secondary data • Be more familiar with the physical environment of Birmingham and its surroundings Have developed the necessary skills for (and be aware of the problems and benefits of) working in a small group to plan, undertake and report on a programme of field and 'laboratory'- based work		
List of module topics:	• Introduction to understanding the physical geography of Birmingham and an outline of the student-led, flexible learning approach of the module • Introduction to mapping as a key geographical skill and mobile mapping technologies • Urban micrometeorology • Urban biogeography		
Key Skills:	• Practical experience of field data observation, measurement and recording, and laboratory analyses • Skill in use of mobile technologies • Map work, including use of the Global Positioning System (GPS) and Geographical Information Systems (GIS) • Desk- and computer-based data processing and analytical skills • Report writing • Critical reading and independent literature searching • Critical thinking, including applying theory in practice		
Delivery:	Rolling programme of three practical exercises prefaced by introductory lectures (3x1-hour lectures); top and tailed by module introductory and concluding lectures (2x1-hour lectures) and supported by a programme of directed reading, interactive DVD, WebCT resources, practical sessions (2x3-hour classes), computer classes and postgraduate help surgeries (6 x3-hour help surgeries)		
Assessment:	Continuously assessed by group practical exercises (Workbook format): Exercise 1 (33%); Exercise 2 (34%); and Exercise 3 (33%)		
Assessment Submission dates *	Exercise 1: Semester 2; Week 5 Exercise 2: Semester 2; Week 8 Exercise 3: Semester 2; Week 11		

Essential Texts:	There is no specific text for this module but the following provide background information: Gardiner V and Dackcombe R, (1983), *Geomorphological Field Manual,* Allen and Unwin Gerrard AJ and Slater TR, (1996), *Managing a Conurbation: Birmingham and its Region,* Brewin Books Goudie AS, (1991), *Geomorphological Techniques,* 2nd Edn., Unwin-Hyman Haynes-Young R and Petch J, (1986), *Physical Geography: Its Nature and Methods,* Harper and Row Shaw G and Wheeler D, (1994), *Statistical Techniques in Geographical Analysis,* 2nd Edn., Fulton **Please note** – a more specific reading list will be provided for each practical exercise

03 20951	**GGM107**	**Natural Hazards**	**10 credits**
Level: C	**Semester: 1**	**Module Leader: John Gerrard**	
Description:	The module aims to provide an insight into the causes and effects of natural hazards and the way in which natural processes and human activity interact to produce them and, sometimes, increase their effects. The course will also examine the problems involved in determining the timing and magnitude of the hazards and will assess mitigation procedures to minimise their effects. The hazards examined include volcanoes, earthquakes, landslides, floods, glacier-related hazards and hurricanes		
Learning Outcomes:	By the end of this module students should be able to: Understand the nature, principal causes and the effects of natural hazards and the role of experts in the mapping, prediction and mitigation of these hazards; Recognise how the level of economic development affects the ways in which countries cope with the hazards.		
Delivery:	20 hours lectures		
Assessment:	Exam (50%) Coursework Project (50%)		
Assessment Submission dates *	TBC		
Essential Texts:	Smith, K. 1990, 1996, 2001 *Environmental Hazards: Assessing Risk and Reducing Disaster,* Routledge Burton, I. et al. 1993 *The Environment as Hazard*, Oxford University Press, HC62/B Alexander D 2002 *Principles of Emergency Planning and Management*, Terra Publishing, T58 Alexander, D 2000 *Confronting Catastrophe: New Perspectives on Natural Disasters*, Terra Publishing, QE501/A Bryant, E.A. 1991 *Natural Hazards*, Cambridge University Press, qGB55/B Bolt, B.A. et al. 1977 *Geological Hazards: Earthquakes, Tsunamis, Volcanoes, Avalanches* Alexander, D 1993 (and subsequent editions) Natural Disasters, UCL Press Kalvoda, J and Rosenfeld, C.L. 1998 *Geomorphological Hazards in High Mountain Areas*		

03 27929	GGM114	From Molecules to Materials: deconstructing the environment	10 credits
Level: C	**Semester: 1**	**Module Leader: Iseult Lynch**	
Description:	The module provides an introduction to the fundamental building blocks of matter and how they interact to the provide a habitable and functioning environment. Focus will be on deconstructing the building blocks of the environment in order to understand how they fit together. Theoretical concepts will be introduced in lectures and through online resources, and their application demonstrated within an environmental context through laboratory practicals and in-class problem-solving exercises**.**		
Learning Outcomes:	By the end of the module students should be able to: - understand key concepts such as bonding, reactivity, states of matter, reaction kinetics; - write / balance chemical equations and use periodic table to calculate formulas, moles etc. - show an understanding of acid-base and redox reactions, pH, and their implications for environmental processes - appreciate the reactivity and structure of selected environmentally important elements & pollutants and understand how they are cycled within environmental compartments - show an awareness of common isotopes, radioactive decay processes, and their application to environmental science - show a basic understanding of the natural and anthropogenic processes affecting atmospheric, soil and aquatic composition - perform prescribed laboratory experiments with a high degree of accuracy and understanding, including how to analyse and report their data and the use of data to support a hypothesis. -		
List of module topics:	- The unique properties of water that enable life - the environmental behaviour of specific elements and classes of compounds, including nitrogen and phosphorus cycles - important classes of chemical reactions in the environment, such as acid-base and redox reactions - radioactive decay and the application of stable and unstable isotopes in geochemistry and pollution monitoring - chemistry of rocks, soils and sediments, and natural waters - chemistry of the atmosphere - anthropogenic inputs -		
Key Skills:	Analytical and laboratory skills Data capture, analysis & interpretation Problem solving Numeracy and literacy Team work & individual work		
Delivery:	Lectures – 15 hours Laboratory Practicals: 5 x 2 hours = 10 hours		
Assessment:	Assessments: - 4 x 3-page (+ figures) Laboratory Practical write-ups (50 %) - 1,500 word essay on the chemistry underpinning a selected environmental / geological topic (list of options provided) (50 %)		

Assessment Submission dates *	TBC
Essential Texts:	Rob Lewis and Wynn Evans: Chemistry 4th edition, Palgrave foundations, ISBN 978-0-230-29182-9. *http://findit.bham.ac.uk/44BIR_VU1:44BIR_ALEPH_DS003251541* *An Introduction to Environmental Chemistry* – Julian E Andrews, Peter Brimblecombe, Tim D Jickells, Peter S Liss, Brian J Reid, 2nd Edition, 2004 – available free online through the University library website as an **ebook**. *http://findit.bham.ac.uk/44BIR_VU1:44BIR_ALEPH_DS001152912* *Introduction to Environmental Science, Earth & Man*, Edited by Cresser, Batty, Boxall & Adams, Pearson; ISBN: 978-0-13-178932-6. *http://findit.bham.ac.uk/44BIR_VU1:44BIR_ALEPH_DS003228807* Principles of Environmental Geochemistry - Nelson Eby, Publisher: Brooks/Cole (4 April 2003). ISBN-13: 978-0122290619

03 27936	**GGM115**	**From Molecules to Materials: deconstructing the environment - Part 2**	**10 credits**
Level: C	**Semester:2**	**Module Leader: Iseult Lynch**	
Pre-requisites: GGM114 From molecules to materials: deconstructing the environment			
NB: Only available to students studying for a full academic year and who have taken GGM114 in Semester 1			
Description:	The module provides an introduction to the fundamental building blocks of matter and how they interact to the provide a habitable and functioning environment. Focus will be on deconstructing the building blocks of the environment in order to understand how they fit together. Theoretical concepts will be introduced in lectures and through online resources, and their application demonstrated within an environmental context through laboratory practicals and in-class problem-solving exercises.		
Learning Outcomes:	By the end of the module students should be able to: - understand key concepts such as bonding, reactivity, states of matter, reaction kinetics; - write / balance chemical equations and use periodic table to calculate formulas, moles etc. - show an understanding of acid-base and redox reactions, pH, and their implications for environmental processes - appreciate the reactivity and structure of selected environmentally important elements & pollutants and understand how they are cycled within environmental compartments - show an awareness of common isotopes, radioactive decay processes, and their application to environmental science - show a basic understanding of the natural and anthropogenic processes affecting atmospheric, soil and aquatic composition - Perform prescribed laboratory experiments with a high degree of accuracy and understanding, including how to analyse and report their data and the use of data to support a hypothesis.		
List of module topics:	- The environmental behaviour of specific elements and classes of compounds including carbon and its compounds, polymers, surfactants, colloids and nanoparticles etc - further important examples of chemical reactions in the environment, such as acid-base and redox reactions as applied in wastewater treatment (for example) - chemistry of the atmosphere - anthropogenic inputs		
Key Skills:	Analytical and laboratory skills Data capture, analysis & interpretation Problem solving Numeracy and literacy Team work & individual work		
Delivery:	Lectures – 15 hours Laboratory Practicals: 5 x 2 hours = 10 hours		
Assessment:	Assessments: - 5 x 3-page (+ figures) Laboratory Practical write-ups (50 %) - 1 hour exam (50%) The exam will include a set of short questions which will be a mix of descriptive, balancing equations, problem solving and giving environmentally relevant examples of concepts.		

Assessment Submission dates *	TBC
Essential Texts:	*Chemistry* - Rob Lewis and Wynn Evans, 4th edition, Palgrave foundations, ISBN 978-0-230-29182-9 *http://findit.bham.ac.uk/44BIR_VU1:44BIR_ALEPH_DS003251541* *An Introduction to Environmental Chemistry* – Julian E Andrews, Peter Brimblecombe, Tim D Jickells, Peter S Liss, Brian J Reid, 2nd Edition, 2004 – available free online through the University library website as an **ebook**. *http://findit.bham.ac.uk/44BIR_VU1:44BIR_ALEPH_DS001152912* *Introduction to Environmental Science, Earth & Man*, Edited by Cresser, Batty, Boxall & Adams, Pearson; ISBN: 978-0-13-178932-6. *http://findit.bham.ac.uk/44BIR_VU1:44BIR_ALEPH_DS003228807* For the **atmospheric science** lectures: *Atmospheric Pollution* (first edition) or *Air Pollution and Global Warming (*2nd edition) – Mark Z Jacobson, Cambridge University Press, 2002 / 2012. [Main library: TD 883 J]

08 27026	**URS101**	**Planning of the Built Environment History and Evolution of Urban and Regional Planning**	**20 credits**
Level: C	**Semester: 1 & 2**	**Module Leader: Mike Beazley**	
NB: A 10-credit version of this module, (08 10800) that can be taken in either semester, is available. Please contact the School.			
Description:	Urban and regional planning plays a critical role in shaping the nature of the built environment in which we all live. Our towns and cities are constantly evolving and the need to manage this change in order to create much better quality urban environments is critical. The recent transformation of Birmingham City Centre is testament to the important role that planning can play. If you are interested in towns and cities, how they have evolved and why, these modules are for you. A key objective of these modules is the understanding of how cities and planning should be understood today. In the first semester we will examine the roots and the development of planning from its origins up to the present day. Here we will pick up on a number of the themes in the recent BBC2 series The History of our Streets.that will be of relevance to the story of the development of planning. Key texts for this part of the module will be Hall, P (2002) Cities of Tomorrow, Blackwell Publishing (3rd edition) and LeGates, R.T and Stout, F.(eds) (2007) The City Reader, Routledge (4th Edition) In semester 2 we look at the contemporary operation of the planning system and examine the tools that urban planners have at their disposal to help shape the nature of the built environment. Here we will cover key issues such as the spirit and purpose of planning, the organisation and management of the planning system, and how we engage the community in the process. We will also examine key contemporary planning issues such as the impact of localism on planning, climate change, urban design and transport. A key element of the second semester teaching will be the inclusion of planning practitioners who are actively engaged in the delivery of the system.	
Learning Outcomes:	By the end of the module you are expected to: • List the factors that led to the emergence of urban and regional planning as a form of public policy; • Understand what urban and regional planning is and how it impacts on the built environment; • Explain the rationale for establishing urban and regional planning as a form of public policy; • Identify the key contemporary issues in the urban and regional environment; • Demonstrate essay writing skills.		
Key Skills:	Poster preparation Essay writing		
Delivery:	20 hours lectures		
Assessment:	Assignment 1: A poster presentation (maximum 2 sides of A4) worth 20% of the mark. Assignment 2: A 2,000 word (maximum) essay worth 30% of the mark. 2-hour Examination worth 50% of the mark.		

Assessment Submission dates *	Assignment 1 Semester 1, Week 2 Assignment 2 Semester 1, Week 6
Essential Texts:	Hall, P. (2002) *Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century*, Oxford: Blackwells Hall, P. and Tewdwr Jones M. (2011) *Urban and Regional Planning*, London, Routledge (Fifth Edition) (Chapter 1) Ward, Stephen V. (2004). *Planning and Urban Change*, London: Sage

08 03434	URS102	Society, Space and Policy : An Introduction to Urban Studies	10 credits
Level: C	**Semester: 1**	**Module Leader: Austin Barber**	
Description:	This 10-credit module provides an introduction to key concepts underpinning the study of urban development and to the dynamics of social and spatial changes in major cities of Britain, Europe and North America. It explores how major processes of change influence different kinds of cities and the diverse groups within urban society. The context for the course is the apparent *"urban renaissance"* of recent years and new challenges posed by the economic crisis since 2008. Many big cities have enjoyed an impressive economic revival, their centres have undergone striking physical transformations and their populations have been growing for the first time in decades. But these changes are creating new social complexities that are reflected in patterns of urban development and in new challenges for urban planners and policy makers. These pressures have been compounded by the severe economic downturn that took hold in 2008.		
Learning Outcomes:	By the end of the course students should be able to: • Demonstrate an understanding of key concepts relevant to the analysis of socio-spatial change in contemporary cities • Explain the broad social and spatial processes of change influencing the development of cities in Britain, Europe and North America • Use the skills of essay writing and research to analyse the differential impact that these social and spatial processes are exerting on the fortunes of cities and on the shaping of urban planning and policy priorities		
List of module topics:	Understanding the city: the study of urban development, historic and contemporary approaches Globalisation, World Cities and polarisation within them Re-urbanisation: how sustainable is the move back to the city? Gentrification pressures: really a bad thing for our cities? Class restructuring: the urban creative class and the disputed underclass International migration: what are the implications for urban planning? These main issues are illustrated through case studies of cities such as Chicago, London, Hamburg, Toronto and Birmingham		
Key Skills:	Essay writing Research and analysis of contemporary social and spatial change in cities		
Delivery:	16 hours of interactive lectures 2 hours of small group classes Plus an optional site visit to an inner city district of Birmingham undergoing rapid social and physical change		
Assessment:	2500 word essay		
Assessment Submission dates *	Semester 2, week 2		
Essential Texts:	Glaeser, E. (2011) *Triumph of the City*, New York: Macmillan. LeGates, R. and Stout, E. eds. (2010) *The City Reader*, (5th ed.), London: Routledge. Sassen, S. (2012) *Cities in a World Economy*, (4th ed.), Thousand Oaks: Pine Forge Press.		

08 03133	URS103	Economy, Space and Policy	10 credits
Level: C	**Semester: 2**	**Module Leader: Austin Barber**	
Description:	This 10-credit module provides an introduction to key processes of economic change shaping the fortunes of cities in Britain, Europe and North America. It complements URS 102 (Society, Space and Policy), which emphasised how processes of social change in urban areas are strongly driven by underlying economic forces. This module explores these economic issues in more detail and highlights the role they play in shaping urban policy and planning priorities in cities. It adopts an accessible and practical approach to contemporary economic issues, their urban implications, and the impact upon city planning. Throughout the module we draw upon current case studies of economic change in major cities such as Munich, Barcelona, Manchester, Toronto, Berlin and Detroit.		
Learning Outcomes:	By the end of the course students should be able to: • Demonstrate an understanding of key processes of structural change in the contemporary British and European economy. • Illustrate how these influence the differential fortunes of cities and regions in Britain and Europe. • Explain how these impact upon public policy formulation and priorities, particularly at the sub national scale. • Combine these skills in the analysis of contemporary economic and spatial policy debates.		
List of module topics:	• First, we critically consider what we mean by a "successful urban economy". We examine the conventional ways of measuring economic growth; the critiques of this approach; and more recent attempts to reconcile strictly economic ambitions with social and environmental priorities to develop more sustainable city economies. • The second section explores structural changes in the fabric of city economies. This takes in processes of de-industrialisation; the rapid growth of services ranging from high value professional activities through basic consumer services; and recent debates about the emergence of a knowledge driven and creative economy. We examine the social implications of that shift, including the effects on urban labour markets, as well as the implications for the physical development of large cities and particularly their central and inner districts. • The third section examines fundamental shifts in how goods and services are produced in urban economies. We focus on the transition to Post-Fordism as a way of organising business activity and workforces, the growing importance of clusters in key growth sectors, and the role of networks of small firms in city economies. Again, we consider the implications for how different parts of cities are transformed and how planners and policy makers think about the future of city districts in this context. • Finally, the module draws together the preceding themes to examine the contention that large cities have enjoyed an economic revival following several decades of decline. We critically examine the underlying strength of this apparent revival and how cities have been newly challenged by the economic crisis that emerged in 2007. We also consider how the changes explored in the course shape the priorities for policy-makers and planners aiming to develop truly competitive cities. We conclude by linking back to our first theme to ask whether the recent urban revival represents a genuinely sustainable economic future for cities and their residents.		
Key Skills:	Report writing and layout Analysis of city economies and structural change Generation of viable policy and planning responses to contemporary urban economic challenges		

Delivery:	18 hours of interactive lectures 2 hours of small group classes
Assessment:	A professional report of up to 2,500 words outlining key priorities for sustainable economic development in a major city of your choice
Assessment Submission dates *	Semester 3, week 1
Essential Texts:	Glaeser, E. (2011) *Triumph of the City*, New York: Macmillan. LeGates, R. and Stout, E. eds. (2010) *The City Reader*, (5th ed.), London: Routledge. Sassen, S. (2012) *Cities in a World Economy*, (4th ed.), Thousand Oaks: Pine Forge Press.

08 27805	**URS105**	**Planning in Action**	**10 credits**
Level: C	**Semester: 2**	**Module Leader: Mike Beazley**	
Description:	This weekly tutorial programme provides an opportunity to explore urban and regional planning issues covered in the URS modules in small group discussion sessions. The programme involves a combination of class discussion, presentations, local visits, and small-group project work. We will be exploring planning in action and using local sites to explore some key issues as part of our planning laboratory.		
Learning Outcomes:	By the end of the module you are expected to: • Have an understanding of some of the real life planning issues facing the City of Birmingham and the wider region. • Have developed some of the basic skills required of being a planner. • Be able to respond to a brief and make a presentation of findings to the wider group. • Have extended your knowledge of what urban planning is all about.		
List of module topics:	• Visual interpretation skills • Urban design • Urban regeneration • Public participation • Role of urban spaces		
Key Skills:	Group working Presentation skills Project management		
Delivery:	2 hours of small group workshops, seminars including two field visits - Birmingham Eastside and Walsall.		
Assessment:	The first assignment is a presentation (worth 20%) and an individual project report on the Birmingham Eastside Project (1,500 words) (worth 60%). The second assignment is the group presentation on the Urban Parks Project (worth 20%).		
Assessment Submission dates *	1. Birmingham Eastside Project: Presentation: Semester 2, Week 5 Report: Semester 2, Week 8 2. Walsall Urban Parks Project Presentation: Semester 2, Week 10		
Essential Texts:	Birmingham Eastside http://www.birmingham.gov.uk/eastside Birmingham Eastside Blog http://eastsideblog.wordpress.com/ Green Space http://www.green-space.org.uk/		

Year 2: all Programmes

Module Information (* Submission dates are an indication only and may be subject to change)

03 27833	**ESCM201**	**Igneous Petrology**	**10 credits**
Level: I	**Semester: 2**	**Module Leader: Paul Anderson**	
Description:	Provides advanced investigation of igneous rocks following on from delivery of the Earth Materials module in year 1 and focuses largely on geochemistry including the use of phase diagrams to study melting and crystallisation. The module will consist of four topics: (1) The mantle and mantle melting; which investigates the overall structure and composition of the mantle, as well as the products of melting at Mid Ocean Ridge and Ocean Island settings. This topic will introduce and provide training on the use of three component phase diagrams (which are essential to the field of igneous petrology) to understand melting of the mantle; (2) Igneous activity at constructive plate margins; which investigates the Mid Ocean Ridge setting in more depth, including background to the formation of economic sulphide deposits which feeds into content within the optional 3rd/4th Year Ore Deposits and Gemmology module (ESCM316/ESCM416); (3) Igneous activity at destructive plate margins; which investigates the geochemical processes leading to melting in these settings; (4) Magma chambers, which investigates processes leading to magma evolution such as fractional crystallisation, mixing and assimilation. This topic again provides background for the optional 3rd/4th Year Ore Deposits and Gemmology module (ESCM316/ESCM416). The topic will also utilise three-component phase diagrams to understand magma crystallisation, hence completing the cycle from melting within a mantle source area through to the final formation of an igneous rock within the crust.		
Learning Outcomes:	By the end of the module the student should be able to: • Be familiar with the practical classification of igneous rocks • Give a more detailed account of the structure and composition of the mantle • Understand how ternary phase diagrams are used to investigate melting • Understand the meaning of the term 'Primary Basalt' and how these are identified • Evaluate how the geochemistry of mantle melts can be used to infer tectonic setting • Evaluate the evidence for the existence of constructive and destructive plate margins • Evaluate the processes of fractional crystallisation, magma mixing and assimilation • Interpret textures of igneous minerals in thin section		
List of module topics:	• The mantle and mantle melting • Igneous activity at constructive/destructive plate margins • Magma chambers		
Key Skills:	Microscope skills; handling and interpreting data; description of rock properties		
Delivery:	10 hours lectures; 20 hours practical classes (including 8 hours self study)		
Assessment:	1.5 hour written examination (60%); Laboratory notes/answers to set exercises on hand-specimens/thin sections (40%)		
Assessment Submission dates *	Coursework: Semester 2, week 10		
Essential Texts:	Best, M., 2003. Igneous and metamorphic petrology. Blackwell Publishing. Hall, A., 1996. Igneous Petrology. Harlow: Longman. McBirney, A., 1993. Igneous Petrology. Boston; London: Jones and Bartlett Wilson, M., 1989. Igneous Petrogenesis: a global tectonic approach. Springer.		

03 00538	ESCM203	Applied Geophysics	10 credits
Level: I	**Semester: 1**	**Module Leader: Tim Reston**	
Description:	The module introduces the principal techniques of geophysical exploration: seismic reflection and refraction; ground penetrating radar, gravity surveys; magnetic surveys; electrical methods - resistivity. It covers basic principles, applications and simple interpretation. *Aims:* To develop an understanding of the principal methods of applied geophysics used to provide geological information.		
Learning Outcomes:	By the end of the module, students should be able to: • describe the principals of acquiring remotely measurable geophysical information • outline the applications of the principal geophysical exploration techniques • discuss the usefulness and limitations of geophysics in geological applications • apply geophysical techniques to resolve geological problems		
List of module topics:	• Seismic basics • Seismic: the Common-midpoint method • Seismic migration • Seismic acquisition and Ground penetrating radar • Gravity: introduction • Gravity: data collection and corrections • Magnetics: introduction • Electrical methods • Applications and well-logging		
Key Skills:	Maths skills, physics skill, seismic interpretation skills, graph plotting and reading, spreadsheet use and data manipulation		
Delivery:	9 hours lectures, 18 hours practical work (including formative assessment and feedback)		
Assessment:	Seismic interpretation and depth conversion exercise, partially Excel based. 40% Gravity and magnetics interpretation and modelling exercise: partially Excel based. 40% Multiple choice sheet of 20 short questions: 20%		
Assessment Submission dates *	To be confirmed.		
Essential Texts:	There is no “essential reading”, but a variety of possible text books that may be used to supplement the course. The best of these is Kearey & Brooks An Introduction to Geophysical Exploration 2nd Edition 1991;		

03 20959	ESCM204	Continental Deformation	10 credits
Level: I	**Semester: 1**	**Module Leader: Carl Stevenson**	
Description:	Building on material covered in Year 1, this module uses the principles of stress, strain and the physical conditions in the crust to examine the processes and products of rock deformation at a range of scales. Wherever possible, emphasis is placed on quantifying description of geological deformation using, for example, strain determination methods, cross-section construction, stress analysis etc. Aim: To develop the knowledge, techniques and skills necessary to measure, record and analyse geological structures in the field and interpret the structural and tectonic evolution of an area or region		
Learning Outcomes:	By the end of the module you will be able to: • Understand the evolution of geological structures in different tectonic settings • Understand geological structural analysis on a variety of scales • Be able to plot and interpret orientation data using stereographic projection • Be proficient in assessing the validity of structural cross-sections using the principals of section balancing and restoration • Know how to use simple graphical techniques to calculate relations between stress magnitude, rock strength and frictional strength using rock mechanics data		
List of module topics:	Lecture topics: • Brittle deformation • Thrust tectonics • Extensional tectonics • Strike-slip tectonics • Tectonics of British Isles • Ductile deformation mechanisms • Shear zones • Kinematics in structural geology Practical classes: • Balanced cross sections • Mohr Circles • Analogue experiment • Move computer modelling • Stereonets • Strain determination		
Key Skills:	• Structural geology • Lab experiment in tectonics • Stereonets • Quantitative analysis of stress and strain • Computer based geological modelling		
Delivery:	10 hours of lectures 20 hours practicals including lab and computer based exercises		
Assessment:	1.5 hour exam: short answer section based on stereonets and Mohr circles essay section – answer 2 from 5 based on lecture topics Coursework: 2000 word report based on analogue experiment		
Assessment Submission dates *	Coursework *usually* week 8, semester 1 (NB this can vary year on year so the module leader should be consulted for confirmation)		
Essential Texts:	Fossen (2010) *Structural Geology*, Cambridge Twiss & Moores (2007 2nd ed) *Structural Geology*, Freeman (1st edition also useful) Davis & Reynolds (1996 2nd ed*) Structural Geology of Rocks and Regions*, Wiley (3rd edition out soon) Pollard and Fletcher (2005) *Fundamentals of Structural Geology*, Cambridge		

03 24064	ESCM209	Sedimentology	20 credits
Level: I	**Semester: 1 & 2**	**Module Leader: James Wheeley**	

NB: A 10-credit version of this module (03 26568), that can be taken in either semester, is available. Please contact the School.

Description:	The module concerns the sedimentology of siliciclastic and carbonate and evaporite depositional systems from the field scale to the pore scale. There is a focus on facies analysis, comparing processes operating in modern systems and how to recognise the signature of such processes and environmental controls in the sedimentary rock record. Sediments are studied in core, hand specimen and in thin section. Parts of the module focus on the interaction of aqueous fluids with surface rocks and sediments; diagenesis - the chemical and physical changes to sediments in sedimentary basins; variations in the chemistry of surface waters and their ability to dissolve, modify or precipitate minerals; products of such interactions; the techniques used in diagenetic studies; characteristic structures, cements, mineralogies and pore water chemistries arising from diagenesis in near- surface marine and non-marine environments, and their modification during deep burial.
Learning Outcomes:	*Aim*: To develop the skills needed for the description and interpretation of the detrital composition and diagenesis of clastic and carbonate rocks By the end of the module the student should be able to: • Describe in technical detail the physical characteristics of sedimentary rocks from • microscope to field scale and record these data in appropriate ways including graphically • Infer 3-dimensional environments from available data • Evaluate the role of base-level shifts as a control on the spatial and temporal variations in depositional systems • Log, describe and interpret facies in core • Describe quantitatively the mineral composition of sedimentary rocks in thin section • Identify, describe and interpret diagenetic processes and products in thin section and their influence on the generation of porosity and permeability.
List of module topics:	Semester 1 Lectures: • Sedimentary Basins/Controls on Sedimentary Rock Record • Siliciclastic facies analysis • Alluvial and fluvial processes, sediments and facies • Alluvial and fluvial processes, sediments and facies • Deltas and estuaries • Arid continental environments and facies • Coasts, beeches, barriers and lagoons • Shallow marine clastics • Deep marine clastics • Glaciogenic sediments Semester 1 Practicals: • Logging briefing • Core logging exercise 1 (Logging) • Core logging exercise 2 (Drawing up logs) • Core logging exercise 3 (Finish logs and written interpretation) • Siliciclastics in thin section

	Semester 2 Lectures: • Introduction to shallow marine carbonates • Shallow marine carbonate environments and facies • Carbonate marine diagenesis • Carbonate meteoric diagenesis • Carbonate burial diagenesis • Dolomites and dolomitization • Reefs and carbonate build-ups • Sedimentary Iron, Phosphorites, Cherts • Evaporites • Exam briefing Semester 2 Practicals: • Carbonate producers and introduction to CARP (**'Ca**rbonate **R**amp/**R**eservoir **P**orosity **P**roject) • CARP marine diagenesis • meteoric diagenesis • CARP burial diagenesis • CARP dolomites • CARP mystery section CARP - catch up week
Key Skills:	Critical Thinking; Written Communication; Time Management; ICT; Adaptability/Flexibility; Managing own Development; Subject Specific Skills.
Delivery:	20 hours lectures, 14 hours of practical classes
Assessment:	1.5 hour written essay style examination (50%), practical exercises (50%) (25% Semester 1, 25% Semester 2)
Assessment Submission dates *	Semester 1 coursework 1 week 8 Semester 2 coursework 2 week 8
Essential Texts:	Maurice Tucker. Sedimentary Petrology. Blackwell Dorrik A. V. Stow. Sedimentary Rocks in the Field: A Colour Guide. Manson Gary Nichols. Sedimentology and Stratigraphy. Wiley-Blackwell Maurice Tucker. Sedimentary Rocks in the Field (4th Edition). Wiley- Blackwell A. E. Adams & W. S. Mackenzie. A Colour Atlas of Carbonate Sedimentary Rocks Under the Microscope. Manson H. G. Reading (ed). Sedimentary Environments: Processes, Facies and Stratigraphy. Blackwell

03 22107	ESCM213	Environmental and Evolutionary Palaeobiology	10 credits
Level: I	**Semester: 2**	**Module Leader: Ian Boomer**	
Description:	This 10 credit module will permit students to develop their year 1 experience in palaeontology by introducing the process of evolution, taphonomy, palaeoecology and palaeobiogeography. In addition to providing an introduction to these themes, the module aims to provide a guide to the current 'hot topics' such as lagerstätte palaeobiology. The central theme of the course is uncovering the relevance of the fossil record, as well as revealing how the record is preserved in the first instance. This includes an examination of modes of fossil preservation, particularly soft tissue preservation, as well as an introduction to the techniques of palaeoecology and palaeobiogeography. Taught components will be complemented by a lab based project addressing shallow marine palaeoenvironments and biotas of the Much Wenlock Limestone Formation evaluating environmental change based on the combination of sedimentological and palaeontological data.		
Learning Outcomes:	• Understand taphonomy and evaluate preservational bias in the geological record. • Understand the methods of determining palaeoenvironments and identifying palaeoenvironmental change. • Understand the process of evolution and its palaeontological significance. • Integration of sedimentological and palaeobiological information to understand environmental change through geological time		
List of module topics:	<u>Lecture contents include:</u> • Taphonomy: the science of death and decay. Introduction to taphonomy and classification of lagerstätten. • High fidelity preservation – pyritisation. Decay zones, decay processes, and introduction to high fidelity preservation in pyrite. • Burgess Shale: palaeoecology of a complex lagerstatte. • High fidelity preservation – phosphates and carbonates. • Environmental controls on biotic distribution. • Populations and communities in the fossil record. • Additional lectures will cover case studies in Palaeobiogeography. <u>Practical project:</u> • Project introduction and limestone classification. • Wenlock allochems. • Introduction to brachiopod data. • Interpretations from aunal and sedimentological data.		
Key Skills:	• Keeping methodical Laboratory/Practical records (workbook supplied) • Report writing – effective summary of practical data • Time management		
Delivery:	11 hours lectures 6 x 2 hour practical classes		
Assessment:	1.5 hour unseen examination (60%). Essay style - 1 question from each of 2 sections Practical project (40%) comprising lab notes (20%) and summary report (20%).		
Assessment Submission dates*	Project submission Semester 3, week 1		
Essential Texts:	Brenchley, P. J. & Harper, D. A. T. 1998. *Palaeoecology: Ecosystems, environments and evolution*. London: Chapman & Hall [QE 719/B; 1 copy, Short Loan] Benton, M. J. and Harper, D. A. T. 2009. Introduction to Paleobiology and the fossil record. Wiley. [QE 721.2.E85 B; 2 copies long loan, 4 copies 1 week loan, 2 copies short loan]. Briggs, D. E. G. & Crowther, P. R. (eds) 2001. *Palaeobiology II*. London: Blackwell. [q QE 711/P; 2 copies in Main Library on Long Loan].		

03 11731	ESCM221	Hydrogeology	10 credits
Level: I	**Semester: 1**	**Module Leader: Mike Rivett**	
Description:	The aim of this module is to provide a fundamental introductory understanding of the principles and practice of hydrogeology. More quantitative aspects of the course will be supported by problem-based practical sessions (formative). Coursework comprises the student producing a short report that aims to produce a hydrogeological conceptualisation of a specific locality – it involves desk-based research and includes descriptive summary text, figures based on geological and hydrogeological information, a brief critique of those sources and some basic calculations that quantify the hydrogeological flow regime. Methods underpinning coursework execution will be presented throughout the lectures and practical sessions.		
Learning Outcomes:	On completion of the module students should: • Be able to understand and quantify the processes governing the occurrence and flow of groundwater in the geological subsurface. • Know appropriate field and laboratory methods to determine key hydrogeologicalparameter values. • Be able to apply basic hydrogeological analysis to a real locality. • Have acquired a foundational expertise to undertake advanced hydrogeology-related courses.		
List of module topics:	• Introduction to groundwater, aquifers and the hydrologic cycle • groundwater flow (Darcy's Law) • groundwater recharge • borehole drilling, design and use • regional groundwater flow • natural groundwater discharge • aquifer properties: transmissivity and storage coefficient • pumped boreholes and pumping test analysis • methods to determine hydraulic properties • introduction to natural groundwater hydrochemistry.		
Key Skills:	Essential hydrogeological theory and application; Report writing; Desktop data gathering and local application; Calculations		
Delivery:	20 hours lectures, 5 hours practical and tutorial sessions		
Assessment:	One hour examination (70%) Report comprising: one-page summary; 400-word critique; one page of calculations; and 2-4 pages of figures (30%)		
Assessment Submission dates *	Sem 1 week 10.		
Essential Texts:	One of the following three texts: HISCOCK, K.M. 2005. Hydrogeology: Principles and Practice. Blackwell Publishing, 389pp [ISBN 0-632-05763-7] YOUNGER, P. L. 2007. Groundwater in the Environment: An Introduction. Blackwell Publishing Ltd. PRICE, M, 1996. Introducing groundwater (2nd ed). Publ. Chapman & Hall. ISBN 0 412 48500 1 For general UK context, to read: Downing, R.A., 1998. Groundwater our hidden asset. ISBN 0852723040 QE625/D		

03 27829	**ESCM262**	**Resources and the Environment**	**20 credits**
Level: I	**Semester: 1 & 2**	**Module Leader: Jason Hilton**	
NB: This module is only available to those students who will be in attendance for the full academic year.			
Prohibited combination with: ESCM261 Resources & Deep Crustal Processes & ESCM246 Resources of the Earth – Environmental Science			
Description:	The module examines the Earth's physical resources and the environmental impacts associated with extraction of these. The following themes are covered in the lecture content: (1). Bulk materials, (2). Water, (3). Energy, (4). Resource management and policy, (6) Remote sensing. Where appropriate topic will commence with background information on formation of the resource, and will elaborate extraction and processing methods as well as the major uses of each resource type. Coursework will include 3 separate practical exercises that are based on real-world examples and tie in directly to lecture contents, namely: (1) Petroleum resource exploration, (2) Quantitative evaluation of sand and gravel bulk deposits, (4) Remote sensing. Coursework will also include a 2500 word essay relating to the environmental impacts of mineral extraction, which will allow the PP and EG cohorts to specialise in appropriate areas for their programmes. The modules will also aim to install training in professional standards of report construction as required by industry.		
Learning Outcomes:	By the end of the module students should be able to: • Demonstrate an understanding of the principles regulating the distribution of natural resources in a plate tectonic context, and to understand the methods of formation for different natural resources. • Identify appropriate extraction and processing techniques for different resources. • Understand and apply the techniques used in remote sensing. • Produce reports on to professional standards expected in industry. • Give a detailed evaluation of the environmental impacts associated with extraction and use of a particular resource.		
Delivery:	10 lectures (10 hours) 1 hour seminar on project introduction 1 hour seminar on professional standards 1 hour drop in session for formative feedback on project 3 practical exercises related to lecture topics (15 hours)		
Assessment:	MCQ exam, following first semester (15%) 3 coursework exercises each worth 15% (45%) Environmental impacts essay (40%)		
Assessment Submission dates *	To be confirmed.		
Essential Texts:	Craig, Vaughan and Skinner 2001. Resources of the Earth: origin, use and environmental impact. Prentice Hall. Montgomery 1997. Environmental Geology. McGraw-Hill. Moon, Whateley and Evans. 2007. Introduction to mineral exploration. Blacklwells publishing. Robb. 2005. Introduction to ore-forming processes. Blackwell's Science. Selley and Selley. 1985. Elements of petroleum geology. Academic press.		

03 27830	**ESCM261**	**Resources and Deep Crustal Processes**	**20 credits**
Level: I	**Semester: 1 & 2**	**Module Leader: Jason Hilton**	
NB: This module is only available to those students who will be in attendance for the full academic year.			
Prohibited combination with: ESCM262 Resources and the Environment & ESCM246 Resources of the Earth – Environmental Science			
Description:	The module examines the Earth's physical resources as well as metamorphism and its link to these resources. It provides understanding of the distribution of resources and metamorphic process in a plate tectonic context. The following themes are covered in the lecture content: (1). Bulk materials, (2). Water, (3). Energy, (4). Resource management and policy, (5) Remote sensing, (6) Metals and ore deposits, (7) Metamorphic processes, and (8) The influence of deep crustal processes on formation of ores/gems. Where appropriate topic will commence with background information on formation of the resource, and will elaborate extraction and processing methods as well as the major uses of each resource type. Coursework will comprise 5 separate practical exercises that are based on real-world examples and tie in directly to lecture contents, namely: (1) Petroleum resource exploration, (2) Quantitative evaluation of sand and gravel bulk deposits, (3) Remote sensing, (4) Minerals and aggregates: identification and economic use, and (5) Metamorphic minerals and their economic value . Coursework will install training in professional standards of report construction as required by industry and will provide essential contents for accreditation by the Geological Society of London.		
Learning Outcomes:	By the end of the module students should be able to: • Demonstrate an understanding of the principles regulating the distribution of natural resources in a plate tectonic context, and to understand the methods of formation for different natural resources. • Evaluate physical resources from hand specimens and geological maps. • Identify appropriate extraction and processing techniques for different resources. • Understand and apply the techniques used in remote sensing • Understand what determines metamorphic textures and how these vary with degree of metamorphism • Be able to identify and describe common ore minerals and evaluate the processes through which these form • Give examples of a metamorphic reactions that represent effective geothermometers and geobarometers • Be familiar with the principles of metamorphic zones and facies • Be able to link deep crustal processes with the formation of ores and gems • Produce reports on to professional standards expected in industry.		
Delivery:	18 lectures (18 hours) 5 practical exercises related to lecture topics (25 hours)		
Assessment:	MCQ exam, following first semester (15%) 5 coursework exercises (85%): Exercises 1-4 each worth 15%; Exercises 5 worth 25% (longer write-up)		
Assessment Submission dates	To be confirmed.		
Essential Texts:	Craig, Vaughan and Skinner 2001. Resources of the Earth: origin, use and environmental impact. Prentice Hall. Montgomery 1997. Environmental Geology. McGraw-Hill. Moon, Whateley and Evans. 2007. Introduction to mineral exploration. Blackwells publishing. Robb. 2005. Introduction to ore-forming processes. Blackwell's Science. Selley and Selley. 1985. Elements of petroleum geology. Academic press. Best. 2003. Igneous and Metamorphic petrology. Blackwell Publishing		

03 18180	**GGM207**	**Hydroclimatology: climate and water**	**20 credits**
Level: I	**Semester: 1 & 2**	**Module Leader: Martin Widmann; Other Staff: Ian Phillips, A N Other**	
NB: This module is only available to those students who will be in attendance for the full academic year.			
Description:	The module seeks to provide an understanding of the processes controlling the behaviour of water in the atmosphere and at the Earth's surface, as well as of the basics of the climate system, so that students will be able to evaluate the impacts of natural and human-induced changes on water within the environment.		
Learning Outcomes:	By the end of the module the student will • be familiar with fundamental concepts and methods in both the atmospheric and hydrological sciences. • have developed an understanding of the interactions between: precipitation, evaporation, interception, soil moisture, snow and ice and stream flow. • be aware of the 'new' challenges in hydroclimatology resulting from increasing human impact upon processes within the hydrological cycle. • have a basic understanding of the hydroclimatology of the British Isles. • be able to apply the knowledge and skills gained in the analysis of atmospheric and water resource management problems.		
List of module topics:	• Precipitation: mechanisms and measurements; • Precipitation variability; • Evaporation; • Interception; • Global climate/energy balance; • Forces and atmospheric circulation; • Climate of the British Isles; • Soil moisture; • Runoff generation; • Snow and ice-melt and runoff;. • River flow regimes; • Hydrological measurement; • Hydrological modelling; • Hydroclimatology of floods and droughts; • Underwater Britain – November 2000 floods; and • Climate change and water resources in Britain		
Key Skills:	Students undertaking this module will develop the following transferable skills: • Critical reading and independent literature searching • Critical thinking, including (1) the application of theory/ process understanding in practice and (2) evaluation of complex, multifaceted issues • Analytical skills • Essay writing (through examination)		
Delivery:	36 hours lectures and one 2h exam paper workshop supported by a programme of directed reading and CANVAS resources.		
Assessment:	This module is assessed by a 3-hour, unseen examination (100% of assessment). The examination paper will be divided into three sections: (A) climate, (B) water and (C) techniques and approaches. One question from each section must be answered and all answers carry equal weight. The answers are essay style. The individual sections will have three choices of questions. Although the examination paper is divided into three sections, you should not compartmentalise the module but instead integrate concepts between lectures.		
Essential Texts:	Aguardo E and Burt JE (2007), *Understanding Weather and Climate*, Prentice Hall, Harlow Jones JAA (1997), *Global Hydrology*, Longman, London Ward RC and Robinson M (2000), *Principles of Hydrology*, 4th edition, McGraw-Hill, London		

03 18181	GGM208	Geomorphological Processes	20 credits
Level: I	**Semester: 1 & 2**	**Module Leader: Greg Sambrook-Smith**	
NB: A 10-credit version of this module (03 26789), that can be taken in either semester, is available. Please contact the School.			
Description:	The module examines the nature of and controls of geomorphological processes at different timescales and spatial. Process understanding is improving substantially and the module aims to communicate the excitement of these novel developments. It reviews fundamental controls on landscape systems and processes, using new and 'classic' research. These are discussed in both simple qualitative frameworks, but also using quantitative modelling approaches where numerical expressions are introduced. They are also applied to a range of geomorphic environments. Semester 1 focusses mainly on hydrological, fluvial and floodplain systems. Semester 2 then broadens the discussion into other environments showing a different suite of geomorphic processes and controls e.g. in coastal, glacial, karst and volcanic environments. Possible dissertation ideas are floated throughout the year.		
Learning Outcomes:	By the end of the module the student will be able to: • Demonstrate an appreciation of the underlying controls on landscape change including roles of material properties, process mechanisms and external forces over time. • Display a detailed knowledge of the inter-related controls on river channel and floodplain environments and the importance of testing ideas against empirical evidence. • Compare and contrast the nature of the controls and resulting processes in glacial and karst environments and within different types of coastal environment. • Communicate an understanding of the appropriate application of both quantitative and qualitative modelling techniques to geomorphological problems and how to integrate ideas and evidence in essays, arguments and presentations.		
List of module topics:	• Geomorphological principles • Geomorphological modelling • Slopes • Group practical on slope processes • Computer practical on slope data analysis • Alluvial fans • Rivers • Floodplain processes • Floodplain morphology • Group poster presentations of slope work • Karst: landforms and hydrology • Karst: Cave development and infilling • Coasts: elements • Coasts: dynamics • Glacial environments: elements • Glacial environments: dynamics • Landscape evolution: models • Landscape evolution: rates • Powerpoint presentations of coursework		
Key Skills:	*Teamwork* (group projects in both semesters) *Communication* (group presentations in both semesters and exam answers) *Numeracy* (data analysis using Excel) *Problem solving* (designing lab experiment) *Planning and organising* (preparing group presentation)		

Delivery:	32 hours of lectures 2 hours of lab practical 2 hours of computer practical 4 hours of seminars
Assessment:	Semester 1 group poster presentation (16.5%) Semester 2 group powerpoint presentation (16.5) 2 hour exam (67%) section A essay style question from semester 1, section B short answer style questions from semester 2
Assessment Submission dates *	Poster presentation: Semester 1 week 11 Powerpoint presentation: Semester 2 week 9
Essential Texts:	Huggett, R.J. (2007) Fundamentals of Geomorphology, Routledge, Oxford, UK; 516 pp. Additional reading will be provided at the end of each lecture to develop the material that is presented.

03 18182	**GGM214**	**Ecological Systems**	**20 credits**
Level: I	**Semester: 1 & 2**	**Module Leader: Mark Ledger**	
NB: A 10-credit version of this module (03 27263), that can be taken in either semester, is available. Please contact the School.			
Description:	**Semester 1:** The first part of the module provides a thorough grounding in basic ecology at the species, population and community levels. We will explore how factors including dispersal, habitat and species interactions affect the distribution of species in marine, freshwater and terrestrial communities, study the demographics and regulation of populations, and investigate regulation of communities by competition, predation and physical disturbance. Major ecological concepts including succession, food web dynamics and ecosystem engineers will be described. **Semester 2:** The second part of the module applies ecological theory acquired in semester 1 to focus on the structure and function of freshwater ecosystems, focusing mainly on rivers, and investigates the adaptations of freshwater organisms to their habitat. Some of the unifying concepts of rivers, including the River Continuum Concept, nutrient spiralling, and patch dynamics will be summarised. Anthropogenic influences on freshwaters will be reviewed, including river regulation, urbanisation, organic pollutants, acidification, mining and forestry.		
Learning Outcomes:	By the end of this module students should be able to: **Semester 1:** 1. Demonstrate knowledge of key concepts of ecology with reference to species distribution, populations, communities and ecosystems. 2. Integrate and evaluate information acquired through lectures and directed reading to demonstrate understanding of specific ecological concepts or issues. **Semester 2:** 3. Demonstrate an understanding both of ecological patterns and processes within rivers and lakes, and of the variables driving these processes. 4. Combine detailed knowledge of some key concepts in ecology to diagnose anthropogenic impacts on freshwater environments		

List of module topics:	• Ecology of freshwater, terrestrial and marine environments • Distribution and abundance • Species, populations, communities and ecosystems • Consumer-resource interactions • Food webs • Herbivory, detritivory and predation • Ecology of rivers with a special focus on their habitats, biota and modification by humans • Good training for ecology dissertations • Great fit with Bala field course (GGM227) (always sunny!)
Key Skills:	• Critical thinking • Ability to contextualise environmental issues and contemporary approaches to their management • Applying theory to understanding practice • Using case studies to demonstrate scientific theory
Delivery:	40 hours lectures
Assessment:	Semester 1: Three 15 minute multiple choice class tests (totalling 25%) Semester 2. Three 15 minute multiple choice class tests (totalling 25%) Semester 3: 1.5 hour exam totalling 50% of the module mark (Section A covering Semester 1 topics: one question from four worth 25%; Section B covering semester 2 topics: one question from four worth 25%)
Assessment Submission dates *	Class tests run approximately every two to three weeks during both Semester 1 & 2
Essential Texts:	**Lecture notes and reading lists:** A detailed reading list and outline for each lecture will be posted on Canvas along with some of the lecture notes. **General reading:** **Semester 1** Krebs, C.J. 2001. Ecology: the experimental analysis of distribution and abundance. 5th Edition. Benjamin Cummings. Begon, M., Harper, J.L. & Townsend, C.R. 1996. Ecology: individuals, populations and communities. 3rd Edition. Blackwell Science. **Semester 2** Allan, J.D. 1995. Stream Ecology: Structure and Function of Running Waters, Chapman & Hall Giller, P.S. & B. Malmqvist. 1998. The Biology of Streams and Rivers, Oxford Univ. Press Mason, C.E. 1996. Biology of Freshwater Pollution, 3rd Edition, Longman Moss, B. 1998. Ecology of Fresh Waters Man and Medium, Blackwell

03 27827	GGM229	Environmental Pollution	20 credits
Level: I	**Semester: 1 & 2**	**Module Leader: Lesley Batty**	
NB: A 10-credit version of this module (Banner Code TBC), that can be taken in either semester, will be available. Please contact the School.			
Description:	Pollution in the environment is one of major threats facing society whether in the form of gases (e.g climate change), dissolved substances (e.g. mine drainage), liquids (e.g. oils) or particles (e.g. nanoparticles). This module will introduce the main environmental pollutants and consider how they are transferred within and between various media and how they interact with biota to constitute an environmental risk. We will use the source pathway receptor model to explore how the form and transport of pollutants contributes to their importance in an environmental context. We will also consider how the extent of pollution can be assessed within different environmental media. These key concepts will be considered in relation to current environmental issues including climate change, nanoparticle and chemical use and oil spills. Lectures will be supported by workshops and laboratory and computer practicals to allow students to put in practice theoretical concepts.		
Learning Outcomes:	By the end of the module students should be able to: • Demonstrate a knowledge and understanding of the basic principles underpinning biogeochemical cycles of major elements. • Show understanding and application of the key concepts of reservoirs, residence times, fluxes, including the calculation of their numerical values. • Have knowledge of the key contaminants that constitute a major environmental risk. • Understand how pH and redox are important controls in the behaviour of pollutants within the environment. • Explain how surface interactions control the behaviour of pollutants within environmental media. • Understand how physical characteristics of soil and sediment affect the movement of pollutants. • Have knowledge of how modelling can be used to characterise the aquatic environment. • Explain how characteristics of pollutants, media and biota affect toxicity. • Be able to perform a toxicity test in the laboratory. • Be able to apply extraction techniques to evaluate soil characteristics. • Describe and appraise the different methods of measuring elements within environmental media.		
List of module topics:	To be confirmed.		
Key Skills:	To be confirmed.		
Delivery:	Large group lectures, workshops, laboratory practicals, Canvas discussion.		
Assessment:	1000 word lab report (20%) 2500 word essay (40%) 1.5 hour exam (40%)		
Assessment Submission dates *	To be confirmed.		
Essential Texts:	To be confirmed.		

03 27941	GGM230	Environments of the Past	20 credits
Level: I	**Semester: 1 & 2**	**Module Leader: Warren Eastwood**	
NB: A 10-credit version of this module (Banner Code TBC), that can be taken in either semester, will be available. Please contact the School.			
Description:	Environments of the Past examines and reconstructs past environmental change over the last 25,000 years or so using science-based techniques. In Semester 1, the emphasis is on reconstructing past environments using palaeoecology, including botanical (e.g. pollen) and zoological (e.g. invertebrate) techniques. These will be studied against natural and human-induced environmental processes that cause environments to change through time. Specific topics to be covered include: lake and peat deposits as archives of environmental change, palaeoecological theory, late glacial and Holocene environmental changes, chironomid palaeoecology, radiocarbon dating. Most of these topics have practical exercises linked to them. In semester 2, the focus is on the construction of the physical archives and the broader development of the subject of Quaternary science. Specific topics to be covered include: contrasting archive types and variations in rates of accumulation, approaches to Quaternary stratigraphy, sedimentary logging, ice core and marine records, dendrochronology and calibration of radiocarbon dates, fluvial and glacial deposits in the UK context, speleothems and U-series dating, concluding with breakthroughs in Quaternary science. Most of these topics have practical exercises linked to them.		
Learning Outcomes:	Learning outcomes of semester 1: 1. To develop skills in the use of a microscope to effectively identify major pollen grain types 2. The ability to describe and interpret pollen and chironomid data sets as a tool to reconstruct environmental change 3. Understand the 'indicator approach' to palaeoenvironmental reconstruction generally and the usefulness of pollen and chironomids as indicators of environmental change Learning outcomes of semester 2: 1. To develop a theoretical understanding of how the main physical archives of Quaternary environments are created, including their composition, geometry and rates of accumulation. 2. To assess with confidence qualitative and quantitative data on Quaternary deposits and to carry out standard data manipulations to aid interpretations of environment or rates of accumulation. 3. To gain knowledge of the main Quaternary events and their expression in ice core, marine and a range of terrestrial archives.		
List of module topics:	Semester 1: • Introduction to Quaternary environmental change, relevance and the peopling of the British Isles. • Lake and peat deposits as archives of environmental change • Palaeoecological theory • Late glacial and Holocene environmental changes • Chironomid palaeoecology • Radiocarbon dating • Societal collapse in the palaeoenvironmental record. • Class practical exercises on Zoning palaeoecological datasets, Describing and Interpreting palaeoecological datasets, Age-Depth modelling palaeoecological datasets		

	Semester 2: • Quaternary events, archives and stratigraphic concepts • Quaternary deposits: sediments, rates of deposition, geometry and succession over time • Introduction to sedimentary logging and practical sedimentary logging exercise from Walton-on-the-Naze • Ice core and marine records and the use of oxygen isotopes (with practical exercises on time-series data) • Dendrochronology and ^{14}C dating lecture with practical exercises on ^{14}C calibration and correlations of sediment and ice cores • Fluvial and glacial deposits and UK Quaternary lecture with practical exercise to construct a sediment identification key • Speleothems and U-series dating (with practical exercise) • Major discoveries in Quaternary science •
Key Skills:	• Use of Excel – including ability to produce publication-quality dataplots, enhance use of equations, manipulate axes and plot multiple data series. • Description and interpretation of sediments in a field context • Manipulation of numerical data, e.g. on accumulation rates of archives. • Description, interpretation and discussion of palaeoecological datasets •
Delivery:	Large-group lectures, small-group laboratory sessions (identification of microscope specimens), large-group class practical and workshop sessions
Assessment:	Assessments: Identification Tests (5%); One 2,500 word assessed essay (45%); Data Analysis course work assignment (50%)
Assessment Submission dates *	Pollen ID Test (5%) (Laboratory): Semester 1; Week 5 Assessed Essay (45%): Semester 2; Week 1
Essential Texts:	Bradley, R. 2014 *Paleoclimatology.* Lowe & Walker 1997 *Reconstructing Quaternary Environments* (2nd edition). Pearson, Harlow. Walker, M. 2005 *Quaternary Dating Method s.*

03 24358	GGM203B	Geomatics	10 credits
Level: I	**Semester: 2**	**Module Leader: Lee Chapman**	
Description:	This course will teach the fundamentals of GPS, GIS and Remote Sensing. The main aim is to enable the student to be proficient in the creation of digital maps by the familiarisation of basic geomatic techniques. Simple spatial analysis is considered towards the end of the course to educate students to the potential analyses suitable for dissertation topics.		
Learning Outcomes:	By the end of the module students should be able to: 1. Explain the basic principles and theory of GPS, GIS and Remote Sensing. 2. Identify where and how to access spatial data sources 3. Use ArcGIS to create maps and perform simple spatial analyses		
List of module topics:	Weekly Topics: Week 1: GPS and Databases Week 2: Vector and Raster Data Models Week 3: Practical Class 1: Using ArcGIS Week 4: Sources of Data (1) Week 5: Practical Class 2: Downloading Data Week 6: Sources of Data (2) Week 7: Practical Class 3: Georeferencing & Digitisation Week 8: Raster Data analysis Week 9: Practical Class 4: Image Classification Week 10: Vector Data Analysis & Distributed GIS		
Key Skills:	This module is about providing a core skill (GIS) demanded by most employers who recruit graduates in the environmental sector. Learning Outcomes 2 and 3 are particularly relevant for dissertation work.		
Delivery:	12 Hours of Lectures 4 Hours of Computer Practicals		
Assessment:	One project (1000-word equivalent) (33%): This will examine learning outcomes 2 and 3 and will be distributed at the first practical class. The student will need to produce a map of an area of their choosing using data downloaded from the internet. One formal examination (1 hour) (67%): The examination will consist of 15 short answer questions (10 to be answered) to test understanding of learning outcome 1.		
Assessment Submission dates *	Project to be submitted in Week 9, Semester 2.		
Essential Texts:	Heywood, I., Cornelius, S. & Carver, S. (2011) An Introduction to Geographical Information Systems. Prentice Hall. 4th Edition (available as an ebook). Longley, P.A., Goodchild, M.F., Maguire, D.J. & Rhind, D.W. Geographical Information Systems and Science. Wiley Barrett, E.C., & Curtis, L.F. (1999) Introduction to Environmental Remote Sensing. Cheltenham. 4th Edition		

03 23438	**GGM205**	**Environmental Assessment and Management**	**20 credits**
Level: I	**Semester: 1 & 2**	**Module Leader: Steve Emery**	
NB: A 10-credit version of this module (03 26502), that can be taken in either semester, is available. Please contact the School.			
Description:	This module provides a foundation in environmental human geography and environmental social science. It traces the emergence of environmental management as a specific practice through the rise of environmentalism and concern for environmental protection. In doing so it encourages critical reflection on the relationship between humans and 'nature' as well as the tensions inherent in the various social relations and interests that underlie engagement with the environment. This critical perspective is extended to problematize prominent principles of environmental management (such as sustainable development, ecosystem services and environmental behaviour change) and to examine them in relation to environmental policy and management practices. These draw on local, national and international case studies relating to planning and development; Environmental Impact Assessment; Agri-Environment Schemes; Payments for Ecosystem Services; environmental policy implementation; climate change mitigation and adaptation, and; participatory decision processes. In sum, the module demonstrates the value of a theoretically grounded social scientific approach for understanding and implementing contemporary approaches to environmental management.		
Learning Outcomes:	By the end of the module the student should be able to: 1. Explain the emergence of environmentalism within historical, cultural and geographic context 2. Articulate, problematise and critique key concepts framing environmental management 3. Describe and assess the role of various institutionalised approaches to environmental assessment and decision-making, and their limitations 4. Apply different theoretical understandings of human-environment relations to analyse and interpret contemporary approaches to environmental management 5. Appreciate and demonstrate the importance of cultural, political and economic geography to contemporary environmental management		
List of module topics:	- Environmentalism - Nature and Culture - Sustainable Development - Management of the Farmed Environment - Payments for Ecosystem Services - Environmental Impact Assessment - Climate Change – Science, policy and management - Environmental Policy - Pro-environmental Behaviour - Environmental Risk Perceptions - Scientific Knowledge and Lay Knowledge - Deliberative and Participatory decision-making		

Key Skills:	- Critical thinking - Ability to contextualise environmental issues and contemporary approaches to their management - Applying theory to understanding practice - Using case studies to demonstrate social scientific theory
Delivery:	40 hours lectures
Assessment:	2,000 word essay (33%) Choose one from three possible questions set in Semester 1 Exam (67%) Answer two essay-style exam questions
Assessment Submission dates *	Essay Semester 2, Week 1
Essential Texts:	There are no core texts for this module but the following provide comprehensive overviews: Castree, N., Demeritt, D., Liverman, D. & Rhoads, B. (2009) *A Companion to Environmental Geography*, Wiley-Blackwell, West Sussex. Pretty, J. et.al. (Eds.), (2007) *The SAGE handbook of environment and society*, Sage, London. Baker, S. (2006) *Sustainable Development*, Routledge, London.

03 24276 **ESCM246**		**Resources of the Earth – Environmental Science**	**10 credits**
Level: I	**Semester: 1**	**Module Leader: Jason Hilton**	
Prohibited Cominations: ESCM261 Resources & Deep Crustal Processes & ESCM262 Resources and the Environment			
Description:	The module examines the Earth's physical resources and provides an understanding of the distribution of different kinds of resources in a plate tectonic context. The following themes are covered in the lecture content: (1). Bulk materials, (2). Water, (3). Energy, (4). Resource management and policy. Where appropriate topic will commence with background information on formation of the resource, and will elaborate extraction and processing methods as well as the major uses of each resource type. Coursework will comprise a 2,500 word report on the environmental impact of a named Earth Resource. Coursework will install training in professional standards of report construction as required by industry.		
Learning Outcomes:	By the end of the module students should be able to: • Demonstrate an understanding of the principles regulating the distribution of natural resources in a plate tectonic context, and to understand the methods of formation for different natural resources. • Identify appropriate extraction and processing techniques for different resources. • To produce reports on to professional standards expected in industry. • Give a detailed evaluation of the environmental impacts associated with extraction and use of a particular resource.		
Delivery:	10 lectures (10 hours) 1 hour seminar on project introduction 1 hour seminar on professional standards 1 hour drop in tutorial session for formative feedback on project prior to submission		
Assessment:	1 hour examination on lecture contents (60%) Project submission (40%)		
Assessment Submission dates *	TBC		
Essential Texts:	Craig, Vaughan and Skinner 2001. Resources of the Earth: origin, use and environmental impact. Prentice Hall. Montgomery 1997. Environmental Geology. McGraw-Hill. Moon, Whateley and Evans. 2007. Introduction to mineral exploration. Blacklwells publishing. Robb. 2005. Introduction to ore-forming processes. Blackwell's Science. Selley and Selley. 1985. Elements of petroleum geology. Academic press.		

03 19219 GGM203A		Statistical Methods for Geographers	10 credits
Level: I	**Semester: 1**	**Module Leader: Ian Phillips**	
Description:	The module aims to develop an appreciation of quantitative data analysis within both physical and human geography.		
Learning Outcomes:	1. To understand the rationale underpinning selected statistical methods and tests. 2. To use a calculator, a pen and a sheet of paper to calculate the following descriptive statistics and inferential tests: mid-range, mode, median and arithmetic mean; range, variation ratio, quartile deviation, mean absolute deviation, standard deviation and co-efficient of variation; area and hence probabilities under a normal curve; 95% confidence interval of the population mean from the sample mean; independent samples Student's *t* test; independent samples one-way analysis of variance; Chi-Square test; Pearson's product-moment correlation co-efficient. 3. To use the SPSS computer program to calculate the following statistics: mode, median and arithmetic mean; range, lower and upper quartiles and standard deviation; skewness; one sample, independent and paired samples Student's *t* tests; independent samples one-way analysis of variance (ANOVA); Chi-Square test; Pearson and Spearman correlation co-efficients. 4. To use the SPSS computer program to conduct simple and multiple linear regression analyses. 5. To interpret correctly the results of statistical analysis		
List of module topics:	**Descriptive Statistics** Measurement scales (nominal, ordinal, interval and ratio) Measures of central tendency (mid-range, mode, median and arithmetic mean) Measures of variability (range, variation ratio, quartile deviation, mean absolute deviation, standard deviation and co-efficient of variation) Skewness **Inferential Statistics** The normal distribution (statistical properties, its importance, parametric tests, transformation of data – why and how, area under a normal curve, the three standard deviations check, standardised or *z* scores) Samples (sample and population parameters, relationship between sample and population parameters, variance of sample means and standard error, calculation of the 95% confidence interval of the population mean from the sample mean with the appropriate use of the *z* or the *t* distribution) Hypothesis testing (stages involved, null and alternative hypotheses, rejection levels, type I and II errors, parametric versus non-parametric tests) The Student's *t* test (assumptions, one sample and two sample *t* tests, independent and paired samples tests, the test statistic as the difference in sample means divided by the standard error of the difference, determining the significance of the test statistic, degrees of freedom) Independent samples one-way analysis of variance (function/purpose of ANOVA, the difference between one-way and two-way ANOVA, null and alternative hypotheses, assumptions of ANOVA, the relationship between the total variance and the variance between and within samples, calculation and mathematical logic of TSS, SSC and SSE, the ANOVA table, Snedecor's variance ratio test) The Chi-Square test (its purpose, assumptions of the test, null and alternative hypotheses, calculation of expected counts, calculation and interpretation of the Chi-Square statistic, determining the critical value, the 20% rule for expected counts)		

	Correlation (definition, positive, zero and negative correlation, assumptions of the Pearson and Spearman correlation co-efficients, the covariance and how to calculate the Pearson correlation co-efficient from the covariance, significance testing of the Pearson co-efficient by use of the Student's *t* distribution, magnitude of *r* required for significance, direct relationships, co-efficient of determination (R^2): its meaning, empirical versus physical reasoning, multicollinearity) **Multivariate Statistics** Simple linear regression (its purpose, defining the line – the least squares method, assessing goodness of fit, R^2 values, significance testing – *t* ratio, ANOVA) Multiple linear regression (enter, forward, backward and stepwise methods) Testing the assumptions of a regression model (linearity, independence of predictor variables, homoscedastic errors, autocorrelation, outliers – extreme residuals and high leverage points) **Using statistical methods in your dissertation** Types of data (quantitative and qualitative); the importance of using statistical methods; examples
Key Skills:	1. This course teaches a range of statistical techniques that are used extensively across the physical and social sciences. Regardless of the subject area, the stages involved in the analysis of any data set are similar. These stages usually entail the description of the data in terms of its central tendency and variability; the testing of differences and associations between samples; and the modelling of relationships. 2. The use of the SPSS computer package. 3. Numerical skills: the exercises in weeks 1-6 will test a student's ability to conduct statistical tests by hand by using a calculator, a pen and a sheet of paper.
Delivery:	1 hour lecture each week (except in Reading Week – week 7) 1 hour computer class each week (except in Reading Week) The exercises in the computer classes relate specifically to the statistical methods that are covered in the lectures. It is thus imperative to attend all lectures in this module. You should not expect to complete all the questions in the one-hour class. It is envisaged that you will need to spend up to four hours each week completing the questions and mastering the material taught in each lecture.
Assessment:	Two question booklets Question Booklet 1: 60% = six weeks' work, Question Booklet 2: 40% = four weeks' work
Assessment Submission dates *	The first question booklet is distributed at the practical/computer class in week 1. The deadline for this booklet is Semester 1, week 8. The second set of questions will be distributed in week 8. The deadline for this question booklet is Semester 1, week 11.

Essential Texts:	Dr Phillips has written a textbook to accompany the module. This textbook is available on Canvas. Other useful books are as follows: Dancey, C.D. and Reidy, J. (2007) *Statistics Without Maths for Psychology: Using SPSS for Windows*. Fourth Edition. Prentice Hall, Harlow (Library Classmark: BF39/D; 2 long-loan copies, 5 week-loan copies and 4 short-loan copies; two further long-loan copies are available in the Education Library). Copies of the second edition of this book that was published in 2002 are also available in the Main Library (9 long-loan copies and 1 short-loan copy) Ebdon, D. (1985) *Statistics in Geography*. 2nd Edition. Blackwell, Oxford (Library Classmark: G74/E; 3 long-loan copies and 1 week-loan copy) Field, A. (2005) *Discovering Statistics Using SPSS*. Second Edition. SAGE Publications (Library Classmark: QA76.73.S66/F, 5 long-loan and 4 short-loan copies in Main Library; 4 long-loan copies and 1 reference copy in the Education Library) Gregory, S. (1978) *Statistical Methods and the Geographer*. 4th Edition, Longman, London (Library Classmark: G74/G; 4 long-loan copies and 1 week-loan copy) Hammond, R. and McCullagh, P.S. (1974)*Quantitative Techniques in Geography*. Clarendon Press . Oxford. (Library Classmark: G70/H; 6 long-loan and 1 week-loan copies available in the Main Library) Hinton, P.R. (2004) *Statistics Explained*. Routledge. London and New York. (Library Classmark: HA29/H: 2 in short-loan, 6 in week-loan and 2 in long-loan. This is a nice book that is easy to follow, despite using examples mostly from psychology.) Hinton, P.R., Brownlow, C., McMurray, I. and Cozens, B. (2004) *SPSS Explained*. Routledge. London, 377pp (Library Classmark: HA32/S; 3 short-loan, 1 long-loan) McGrew, J.C. and Monroe, C.B. (1993) *An Introduction to Statistical Problem Solving in Geography,* William C Brown (Library Classmark: G74/M; 3 long-loan copies and 1 week-loan copy) O'Brien, L. (1992) *Introducing Quantitative Geography: Measurement, Methods and Generalised Linear Models,* Routledge (Library Classmark: G70/O; 3 long-loan and 1 week-loan) Shaw, G. and Wheeler, D. (1994) *Statistical Techniques in Geographical Analysis*. (Library Classmark: G70/S; 1 copy in short-loan, 1 copy in week loan and 2 copies in long-loan)

03 27798	**GGM225**	**Cultural and Development Geographies**	**20 credits**
Level: I	**Semester: 1 & 2**	**Module Leader: Phil Jones**	
NB: A 10-credit version of this module (Banner Code TBC), that can be taken in either semester, will be available. Please contact the School.			
Description:	In the first semester the focus will be on concepts and practices of development geography. This section will set out a contested history of development theories, and it will conceptualise the roles of key development agents and the negotiation of key development spatialities (the global, the national, the household, the rural and the urban). These concepts and spatialities will then be focused through aspects of the lived experience of children and young people in the Global South. In the second semester the focus will be on cultural and historical geographies of the city. Key theoretical frames will be outlined and these will be applied to the examination of key issues in the development of cities from the mid-19th century (the birth of the modern city) through to the contemporary with a focus primarily on Europe and North America. This will cover issues around identity, cultural landscapes, geographies of memory, binaries, feminism, architecture and modernity.		
Learning Outcomes:	By the end of the module the student should be able to: • Engage with key histories, theories and concepts in development geography. • Critically apply development theories and concepts to consider the lived experience of children and young people in the Global South. • Understand the diversity of theoretical approaches to understanding the city. • Critically deconstruct the cultural geography of the contemporary city using a variety of theoretical approaches.		
List of module topics:	Semester 1: Cultural Landscapes; public art; structure, power and the public sphere; resisting public space; placemaking and participation; landscape and hidden meaning; landscape and memory; feminism and public space; Semester 2: the binary city; feminist approaches to the city; performativity; geographies of architecture; culture and urban regeneration; faith & religion		
Key Skills:	Short essay skills Critical thinking skills		
Delivery:	40 Hours lectures		
Assessment:	2 x 1500 word essay 1 x 1.5 hour exam		
Assessment Submission dates *	TBC		
Essential Texts:	Mitchell, D. (2000) Cultural geography: a critical introduction. Blackwell; London Anderson J (2010) Understanding cultural geography: places and traces. Routledge, London Sibley, D. (2001) The binary city Urban Studies, 38(2), 239-250		

03 23142	GGM226	Social and Political Geography	20 credits
Level: I	**Semester: 1 & 2**	**Module Leader: Julian Clarke**	
NB: A 10-credit version of this module (03 26661), that can be taken in either semester, is available. Please contact the School.			
Prohibited combination with: GGM229 Environmental Pollution			
Description:	This module uses a range of contemporary social and political geographical approaches to understand how, why and in what ways individuals and organisations act in an increasingly globalised world. In semester 1 the module will elaborate a critical geography approach with regard to current socio-economic developments at the global scale, paying particular attention to questions of social equity, demographic change, household coping strategies, and the spaces of energy production and consumption. A geographical critique of neoliberalism and its discontents will form the conceptual core of the module, utilising the wide body of scholarship in this field. Building on human geography concepts introduced in year 1, the module will aim to take the students beyond a mere descriptive understanding of the basic themes and issues in contemporary social geography by giving them the skills – mainly through EBL methods – to actively question taken-for-granted assumptions regarding the relationship between society, economy and the everyday. Complementing the social geography approaches considered in semester 1, in semester 2 our focus moves to key concepts in political geography, and to contemporary political geographical forms of organization. Specifically, drawing on historic and contemporary examples (including case studies of the world's largest trading bloc, the European Union), semester 2 provides an in-depth analysis from political geographical perspectives of the following issues: what are the key concepts in political geographical thought and the critical drivers of political geography for actors and organizations, and how are these manifested at a variety of spatial scales? To what extent can different theoretical approaches enable us to better understand these drivers? And what are the likely future patterns and processes of political integration and geopolitical development across Europe?	
Learning Outcomes:	By the end of the module the student will be able to: • recognise the social implications, elements and functioning of neoliberal policies at a • global scale. • understand the core components of critical geographic thought with regard to • contemporary social geography issues. • relate critical geography approaches to questions of social equity and justice, energy • liberalisation, household coping strategies and contemporary socio-demographic change. • understand the key concepts in contemporary political geographical and geopolitical thought. • understand key events and processes underpinning the changing political geographies of Europe. • have developed a knowledge of the significance and likely impact of European policy • activities at a variety of spatial scales.	

List of module topics:	Indicative only (2013-14 academic year; lectures may vary year on year) S1 Social geography 1: Towards a critical social geography of neoliberalism and inequality 2: 'Household' and 'home' through a social geography lens 3: Social geographies of transnationalism, immigration and race 4: Social citizenship and participation 5: Neoliberal identities 6: Governing social practice 7: Neoliberal social policy and crisis 8: Africa in the Colonial Century 9: A Neoliberal/Globalizing Africa 10: Project consultation seminars S2: Political geography 1: Europe's political geographies 2: Governing Europe 3: Theories of European integration 4: Rural transformations: the CAP 5: Rural transformations: the Languedoc 7: Visualising Europe 8: Crisis in Euroland 9: EU accession and enlargement 10: Europe in the 21st century
Key Skills:	Evidence based-learning methods; critical thinking, independent reading, research and analysis, group discussion and participation
Delivery:	38 hours lectures, 8 hours practical classes/workshops
Assessment:	1) 2 hour examination , essay style questions (50%)on the political geographies of Europe 2) Essay, 3000 words (50%) on social geography topics
Assessment Submission dates *	Essay to be submitted Semester 2, wk 1
Essential Texts:	Anderson, B. 1983. Imagined Communities: Reflections on the Origins and Spread of Nationalism. Lodon: Verso. Appadurai, A. 1996. Modernity at Large: Cultural Dimensions of Globalization. Minneapolis: University of Minnesota Press. Harvey, D. 2007. A Brief History of Neoliberalism. Oxford: Oxford University Press. Isin, E. F and Wood P. K. 1999. Citizenship and Identity. London: Sage. Heffernan M. 1998 The Meaning of Europe: Geography and Geopolitics. Oxford: Blackwell. Leonard M. 2005 Why Europe will run the 21st century. London: Fourth Estate. Morris J 2006. Europe: An Intimate Journey. London: Faber and Faber. Pagden A. ed. 2002. The Idea of Europe: From Antiquity to the European Union. Cambridge: Cambridge University Press

03 27800	**GGM231**	**Economic Geographies: cities and regions**	**20 credits**
Level: I	**Semester: 1 & 2**	**Module Leader: Vlad Mykhnenko**	
NB: A 10-credit version of this module (Banner Code TBC), that can be taken in either semester, will be available. Please contact the School.			
Description:	This module examines the spatial economic underpinnings of the behaviour of urban and regional economies. Highlighting the differences and connections between the two types of economy, it explores a diverse range of basic analytical techniques, as well as the most current, state-of-the-art thinking in the field of local economic development and policy. The course is divided into two teaching "blocks", each of 10 weeks and runs over two terms: 1. Cities and the Urban Economy examines various aspects of spatial economic analysis, explaining why groups of firms and activities are often located together in cities, urban agglomerations, and industrial clusters. It highlights increased competition between Europe's cities for mobile investment through the development of public - private partnerships, property development and urban regeneration strategies. This block of lectures also considers the broader historical themes relating to the changing context in which cities and regions nowadays find themselves. 2. Local and Regional Development explores the key urban and regional economic development theories and discusses their implications for modern economic policy analysis. It considers the theoretical ways we can understand the location behaviour of individual firms, how the linkages between firms and activities in a local area affect the overall output of an area, and also discusses the various approaches we have to analyse regional growth and decline. This block of lectures then integrates the arguments in each of the previous lectures in order to explain in detail the nature of – and the justification for – urban and regional economic policy in the context of modern globalisation.		
Learning Outcomes:	By the end of the module the students will be able to: • Identify and explain the spatial economic underpinnings of the behaviour of urban and regional economies; • Compare and contrast different theoretical models of urban and regional economic development; • Explain disparities in economic performance between different cities and regions; • Reflect upon the potential contribution to urban and regional economic development of a variety of policy initiatives and interventions; • Recognise the advantages, disadvantages and welfare implications of specific policy instruments; • Formulate and justify criteria (efficiency, equity, sustainability) for selecting policy priorities in different urban and regional economic development contexts.		

List of module topics:	Typically, the lectures cover a number of the following topics: • Space, place, and scale: a geographical introduction to the economy. • Why do cities exist? Agglomeration and clustering. • The spatial distribution of economic activities. • The spatial structure of the urban economy. • Globalisation, urbanisation, industrialisation: global firms, global regions, and global cities. • The world is 'spiky': cities and regions in the modern global economy. • Mapping the changing contours of the urban economy: recapitulation. • Industrial location: the location of the firm in theory. • Regional specialisation, trade, and multiplier analysis. • Regional labour market analysis. • Regional growth and factor allocation. • Geographies of uneven development: convergent growth or divergent growth? • The modern local economic development policy: the urban context. • Regional policy: interventions and policy instruments. • Regional policy and the European Union. • Regional policy and devolution. • New debates in urban and regional policy.
Delivery:	Lectures: 40 hrs
Assessment:	2,000-word essay Two-hour essay style examination
Assessment Submission dates *	Essay due in Semester 2 Week 3.
Essential Texts:	Armstrong, H. & Taylor, J. (2000) *Regional Economics and Policy*, Third Edition, Blackwell, Oxford. McCann, P. (2013) *Modern Urban and Regional Economics*, Oxford University Press, Oxford.

08 22208	URS202	Understanding Neighbourhood Poverty	20 credits
Level: I	**Semester: 1 & 2**	**Module Leader: Peter Lee**	
NB: A 10-credit version of this module (03 26667), that can be taken in either semester, is available. Please contact the School.			
Description:	The module builds on the module lead's 20+ years' experience of researching on urban planning and poverty issues including research on household poverty, housing tenure and poverty, low demand and abandonment, regional planning and housing strategy policy at local, regional and national level. Recent additions to the module have included sessions on *resilience and neighbourhoods* and the *role of energy in shaping future trajectories of neighbourhoods*. The course has three elements: theoretical, technical and policy related lectures which contribute to the understanding of neighbourhood poverty and series of practical workshops to develop analytical skills. The workshops involve analysis of census and other large data sets at regional, city and neighbourhood level and work towards a project on identifying and explaining patterns of neighbourhood poverty as part of the assessment. Guest lectures given by local and regional policy makers and stakeholders contribute to sessions on resilience and neighbourhood strategies. The core argument of the module is that *narratives* of poverty and *place* start with our own perceptions of what poverty is and our experiences of where we have lived		
Learning Outcomes:	• Understand the role of neighbourhoods in policy debates on social exclusion and differentiate between individual and place based poverty • Develop spatial analytical techniques for poverty analysis and planning • Identify methodological and policy limitations of *area based* approaches • Understand the drivers affecting neighbourhoods and their function within a wider spatial planning context • Develop insights that will help in a planning, economic development or business development career • Develop practical skills in handling data/secondary sources and software packages that will help in both your dissertation and career development At the end of the course you will be able to: • compare and contrast theories and models of poverty and how these are used by policymakers and planners in particular; • explore the causes and consequences of urban poverty; • identify the main data sources for the measurement of different concepts related to urban poverty, recognising their methodological strengths and weaknesses; • situate models of poverty within a wider analytical and spatial context • formulate and justify area measurements of deprivation using computer-based techniques; • evaluate different poverty perspectives and the consequences for the spatial analysis of urban policy • understand the advantages and limitations of GIS in poverty studies; Develop analytical skills in GIS for planning and development for policies on social cohesion and sustainability.		

List of module topics:	• Understanding poverty and deprivation • Narratives of poverty – participative class survey • Understanding neighbourhood and whether it matters for citizenship and participation • The underclass, social exclusion and new poor • Measuring area based deprivation: data sources and indicators • Measuring area based deprivation II: Standardising data and creating indices • Case studies of deprivation in the West Midlands • Policy in Birmingham on Neighbourhood Strategies • Council housing as a spatial marker • Housing tenure, residualisation and neighbourhood function • Ethnicity and neighbourhood segregation • Neighbourhoods and Resilience • Developing a Neighbourhood Resilience Index • Housing markets and neighbourhood poverty • Birmingham Resilience • Energy, housing and neighbourhood trajectories • Introduction to Excel and SPSS • Standardisation: Z Scores and Chi Square using SPSS • Combining Indicators • Introduction to Census Data and CASWEB data repositories • ArcGIS and mapping indices • Adjacency analysis and selecting boundaries in ArcGIS • UK Borders and StreetView GIS resources
Key Skills:	The module will help develop analytical skills that will help particularly in a planning, economic development or business development career and in graduate levels occupations generally. Development of practical skills in handling data/secondary sources and software packages (eg: Excel, SPSS, ArcGIS, Q-GIS) and data platforms (CASWEB, IN-FUSE, UKBorders, StreetView, Neighbourhood Statistics, NOMIS) that will help in both your dissertation and career development. Relating concepts of resilience and emerging agendas around energy and spatial inequality provides opportunities for transferring ideas to different contexts.
Delivery:	20 hours of lectures 20 hours of computer based workshops
Assessment:	1X3000 word essay (50% of overall course mark): What is neighbourhood poverty and how would you measure it? This assignment will form a background methods / conceptual paper to support the second assignment (project report). The essay should capture methodological issues of measuring spatial poverty including data sets, spatial boundaries, indicators and data sources and in approaching this you should describe whether place contributes to poverty setting out the methodological and empirical issues associated with measuring poverty at neighbourhood level in an area of your choice. You should demonstrate here that you have engaged with the literature on poverty, deprivation and urban disadvantage and by doing so include an analysis of issues relating to the measurement of deprivation and a discussion of the indicators that could be used in your project report (second assignment). Assignments will be marked in accordance with the extent to which indicators have been justified on the basis of the literature and how these indicators relate to theories of disadvantage. You should also reflect on the limitations of aggregate data and whether measuring area based poverty is 'valid'. 1X3000 word project report (50% of overall mark): Profiling Neighbourhood Poverty in an area of your choice; this involves writing a report showing the concentrations of deprivation in a city/local authority/county of your choice and how do the most deprived areas differ in their characteristics, needs or 'function'. The second assignment builds on assignment #1. The aim is to construct an index of deprivation at neighbourhood level, identify concentrations of deprivation and highlight differences between areas.

Assessment Submission dates *	**Assignment #1** – Semester 2, Week 2 **Assignment #2** – Semester 3, Week 2
Essential Texts:	Dorling, D et al (2001) How Much Does Place Matter, Environment and Planning A 2001, volume 33, pages 1335-1369: a selection of articles by Danny Dorling; George Smith, Michael Noble and Gemma Wright; Roger Burrows and Jonathan Bradshaw; Heather Joshi; Charles Pattie; Richard Mitchell; Anne E Green and Andrew McCulloch. Lee, P and Murie, A (1999) Spatial and Social Divisions within British Cities: Beyond Residualisation, Housing Studies, Vol.14, No.5, pp.625-640 and Lee, P and Murie, A (1997) Poverty, Housing Tenure and Social Exclusion, Policy Press: Bristol Townsend, P (1979) Poverty In The United Kingdom: A Survey of Household Resources And Standards of Living, Allen Lane: London; chp 1 and chp 2.

Year 3: all Programmes

Module Information (* Submission dates are an indication only and may be subject to change)

03 01420	**ESCM301**	**Global Tectonics**	**10 credits**
Level: H	**Semester: 1**	**Module Leader: Tim Reston**	
Description:	*Aims:* To develop an understanding of the principal methods of applied geophysics used to provide geological information		
Learning Outcomes:	By the end of the module, students should have a thorough understanding of the development of plate tectonics, the application of plate tectonics and of the latest developments in our understanding of plate margin processes		
List of module topics:	The lithosphere: structure and mechanics Isostasy and basin formation Development of plate tectonics I-IV: continental drift; seafloor spreading; transform zones; subduction zones; Measuring plate velocities Plate driving mechanisms Rifting Continental breakup Magma poor margins Magma rich margins Seafloor spreading: fast ridges Slow Ridges Subduction zones Accretionary wedges Non-accretionary and erosional margins Cordilleran style orogenesis (Andes) Collision-style orogenesis - Himalayas and Tibet Transform margins and strike-slip tectonics		
Key Skills:	Maths skills, particular problem formulation, physics skills, visualisation skills, data analysis skills, information extraction from papers		
Delivery:	20 hours lectures, 10 hours practical work		
Assessment:	90 minute written examination (70%), exercises (30%).		
Assessment Submission dates *	Exercises: Semester 1, week 8		
Essential Texts:	There is no single textbook that covers the material in the course: the main reading will be journal articles, details of which will be provided during the module. Recommended (but not essential): Global Tectonics by Kearey, Klepeis and Vine; How Plate Tectonics Works, by Cox and Hart		

03 24059	**ESCM308**	**Petroleum Geoscience**	**20 credits**
Level: H	**Semester: 2**	**Module Leader: Steve Jones**	

Pre-requisites: Students without ESCM203 (Applied Geophysics) and ESCM301 (Global Tectonics) must speak to the module leader before signing up; you may take the course if you are prepared to do catch-up reading before the course starts. ***N.B. There is limited Space on this module.***

Prohibited combination with: ESCM319 Evolution of Vertebrates

Description:	This course provides a theoretical and practical understanding of the hydrocarbon industry and petroleum systems geology.
Learning Outcomes:	By the end of the module students should be able to • Use typical quantitative industry interpretation techniques to assess a petroleum system and explain the theory behind these techniques • Interpret 2D and 3D seismic dataset using typical oil-industry software, and understand the principles of seismic reflection data acquisition and processing • Design a hydrocarbon well, interpret wireline logging data and explain the principles of wireline logging tools.
List of module topics:	The main topics covered are: the petroleum system; economics of exploring for and producing hydrocarbons; seismic reflection data acquisition, processing and interpretation; drilling methods, well design & borehole logging; seismic-well correlation; source rock burial and maturation; sedimentary basin analysis through backstripping; and hydrocarbon migration.
Key Skills:	This course is strongly focussed on teaching technical information to those considering a career in the hydrocarbon industry. The main generic skill is quantitative analysis of multiple, diverse and incomplete datasets.
Delivery:	These topics are introduced in 12 lectures. Most of the course time (38 hours) is devoted to 12 extended practical exercises that provide grounding in industry-standard analysis techniques and software.
Assessment:	Sub-set of practical exercises selected for detailed assessment in consultation with students (30%) Folder of remaining practical exercise (10%) 2 hour exam (60%), summer term, consisting of 8 short-answer (15 minute) questions from a choice of 16.
Assessment Submission dates *	Assessed Practical 1, Semester 2, Week 3 Assessed Practical 2, Semester 2, Week 6 Assessed Practical 3, Semester 2, Week 9 Practical Folder, Semester 2, Week 10.
Essential Texts:	Allen PA, Allen JR. Basin Analysis: Principles and Application to Petroleum Play Assessment (3rd edition). Wiley-Blackwell, 2013. Ashcroft WA. A Petroleum Geologist's Guide to Seismic Reflection. Wiley-Blackwell, 2011. Rider M. The Geological Interpretation of Well logs (2nd edition). Rider-French, 2002.

03 21309	ESCM312	Magmatic Processes	10 credits
Level: H	**Semester: 2**	**Module Leader: Stephen Jones**	
Description:	This course provides a theoretical and practical understanding of the processes of mantle melting, magma transport from mantle to crust and magma emplacement within the crust. These processes are illustrated with case studies from mid-ocean ridges and subduction zones. Emphasis is placed on joint interpretation of petrological, geochemical and geophysical data on magmatic systems.		
Learning Outcomes:	By the end of the module students should be able to • Critically evaluate a range of geochemical and geophysical data and produce integrated interpretations. • Understand how to test current hypotheses and models of igneous petrogenesis in the context of mid-ocean ridges and subduction zones. • Show awareness of uncertainties in the interpretation of limited and complex datasets.		
List of module topics:	• Quantifying melt productivity during decompressional melting. • Trace element composition of mantle melting. • Magma transport and mixing at mid ocean ridges. • Magma emplacement & mantle source heterogeneity. • Slab surface to mantle wedge – the origins of melting in subduction zones. • From wedge to surface – magma transport through subduction zones. • Melt compositional modifications – primary melts and magma evolution. • Storage and eruptions – assembling and evacuating shallow magma chambers.		
Key Skills:	• Data analysis skills, particularly quantitative analysis of multiple, diverse and incomplete datasets. • Engagement with literature at the research frontier. • Subject specific skills. • Maths skills. • Microscope Work		
Delivery:	10 hours of lectures and 20 hours of practical classes/workshops		
Assessment:	2 sets of practical exercises (1 set for each co-teacher, 20% each) 1.5 hour summer exam (60%)		
Assessment Submission dates *	Practical exercises Semester 2, weeks 6 & 11		
Essential Texts:	Almost all reading for this course is in journal articles. The following provide a flavour. • McKenzie D, Bickle M. The volume and composition of melt generated by extension of the lithosphere. *Journal of Petrology* 29 (1988) 625–679. • Kelemen P, Hirth G, Shimizu N, Spiegelman M, Dick H. A review of melt migration processes in the adiabatically upwelling mantle beneath oceanic spreading ridges. *Philosophical Transactions of the Royal Society of London* A 355 (1997) 283–318. • Parsons I (ed). Origins of Igneous Layering, *NATO Advanced Science Institute Series* 196 (1987).		

03 27944	ESCM316	Ore Deposits and Gemmology	20 credits
Level: H	**Semester: 1 & 2**	**Module Leader: Paul Anderson**	
Prohibited Combination: GGM310 Weather, Climate & Society and GGM341 Environmental Protection			
NB: A 10-credit version of this module (03 27558), that can be taken in Semester 1, is available. Please contact the School.			

Description:	This module examines the geology of mineral resources, primarily focusing on the formation of ore deposits and gems, by rooting these processes back into a geological context. The module is also largely focused on crystallography, as well as the economics and ethics of mineral and resource exploration from both a human and environmental perspective. All major parts of this module will be shared with a Level M variant, but will differ from this in terms of some of the assessment. The first half of the module consists of classes and practical exercises, covering the following key areas: (1) mineral classification, (2) crystallography, (3) economics and applications of ores, (4) Specific ore forming processes, (5) Nuclear energy, (6) exploration and mining techniques, and (7) environmental and social factors. The second half of the module consists of two practical exercises: (1) A mock Inquiry, which includes in-depth research into the feasibility of mineral extraction within a particular area. Students are divided into four main groups: mining companies, geological consultants, environmental consultants and a Board of decision makers (4th year of MSci programmes). Group research will lead towards a final inquiry, in which several mining proposals are considered. One or more external contacts with experience in the mining sector may be available to assist in this process. (2) A quantitatively-based analysis of the volume and value of a mineral resource, using computer software designed for professional use.
Learning Outcomes:	By the end of the module students should be able to: • Classify the main types of ore forming minerals and gems. • Comprehend the effect and relevance that mineral deposits and certain ores have in the context of world economy and society. • Understand and be able to interpret the formation of key mineral deposit types. • Understand the principals of gemmology and crystallography. • Gain a detailed understanding of the techniques used in mineral exploration and mining. • Be able to quantitatively determine the volume and value of a mineral resource using computer software. • Evaluate the environmental impacts of mineral extraction. • Evaluate the ethical considerations surrounding mineral exploration and exploitation including environmental and human. • Develop an understanding of the complex and interrelated arguments surrounding extraction of an ore deposit.

List of module topics:	Mineral classification Crystallography Economics and applications of ores Specific ore forming processes Nuclear energy Exploration and mining techniques Hydrothermal ores Environmental and social factors Investigations into the feasibility of extraction within particular areas
Key Skills:	Mineral identification skills, use of professional mining computer software, experience of a mock Public Inquiry
Delivery:	10 hours of lectures 30 hours practical classes/work shops/demonstrations (This includes an afternoon of public inquiry style presentations/debate and tutorials leading up to these)
Assessment:	Coursework: inquiry group presentation (15%) Quantitative assessment of mineral resource volume/value, using new computer software (35%) 1.5 hour exam (50%) with two sections. Section A will cover the practical exercises with short answer questions, and section B will cover the theory with essay style questions. Formative feedback: Engage in peer learning by attending Level M students' crystallography presentation sessions Formative feedback in class while working on practical exercises, including during preparation for mock inquiry; feedback from Level M students during mock inquiry
Assessment Submission dates *	Presentation: Semester 2, week 6 Quantitative assessment exercise: Semester 2, week 10
Essential Texts:	Deer, Howie and Zussman (1966): An introduction to the rock forming minerals. Longman Group Limited Evans (1997): An introduction to economic geology and its environmental impact. Blackwell Science Ltd Moon, Whately and Evans (2006): Introduction to mineral exploration. Blackwell Publishing Richards and Jeremy (2010): Mining, society and a sustainable world. Springer Robb (2005): Introduction to ore-forming processes. Blackwell Science Ltd Schuman (2013): Gemstones of the world: Newly Revised fifth edition.

03 26365	ESCM317	Palaeoclimates	10 credits
Level: M	**Semester: 2**	**Module Leader: Heiko Moossen**	
Description:	This module will provide the basis for detailed understanding of the controls on palaeoclimatic change and to contextualise projections of future climate change. - How are climate archives like sediments, ice-cores, corals and tree-rings used to reconstruct past climates? - How and why has climate changed on various timescales? - How are palaeoclimate studies used to understand Earth's climate sensitivity (e.g. how do temperatures and sea-levels respond to a change in CO_2 or other climate forcing?). - What does this all mean for the future? The course will teach fundamental concepts including: forcings, responses, feedbacks and the greenhouse effect, before moving on to explain how palaeoclimatic proxies (microfossils, biomarkers proxies, stable isotopes) and computer models are used to reconstruct past conditions. We will look palaeoclimatic change on different timescales (tectonic and orbital) before going "Back to the Future" and focusing the Cenozoic Era and the role of CO_2 and methane in past Greenhouse climates and the implications for Earth System sensitivity, sea-level rise and 'target' CO_2 levels.		
Learning Outcomes:	By the end of this module, you should be able to: • review, evaluate and critically synthesise current literature on environmental change • be able to evaluate the magnitude, pattern and rates of climate change during the Quaternary and early Cenozoic • assess how this can be established from the geological record		
List of module topics:	• The importance of Palaeoclimate Science • The basics • Earth Climate today • The marine Carbonate cycle and ocean acidification • Sedimentation, Diagenesis and Catagenesis • Climate archives (focus on marine archives) • Radiocarbon dating of archives • Climate proxies: biomarkers • Climate proxies: C H isotopes • Forcings, feedbacks and climate sensitivity • Tectonic scale climate change • Orbital control on climate change • The Cenozoic • Back to the future: a +1 degree world • Back to the future: a +2 degree world • Back to the future: a +3 degree world • Back to the future: a +4 (and more) degree world		

Key Skills:	The key skills are engagement with literature at the research frontier and developing both technical knowledge and critical appreciation of data quality and appropriate hypothesis building and testing.
Delivery:	20 hours lectures
Assessment:	The examination is 1.5 hours and consists of two sections. Section A is a choice of one from 3 questions which has to be answered in 30 minutes. The three questions are drawn from a list of 12 or 13 questions provided in the lectures. Section B is a choice of one from two seen essay topics that are announced at the end of the lectures.
Essential Texts:	Bradley, R.S. 2014 *Quaternary Palaeoclimatology*. 3rd edition Ruddiman, W. 2000 *Earth's Climate. Past and Future.* Freeman Zachos, J.C. et al. 2001 Trends, rhythms, and aberrations in global climate 65 Ma to present. *Nature*, 292, 686-693.

03 24062	ESCM318	Sedimentary Basin Analysis	20 credits
Level: H	**Semester: 1**	**Module Leader: James Wheeley**	
N.B. There is limited Space on this module.			
Description:	The module develops the concepts of sequence stratigraphy, demonstrating the diversity of techniques available to analyze the controls on the development of sedimentary successions using data for example from outcrops, boreholes, wireline logs and seismic. A case study approach emphasises the components of sequence stratigraphy and establishes the sequence stratigraphic differences between depositional systems (i.e. marine siliciclastic, carbonate and non-marine). Case studies from throughout the Phanerozoic are used. Sequence stratigraphy is considered as a dynamic tool in a 'bigger picture' context through the analysis of integrated models. Building on the foundations of sequence stratigraphy students will learn how it has been applied across the geosciences.		
Learning Outcomes:	Aim: To provide a theoretical and practical understanding of sequence stratigraphy across a range of sedimentary systems. By the end of the module, students should be able to demonstrate understanding of: 1. the historical context of sequence stratigraphy 2. the relative influences of eustasy, subsidence, sediment supply and local structure on sedimentary sequence architecture 3. the similarities and differences between marine siliciclastic and carbonate sequence stratigraphy, and non-marine sequence stratigraphy 4. integrated models for the evolution of sedimentary basins that link basin formation, tectonics, and sea-level variation, in a global context 5. seismic stratigraphy and be able to work with seismic expression of sedimentary basin fills 6. the application of sequence stratigraphy to other geoscience fields e.g. sedimentology, locating organic-rich facies and hydrocarbon source rocks; palaeoclimate studies, palaeoecology and biotic evolution		
List of module topics:	TS = Teaching session (lasting 2, 3 or 5 hours) TS1 Introduction TS2 Sophisticated stratigraphy TS3 - Intro exercises handouts in class TS4 Controls on sedimentary systems TS5 - Intro exercises handouts in class TS6 - Neftex Guest Lecture TS7 - Sequence Stratigraphy 1 TS8 - Chronostratigraphic Charts - handouts in class TS9 - Sequence Stratigraphy 2 TS10 - Chronostratigraphic Charts - handouts in class TS11-15 - Book Cliffs + handouts in class TS16-18 Lake Maracaibo - handouts in class TS19 - Carbonates refresher TS20 - Carbonate sequence stratigraphy 1 TS21-23 Carbonate exercise - handouts in class TS24-25 - Carbonate sequence stratigraphy 2 TS30 - Seismic Sequence Stratigraphy: Moray Firth exercise		
Key Skills:	Critical Thinking; Written and Oral Communication; Time Management; ICT; Adaptability/Flexibility; Managing own Development; Subject Specific Skills		

Delivery:	50 hours of mixed lectures and practicals
Assessment:	40% summer short answer and essay based examination on the module contents and directed reading; 60% continual assessment coursework portfolio
Assessment Submission dates *	60% continual assessment coursework portfolio – roughly every other week through Semester 1
Essential Texts:	Emery, D., Myers, K.J. 1996: *Sequence Stratigraphy*, Blackwell Science. Coe A. et al. 2003: The Sedimentary record of sea-level change. Open University/Cambridge Posamentier, H.W. 1993: Sequence Stratigraphy & Facies Associations, Blackwell. Catuneanu, O. et al. 2009. Towards the standardization of sequence stratigraphy. Earth Science Reviews 92, 1–33. See http://www.uga.edu/strata/sequence/readings.html for more suggested papers. USC Sequence Stratigraphy Web: http://strata.geol.sc.edu/ University of Georgia Stratigraphy Lab: http://www.uga.edu/strata/sequence/

03 10820	**ESCM319**	**Evolution of Vertebrates**	**20 credits**
Level: H	**Semester: 2**	**Module Leader: Ivan Sansom**	
Prohibited combination with: ESCM308 Petroleum Geoscience			
Description:	The module will examine the evolution and palaeobiology of vertebrate groups with emphasis on the evolutionary origins of distinct types of skeletal architecture. The practicals will involve the examination and comparison of fossil and recent vertebrates and employ cladistic methods to analyse relationships.		
Learning Outcomes:	By the end of the module the student should be able to: • Describe, in detail, the evolutionary history and palaeobiology of extant and extinct vertebrate groups; • Evaluate the techniques used to analyse their phylogenetic relationships.		
Delivery:	18 hours Lectures 27 hours Practical classes		
Assessment:	2 hour written exam (60%) Coursework: multi-authored review article and presentations (40%).		
Assessment Submission dates *	Semester 3, Week 1		
Essential Texts:	Benton, M. *Vertebrate Palaeontology: 3rd Edition* (2005)		

03 21937	ESCM320	Micropalaeontology	20 credits
Level: H	**Semester: 1**	**Module Leader: Ian Boomer**	
Description:	This module offers training in the uses of microfossils by integrating industrial techniques together with uses of microfossils in microevolutionary studies and palaeoenvironmental reconstruction. The following themes are covered: ecology and geological history of major microfossil groups, the industrial/geological applications of different groups, environmental reconstruction based on microfossil data from deep-time through to the Quaternary, evolutionary studies on selected groups, community change and methods of analysis. Use will be made of microscope facilities within GEES.		
Learning Outcomes:	By the end of this module students will be able to: 1) Identify major microfossil groups and the time periods within which they occur 2) Analyse and interpret sample data from different microfossil groups 3) use microfossil data to interpret stratigraphy and community change over time 4) undertake independent analysis of calcareous microfossil assemblages		
List of module topics:	Lectures: Introduction to Microfossils and their applications, Techniques, Diatoms, Radiolaria, Conodonts, Calcareous nannoplankton, Ostracods, Foraminifera, Spores & Dinoflagellates. Practicals: Introduction to picking and processing Ostracods, Foraminifera, desk-based project work (x5)		
Key Skills:	Report writing; data collection and manipulation; fossil identification and interpretation.		
Delivery:	Lectures: 18 hours Practical classes: 12 hours Project Supervision: 2 hours		
Assessment:	2 hour written exam (60%) that will consist of three seen questions. The directed review essay (40%) has a word limit of 2500 words.		
Assessment Submission dates *	Directed Review Essay (2,500 words): Semester 2, week 2.		
Essential Texts:	Armstrong, H.A. & Brasier, M.D. (2005) *Microfossils*. Blackwell Publishing, Oxford (2nd edition) 304pp., ISBN: 0 362 05279 1 Dedicated reading lists will be provided for each lecture – the most relevant reading is from journal articles.		

03 24923	ESCM323	Applied Geology: Engineering geology & pollution hydrogeology	20 credits
Level: H	**Semester: 2**	**Module Leader: John Tellam**	
Description:	This 20 credit, Spring Term module deals with the mainly quantitative problem-based aspects of engineering geology and pollution hydrogeology, developing the principal skills involved in these and other applied geology disciplines. The main aims of the module are: (i) to provide an essential working knowledge of the application of examples of engineering geology and pollution hydrogeology theory to solving practical problems; (ii) to illustrate how real-world problems can be tackled when either (a) the science of the problem is too complex or is imperfectly understood, (b) when the data required by the theoretical model are too expensive to collect.		
Learning Outcomes:	By the end of the module students should be able to: Understand how geological theory can be used in solving practical problems. Specifically: 1. understand the essential theories covering rock strength, soil consolidation, and solute transport in groundwaters; 2. solve real problems using these theories.		
List of module topics:	Topics covered include: 1. for engineering geology - rock strength theory and its application in rock slope stability assessment and remediation; soil consolidation theory and its application in land subsidence assessment and remediation; site investigation. 2. for pollution hydrogeology - groundwater reactive transport theory, including analytical modelling and numerical computer modelling using industry standard software, and the application if the modelling techniques in solving groundwater pollution problems.		
Key Skills:	Problem solving, particularly in the context of the use of scoping calculations and computer modelling approaches, involving sensitivity analysis to help develop understanding of a given physical or chemical problem. Part of this is developing the ability to interpret equations and use them as part of developing an understanding. Report writing skills, including both technical scientific writing and consultant report writing.		
Delivery:	Hours assigned to each type of activity are tailored to suit the group, but typically would involve: Engineering Geology 16 hours of lectures 8 hours of practicals Pollution Hydrogeology 16 hours of lectures 8 hours of practicals, including at least 2 computer sessions. Practical sessions include working through problems, either individually or in groups, or guided by the lecturer.		

Assessment:	Assessment includes examination (70%) and coursework (30%). Examination paper: A 2 hour examination paper requiring students to answer questions from both disciplines covered in the module. Answer: 1 question from 3 Engineering Geology soil mechanics questions; 1 question from 3 Engineering Geology rock mechanics questions; and answer 2 questions from 6 Pollution Hydrogeology questions. Questions mixtures of essay-style and calculations, often multi-part and closely focussed. Engineering Geology coursework (15% module assessment): a choice between a 1500-word report on a set engineering problem and the analysis of a rock slope stability problem involving the writing of a spreadsheet model and short report. Pollution Hydrogeology coursework (15% module assessment): the investigation of a groundwater pollution problem using professional groundwater pollution transport software (latter available on University computers but also available free for installation on your own computer).
Assessment Submission dates *	Engineering Geology – set in Week 5, submission in Semester 2, Week 10 Pollution Hydrogeology – set in Week 7, submission in Week 12 (i.e. one week after the end of the Semester 2)
Essential Texts:	Though not essential, these cover the material in the courses: Engineering Geology: Hoek, E., 2007. Practical Rock Engineering. Downloadable [38Mb!] from: http://www.rocscience.com/hoek/pdf/Practical_Rock_Engineering.pdf Hoek, E, and Bray, JW, 1981. Rock slope engineering. Instn Min Metallurgy, London.(qTN706) [Ancient, but excellent text on slopes and basic rock mechanics] Powrie, W., 1997. Soil mechanics: concepts and applications. E&F Spon, London, 420pp. Pollution Hydrogeology Various possible, but including Hiscock, K.M. 2005. Hydrogeology: Principles and Practice. Blackwell Publishing, 389pp [ISBN 0-632-05763-7] Available as ebook from Library: http://findit.bham.ac.uk/ [New edition due out in 2014 – Hiscock & Bense (2014)] To get an impression of the groundwater consultancy world (and the suppliers of the software used in the module), a visit to the website of Environmental Simulations International is worthwhile [http://esinternational.com/water/].

03 24927	**ESCM329**	**Managing Geological Hazards & Anthropogenic Impacts**	**20 credits**
Level: H	**Semester: 1 & 2**	**Module Leader: Mike Rivett**	
NB: This module is only available to those students who will be in attendance for the full academic year			
Description:	**Aim:** To examine the nature and processes controlling geological hazards and anthropogenic impacts primarily from a geo-environmental perspective, and to evaluate options available for their mitigation and strategic management. Planet Earth is under stress, both from geological hazards and the impacts of past and present anthropogenic activity. Mankind has an impact on the environment, likewise, the environment has an impact upon mankind. Our understanding of the potentially complex interplay of natural geological phenomena and anthropogenic activity is emergent rather than complete. This module seeks to understand the nature and processes controlling geological hazards and anthropogenic impacts primarily from a geo-environmental perspective. Also, to evaluate risks posed by and to identify options available for their mitigation and strategic management. Geological hazards explored may include volcanic and magmatic systems, earthquakes, tsunami, slope stability and landslides. Anthropogenic impacts are evaluated, within the context of environmental impact assessment (EIA), and may include groundwater-contaminated land pollution and remediation, waste management in the geosphere (e.g. landfill, radioactive waste) and the development of geosphere-related more sustainable energy options (e.g. carbon capture and storage, shale gas).		
Learning Outcomes:	By the end of the module, students should be able to: understand the nature, principal causes and the effects of key geological hazards; understand the nature, principal causes and the impacts of a representative range of anthropogenic activities, both historical and current, or emergent; appropriately assess hazards and impacts within risk assessment frameworks; and, develop appropriate mitigation and remedial management strategies, including appreciation of emergent options and technologies		
List of module topics:	<u>Semester 1</u> - Environmental impact assessment - Groundwater - contaminated land pollution and remediation, urban, mining, agricultural - Waste management in the geosphere, incl. landfill disposal, radioactive waste disposal - More sustainable energy options, e.g. carbon capture and storage, shale gas <u>Semester 2</u> - Introduction to natural hazards - Earthquakes - Volcanoes - Landslides - Bolides - Tsunamis		
Key Skills:	Group work; Oral presentations; Poster presentation (as groups and individually); Techniques in environmental impact / natural hazards assessment and management.		
Delivery:	Lectures (42 hrs), open tutorials for coursework steering (2 hrs), student oral presentations (6 hrs). These are equally spread across Semesters 1 and 2.		

Assessment:	2 hour written examination (60%) comprising sections of both short answer and long answer questions. Coursework comprising (i) anthropogenic impact individual student poster in Semester 1 (20%) and (ii) geological hazards group project with group poster presentation and individual oral presentation contributions in Semester 2 (20%).
Assessment Submission dates *	Semester 1 poster, Week 10 Semester 2 poster Week 9 with presentations in Weeks 10 and 11
Essential Texts:	Journal and report citations will be provided for each lecture. Essential reading: Defra (2011), Guidelines for Environmental Risk Assessment and Management – Green Leaves III.

03 26161	GGM304	Climates of the Past	20 credits
Level: H	Semester: 2	Module Leader: Ian Fairchild and James Bendle	
Prohibited combination with:	GGM338 Nature and Society ESCM317 Palaeoclimates		
Description:	This module develops knowledge and understanding of past climates experienced on Earth, primarily by learning about how to interpret climate archives. There will also be coverage of modern climatology and a distinct focus on periods in the past which may serve as analogues for a warmer future. The examples are drawn across the Cenozoic (65 Ma to present), but there is also a distinct focus on Pleistocene and Holocene climates and the coursework is focused around such Quaternary examples.		
Learning Outcomes:	By the end of this module, you should be able to: • review, evaluate and critically synthesise current literature on environmental change • be able to evaluate the magnitude, pattern and rates of climate change during the Quaternary and early Cenozoic • assess how this can be established from the geological record • demonstrate an in-depth understanding of one key subject area related to the course in relation to relevant literature		
List of module topics:	• Introduction to Palaeoclimate Science • Climate Archives • Quaternary literature • Climate proxies: biomarkers • Climate proxies: oxygen isotopes • U-series dating and speleothems as multiproxy archives • Radiocarbon dating of archives • Coursework planning • Climate proxies: C H isotopes • Holocene palaeoclimates including case studies (3 hours) • Current climatology • Forcings, feedbacks and climate sensitivity • Plate tectonics and long-term climate changes • The Cenozoic • The Quaternary a orbital controls • Back to the Future concept and application to +1 to +4 degrees C warming (5 lectures) Debates on controversies in Quaternary science (4 hours)		
Key Skills:	The key skills are engagement with literature at the research frontier and developing both technical knowledge and critical appreciation of data quality and appropriate hypothesis building and testing.		
Delivery:	2 hours lectures, 2 hours quizzes, 1 hour coursework introduction, 4 hours debates on controversial issues		

Assessment:	Coursework is a 3000-word essay. Each student researches a topic in consultation with the module leader leading to a unique essay title related to the module. The examination is 1.5 hours and consists of two sections. Section A is a choice of one from 3 questions which has to be answered in 30 minutes. The three questions are drawn from a list of 12 or 13 questions provided in the lectures. Section B is a choice of one from two seen essay topics that are announced at the end of the lectures. Coursework and examination are weighted 50% each.
Assessment Submission dates *	Week 11, semester 2.
Essential Texts:	Bradley, R.S. 2014 *Quaternary Palaeoclimatology*. 3rd edition Ruddiman, W. 2000 *Earth's Climate. Past and Future.* Freeman Zachos, J.C. et al. 2001 Trends, rhythms, and aberrations in global climate 65 Ma to present. *Nature*, 292, 686-693.

03 23395	GGM305	Environment and Landscape Change	20 credits
Level: H	**Semester: 1**	**Module Leader: Warren Eastwood**	
Description:	A greater understanding of natural and human-induced environment and landscape changes is crucial in order for informed management practices to be applied. In this respect the module adopts a palaeoecological approach and a range of case studies will be examined over the last 20 thousand years or so in order to get a handle on how environments and landscapes have changed in the past. The module therefore adopts a 'palaeo approach' to examine human-environment interactions and the processes causing environment and landscape change at a variety of spatial and temporal scales. The module is prefaced by introductory lectures that provide a general introduction to the triggers and forcing mechanisms – both natural and human-induced – that effect environmental and landscape change as well as some of the techniques and 'palaeo' indicators that are used for its study. The rest of the module will follow a thematic approach consisting of lectures dealing with topics relevant to specific types of environment and landscape change. Typical topics include catastrophic environmental and landscape changes including flooding associated with the Mediterranean-Ponto-Caspian sea corridors and connections, catastrophic volcanism, late glacial-Holocene climate change, the origin of agriculture in Southwest Asia and the Neolithic transition, the early Holocene Forest (Re-) advance and refugia debate, Holocene climate variability and civilization/societal collapse, and sub-recent and catchment-scale environmental changes. The module will include short assignment workshop sessions designed to assist students with choosing an extended essay topic and appropriate means of searching for literature. Students will be encouraged to attend further individual meetings to clarify and focus the organization of their chosen extended essay.		
Learning Outcomes:	• Demonstrate familiarity with the factors that cause environmental and landscape change and a familiarity of some of the palaeo indicators that can be used to reconstruct past environmental changes. • Develop cogent, coherent and sustained arguments about significant issues related to natural and human-induced environmental change from a range of case studies. Demonstrate an in-depth understanding of one key subject area related to the themes of the course and in relation to relevant literature.		
List of module topics:	• Introduction to understanding how we go about studying past environment and landscape change • Low-Mid Latitude Climate Change & Vegetation Effects • Mid-High Latitude Climate Change & Effects • Origins of Agriculture • Societal collapse • Catastrophic environmental change I: Volcanism • Human Impacts (From 'Garden of Eden' to 'Ruined Landscape' to 'Lost Eden') • Anthropocene • Catastrophic environmental change II: Mediterranean-Ponto-Caspian connections *(Noah's Flood).* • Conclusion to Environment and Landscape Change (25,000 years of change)		

Key Skills:	**Subject/Discipline-specific Skills** • To have a working knowledge of the main natural and human-induced forcing mechanisms and triggers that cause environmental change • To have a working knowledge of some of the palaeo indicators that can be used to reconstruct past environmental changes • The ability to describe and interpret palaeoecological and palaeoclimatological datasets to reconstruct environmental change. **Generic and Intellectual (thinking) Skills** • The ability to retrieve, collate and interpret different sources of information in order to understand issues relating to Quarternary environmental change. • The ability to summarise and synthesise relevant information. The ability to develop and put forward reasoned arguments in written form.
Delivery:	Lectures: approx 20 hours Assignment Workshops: 4 hours Seminars: 6 hours Feed Forward session: 1 hour Feedback session: 1 hour
Assessment:	One 3000-word extended essay (50%). One x 1.5 hour examination paper (seen essay question) (50%).
Assessment Submission dates *	Essay Semester 1, week 11
Essential Texts:	Battarbee, R.W., Gasse, F. and Stickley, C. (eds.) (2004) *Past Climate Variability through Europe and Africa*. Springer, Dordrecht. [Main Library] Bell, M and Walker, M.J.C. (2005) *Late Quaternary Environmental Change*, 2nd edition Longman. Bradley, R. S. (1999). *Paleoclimatology. Reconstructing Climates of the Quaternary.* Academic Press. Burroughs, W.J. (2001) *Climate Change: A Multidisciplinary Approach.* CUP Grove, A.T. and Rackham, O. (2003) *The Nature of Mediterranean Europe: An Ecological History*. YUP. [Barnes, Main Library] IPCC (Houghton, J.T. et al.) 2001 *Climate Change 2001 the Scientific Basis*. CUP. See: http://www.grida.no/climate/ Lowe, J. J and Walker, M. J. C. (1997) *Reconstructing Quaternary Environments,* Longman, Essex. Mackay, A., Battarbee, R., Birks, J. and Oldfield, F. (2003) (eds.) *Global Change in the Holocene*. Arnold, London. Roberts, N. (1998) *The Holocene: An Environmental History* 2nd edition. Blackwell, Oxford. Walker, M. (2005) *Quaternary Dating Methods*. Wiley. Woodward, J. (editor) (2009) *The Physical Geography of the Mediterranean*. OUP, Oxford. Elias, S.A. (ed.) (2007) *Encyclopaedia of Quaternary Science*. Elsevier, London

03 19216	GGM310	Weather Climate and Society	20 credits
Level: H	**Semester: 1**	**Module Leader: Gregor Leckebusch**	
Prohibited Combination: ESCM316 Ore Deposits and Gemmology			
Description	The module is designed to make students familiar with basic aspects of mid-latitude weather (incl. different aspects of observations, analysis, and forecasts), climate (e.g. natural variability, anthropogenic climate change), and the way operational information will be used for benefit for society. This will include interfaces between scientific knowledge and end users in economy and society on climate scales. Specific applications will be highlighted: the potential of wind and solar power; the cost/benefit of the use of weather information by industry; understanding of climate variability; the two way relationship between climate and society and the methods of climate impact assessment.		
Learning Outcomes:	By the end of the module students should be able to: 1. analyse a synoptic weather chart and roughly recognise the actual large scale weather situation 2. understand the nature of climatic variability and change 3. review state-of-the-art downscaling techniques 4. describe basic applications of meteorological / climatological information from end-user and scientific perspective 5. understand basic concepts of atmospheric hazards risk assessment		
List of module topics:	L1: Introduction, Weather1 (Gen. Introduction, Synoptic Meteorology, Fundamentals of atmospheric science, meteorological observations, history of relation between atmospheric sciences and society) L2: Weather2 (Atmospheric movements, basic concepts of weather system dynamics, Waves in the atmosphere, etc.) L3: Climate1 (Basics & fundamentals of the climate system) L4: Climate2 (Seasonal & interannual variability (e.g. ENSO)) L5: Climate3 (Paleoclimatology, Past & Future Changes) L6: Climate4 (Downscaling of future climate change) L7: Weather & Society1 (Downscaling of extremes, impact modelling, impacts of extremes) L8: Weather & Society2 (Weather & Climate in politics, society, administration) L9/10: Climate & Society3 (Weather & Climate info used by industry)		

Key Skills:	• Knowledge of the fundamentals of Meteorology • Develop capability to analyse synoptic weather situation by means of surface and upper-air charts • Knowledge of fundamentals of the climate system and sources of its variability • Understanding the weather and climate systems interactions and basic understanding of the differences between weather and climate • Basic understanding of interactions between weather and society, industry and business • Basic understanding of meteorological applications in risk transfer mechanisms • Basic understanding of impacts of climatic extremes on society and economy
Delivery:	Lectures: 20 hours, seminars: 6 hours
Assessment:	Student group presentations (including 1 page fact sheets) 10% Essay (2500 words) 40% 1.5 hour written examination 50%
Assessment Submission dates *	Essay Semester 2, Week 1
Essential Texts:	Lutgens, F.K., E.J. Tarbuck & D.G. Tasa, 2012: The Atmosphere: An Introduction to Meteorology (12th Edition), 2012, Prentice Hall ISBN-10: 0321756312 | ISBN-13: 978-0321756312 Potter, T.D., B.R. Colman (Eds), 2005: Handbook of Weather, Climate, and Water: Dynamics, Climate, Physical Meteorology, Weather Systems, and Measurements. John Wiley & Sons, Inc. Editor(s):. ISBN: 9780471214908. Online ISBN: 9780471721604. DOI: 10.1002/0471721603 Urry, J., 2011: Climate Change and Society. Wiley, ISBN: 978-0-7456-5037-1. Palutikof, J., S.L. Boulter, A.J. Ash, M.S. Smith, M. Parry, M. Waschka, D. Guitart (Eds), 2013: Climate Adaptation Futures. Wiley, ISBN: 978-0-470-67496-3 Downing T E, Olsthoorn & Tol R S J. 1999. Climate, Change and Risk. London: Routledge. Harvey, L D. 2000. Climate and Global Environmental Change. Harlow: Prentice Hall. Boulter, S., Palutikof, J., Karoly, D. and Guitart, D. (eds.), 2013: Natural Disasters and Adaptation to Climate Change. Cambridge, UK: Cambridge University Press, in press <u>Related Scientific Journals:</u> Weather, Climate and Society (American Meteorological Society) http://journals.ametsoc.org/toc/wcas/current

03 19134	GGM312	Landscape and Urban Ecology	20 credits
Level: H	**Semester: 2**	***Module Leader: Jon Sadler***	
NOTE THAT THIS MODULE HAS A MAXIMUM NUMBER OF 50 STUDENTS			
Description:	The module will consider the sustainability of urban biodiversity in the UK. Emphasis will be placed upon the potential importance of urban habitats, their uniqueness and the application of appropriate ecological theories to urban areas. It will be argued that to understand fully the complexities of urban environments one needs to utilise results from both the natural and social sciences. Topics addressed will include the following: green corridors; metapopulations and gradient theory; system disturbance, monitoring and recovery; sampling; habitat restoration; sustainability.		
Learning Outcomes:	1. Demonstrate knowledge of key ecological processes and their application to urban environments. 2. Identify key strategies used to design, protect, and manage urban habitats. 3. Demonstrate competence in project / sample design. 4. Undertake and complete a field project in the local environment		
List of module topics:	**Lectures** 1. Landscape and Urban Ecology 2. Urban disturbance gradients 3. Connectivity and Corridors 4. Sampling and project design 5. URGENT - ecology of Birmingham 6. Un-muddying the waters – urban rivers and hydrology 7. Emerging disruptors of ecological function 8. Building for Biodiversity 1 – domestic spaces 9. Building for Biodiversity 2 - Ecologically mediated urban design 10. Course conclusion **Workshops** 1. Workshop – marking schemes and project design (feed forward) 2. Workshop – statistics (comparison of means) 3. Workshop – statistics (regression) 4. Workshop – statistics for project work (using SPSS)		
Key Skills:	• Sample design (Project) • Statistical analyses (using SPSS, Brodgar, Excel, PAST) (Project) • Project planning (Project) • Project reporting (Project) • Essay writing (Examination) • Ecological problem solving (Examination)		
Delivery:	Lectures (20 hours) Workshops (8 hours) Fieldwork (5 hours) Course Office hours for project design (6 hours)		
Assessment:	One 3000-word field project in semester 2 (50%). The project involves the creation of a research paper based on the results of an ecology study of a local (urban) environment. One x 1.5 hr written examination in the semester 2 examination period (50%)		
Assessment Submission dates *	Project Semester 3, week 1		
Essential Texts:	There is an extensive reading list supporting this module derived from journals. Details will be provided at the start of the module		

03 19136	GGM314	Applied Micrometeorology	20 credits
Level: H	**Semester: 2**	**Module Leader: Xiaoming Cai**	
Description:	This module will provide students with an understanding of: (1) the principles of meteorology at small scales (metres to kilometres), (2) the meteorological processes near the earth's surface (e.g., over a range of different surfaces/environments) associated with the exchange of heat, mass and momentum, and (3) transport and dispersion of pollutants in the atmospheric boundary layer.		
Learning Outcomes:	By the end of the module students should be able to: 1) demonstrate a knowledge of meteorological processes near the earth's surface and the exchange of heat, mass and momentum between the earth's surface and the atmosphere; 2) transfer this knowledge to applied micrometeorological problems in different environments e.g., urban/rural climate and air quality; become familiar with methods for analysing near-surface meteorological data: (a) to derive quantities such as heat and moisture fluxes; (b) to estimate energy budgets for a range of natural and human-made surfaces and to predict local climate; and (c) to assess the effects of micrometeorological processes upon air quality		
List of module topics:	• Survey of the atmosphere • Radiation characteristics • Radiation balance • Sensible heat flux and local climate • Atmospheric stability • Measurement and evaluation of energy fluxes in the surface layer • Effect of meteorology on dispersion • Urban meteorology • Urban heat island • Case study		
Key Skills:	Students undertaking this module will develop the following transferable skills: • Data collection (primary and secondary sources) • Data processing • Critical reading and independent literature searching • Project design • Analytical skills • Report writing		
Delivery:	• Lectures: 18 hrs • Computer practicals: 8 hrs • Visit meteorological station: 1 hr • Project workshop: 2 hrs • Revision: 1 hr		

Assessment:	One 3000-word practical project (50%) Choose 1 out of of 6 projects to write a scientific report in the style of an international journal paper, which includes abstract, literature review, methods, data analysis, interpretation and discussions of results, conclusion, and references. All the projects involve analysis of real data (meteorology and/or air quality) with reference to micro-meteorological processes. 1.5-hour exam paper (50%) • Section A (20 marks): short answers to 2 concepts (10 mark each) out of 4 choices. • Section B (20 marks): long answer to 1 question (out of 2 choices) in the topic of "Measurement and evaluation of energy fluxes in the surface layer" • Section C (60 marks): 2 questions (30 marks each) in mini-essay style in other topics (out of 4 choices).
Assessment Submission dates *	Practical project: Semester 2, Week 11
Essential Texts:	Oke, T R, (1987), *Boundary Layer Climates*, 2nd ed., Methuen, London International Association for Urban Climate's newsletters, http://urban-climate.com National Research Council of the National Academies of US, 2012: Urban Meteorology: Forecasting, Monitoring, and Meeting Users' Needs, The National Academies Press (obtaining free pdf file at http://www.nap.edu/catalog.php?record_id=13328)

03 23433	**GGM341**	**Environmental Protection**	**20 credits**
Level: H	**Semester: 1 & 2**	**Module Leader: Iseult Lynch**	
NB: A 10-credit version of this module (03 26490), that can be taken in either Semester, is available. Please contact the School.			
Probited Combination: ESCM316 Ore Deposits and Gemmology			
Description:	This module provides an overview of some of the key principles and approaches to environmental protection, including the precautionary principle, ecosystems services and environmental impact assessment, and key regulatory frameworks such as REACH, the Water Directive Framework (including the pesticide and wastewater directives), and the EU 2020 Biodiversity Strategy. Building on these frameworks, the module will introduce approaches to monitoring and quantifying current exposure to, and hazard from, pollutants as the basis of risk assessment, using examples from air, water and soil pollution and exposure via food. The second semester will use fundamental concepts from semester 1 and apply them via mathematical models of environmental processes in order to predict to future exposure (and hazard) in a range of scenarios. The module will conclude with an overview of the legal basis of environmental protection, including the legal interventions available to regulators in preventing and resolving environmental pollution incidents. Case studies will be used extensively to illustrate examples; including remediation of contaminated land, environmental impact assessment of human activity such as the high-speed rail, and environmental impacts of nano-enabled products.		
Learning Outcomes:	1. Demonstrate understanding of key concepts in environmental protection and the major EU environmental protection directives applicable to air, water, soil, plants and food 2. Show understanding and application of the principles of human exposure & health impacts assessment, including advantages & limitations of various sampling techniques 3. Demonstrate understanding and application of some simple mathematical modelling approaches and be able to apply these to a range of environmental problems. Show understanding of how key environmental protection concepts, principles and models are integrated into environmental protection strategies, policies, programmes and legislation.		

List of module topics:	**Topic 1: Environmental Protection Concepts and approaches**; includes lectures on -Precautionary Principle (e.g. REACH and other legislation, the GM crop debate etc.) -Environmental Impact Assessment e.g. High speed rail case study - Ecosystems services as means to value environment – covers water and land, but less coverage of air - Remediation of contaminated land -Remediation of contaminated land **Topic 2: Monitoring Human Exposure to Environmental Pollutants** – Exposure routes, confounding factors etc. DG-Sanco etc. – Air exposure including vehicle emissions - Air exposure **Topic 3: Evaluating Significance of Environmental Pollution** – Air quality Standards – Food, pesticides, dust etc. new challenges from nanoparticles **Topic 4: Understanding Environmental Behaviour of Organic Chemicals** 4 Lectures on PCBs & modelling pollutant behaviour etc. 1 lecture on pesticide residues in plants / soil etc. -Wastewater treatment processes and add fate of pollutants **Topic 5: Overview Environmental Protection Regulatory Role** 4 lectures.
Key Skills:	Policy analysis Data analysis Abstracting and synthesising information Evaluation of information Construction of an arguement Informed decision making Numerical and literacy skills
Delivery:	Lectures (28 hours) Workshops (6 hours) Case studies (6 hours)
Assessment:	One x 1.5 hour examination paper (50%). Students must answer 1 question from Topics 1-3 and 1 question from topics 4 & 5. One x 1500-word essay per semester (25% each)
Assessment Submission dates *	Essay1 Semester 1, week 10 Essay 2 Semester 2, week 10
Essential Texts:	Environmental Principles and Policies (2006) by Sharon Beder, EARTHSCAN, London, UK; ISBN: 9781844074044; The Modern English Legal System by Smith, Bailey and Gunn (2007), Sweet and Maxwell. ISBN: 9780421909106 Pollution: Causes, Effects and Control, 4th edition (2001), editor. R.M. Harrison, Pubd. Royal Society of Chemistry, Cambridge; ISBN: 978-0854046218.

03 27373	GGM348	Remote Sensing of the Cryosphere	20 credits
Level: H	**Semester: 1**	**Module Leader: Nick Barrand**	
Description:	In the module 'Remote Sensing of the Cryosphere', students will be introduced to the physical principles of remote sensing, standard remotely sensed image processing techniques, and a range of applied examples in the cryospheric sciences. The syllabus will contain an introduction to electromagnetic radiation theory, sensor types, and a variety of digital image processing techniques including: image acquisition, geometric and radiometric correction, image enhancement, vegetation, snow and ice indices, image classification, change detection and accuracy assessment. In addition to this theoretical background, students will learn specific technical skills through targeted practical sessions and classroom assessments and critically engage with the key debates in the cryospheric sciences, including: monitoring snow cover and snow-water equivalent; glacier and ice cap change; ice sheet mass balance; iceberg tracking; sea ice extent and thickness monitoring; assessing glacier hazards; and monitoring change of freshwater (lake) ice and permafrost. Practical sessions will be conducted to develop critical thinking and problem solving skills. The module will develop key technical, analytical and critical skills for applying emergent earth observation and geospatial technologies to problems in the cryospheric sciences.		
Learning Outcomes:	By the end of the module, students should be able to: - Demonstrate a strong understanding of the basic radiative processes that influence observed radiance. - Demonstrate a strong understanding of the electromagnetic spectrum and it's unique relationships to remote targets. - Confidently identify, extract and analyse quantitative information from remotely sensed imagery using numerous approaches. - Apple emergent remote sensing technologies to key questions in the cryospheric sciences.		
List of module topics:	Lectures 1. The Cryosphere in the Earth System. 2. Fundamentals: principles of earth observation. 3. Image acquisition: satellite systems, sensors and data formats. 4. Image processing: correction, enhancement, classification and change detection. 5. Glacier monitoring from remotely sensed data. 6. Geodetic measurement of ice sheet mass balance. 7. Seasonal sea ice: monitoring variability and trends. 8. Calving, icebergs and glacier-related hazards. 9. Land ice modelling: a remote sensing perspective. 10. Refresher and exam review. Practicals 1. Glacier mapping from space. 2. Svalbard glacier volume changes and geodetic mass balance. 3. Greenland glacier dynamics using synthetic aperture radar remote sensing. 4. Exploring Antarctica with Bedmap2. 5. Mapping Antarctic Peninsula snowmelt with microwave remote sensing.		
Key Skills:	Critical thinking, - Data management and exploration, - Spatial analytical GIS, - Remote sensing image interpretation, - Raster map algebra, - Image classification, - Time-series analysis.		

Delivery:	10 x 2 hour lectures. 5 x 3 hour computer practicals.
Assessment:	5 computer practicals (each, 10%) 1.5 hour exam (50%), Essay Style; 2 questions - 1 from each section. Each section is worth 50% of the examination mark
Assessment Submission dates *	Semester 2, Week 1, Thursday
Essential Texts:	Bamber, J.L. and A.J. Payne (Eds), 2004. *Mass balance of the Cryosphere*. Cambridge University Press, Cambridge, 644 pp. [ISBN:9780521808958] Cuffey, K.M. & Paterson, W.S.B., 2012. *Physics of Glaciers*. 4rd Edition, Elsevier Science Ltd. 480 pp. [ISBN:9780123694614] Rees, W.G. 2005. *Remote Sensing of Snow and Ice.* CRC Press, 312 pp. [ISBN:9780415298315]

03 24061	**GGM349**	**River Processes, Deposits and Environments**	**20 credits**
Level: H	**Semester: 1**	**Module Leader: Greg Sambrook Smith**	
Description:	This module develops approaches to help understand the fundamental controls on river processes, channel change and depositional systems. The module draws on latest research as well as classic ideas. The module evaluates the different innovative ways in which fluvial scientists tackle key questions in river research. A key theme is the interaction between fluvial processes, erosion and deposition. The module initially focuses on the smaller bedform and bar scale, before considering larger channel scale issues and deposits over a range of timescales. These topics are addressed across a broad range of river systems and scales varying from single grains to whole catchments, and turbulent events to Quaternary changes. Topics to be covered will include: • Techniques for measurement, Turbulent Boundary Layer (TBL) structure, methods of shear stress determination. • Flow separation, types of secondary flows, confluence dynamics, shear layers. • TBL structure, coarse sediment entrainment, and the initiation of bedforms. • Types of bedforms and bar forms in rivers: generative mechanisms, self-organization, dynamics and stability, deposits. • Sedimentology of bedforms, bars and channels; alluvial architecture of braided and meandering systems; preservation potential of sediments.		
Learning Outcomes:	By the end of the module the student will be able to: • Develop coherent and sustained arguments on the controls of fluvial erosion, sediment transport and depositional process events, rates and mechanisms. • Demonstrate an in-depth familiarity with key concepts, models and datasets appropriate to the quantification and interpretation of river geomorphological and sedimentological dynamics, through a critical engagement with published analyses in the international scientific literature. • Articulate a sound understanding of a range of monitoring and analytical strategies in the fluvial sciences.		

List of module topics:	Catchment Processes Measurement Techniques Flow Structure Coursework Session Suspended Load Bedload Bedforms and Sedimentary Structures Hyporheic Flow Formative Test Hydroecology 1 Hydroecology 2 Meandering Rivers Braided Rivers Channel Evolution Feedback and Exams
Key Skills:	Communication (written project report and exam answers) Numeracy (data analysis using Excel) Problem solving (determining methodology for project data analysis) Planning and organising (completing coursework to deadline)
Delivery:	28 hours of lectures, 2 hours of workshop
Assessment:	One x 3000 word research project (50%) One x 1.5 hour exam (50%): Answer any two essay style questions
Assessment Submission dates *	Research Project: Week 8 of Semester 1
Essential Texts:	Bridge, J. S. (2003) Rivers and Floodplains - Forms, Processes and Sedimentary Record, Blackwell Science Ltd, Oxford, UK; 504 pp. Additional journal articles will be provided at the end of each lecture to develop the material that is presented.

03 25908	GGM308	Wetland Environments	20 credits
Level: H	**Semester: 1**	**Module Leader: Nick Kettridge**	
Description:	Wetlands are an essential global carbon store and water resource, storing five times more carbon than the Amazonia rainforest and providing an important source of the UK's drinking water. This module studies the hydrological processes that control these critical ecosystems. The module examines how wetland hydrology is characterised, investigating evapotranspiration, ground water and unsaturated moisture dynamics within these environments. It shows how these processes impact wetland carbon dynamics and the wider catchment hydrology. Further, interactions between wetlands ecological and hydrological processes are explored and the vulnerability of these environments to increasing wildfire activity under a changing climate is assessed.		
Learning Outcomes:	By the end of the module the student will be able to: • Demonstrate a good understanding of fundamental concepts and methods used within hydrological sciences. • Apply these concepts and methods to represent the hydrological system and project its response to changing environmental conditions. • Articulate how models represent the environment and be familiar with some of the limitations of model simulations. • Perform laboratory/field techniques • Be aware of interconnections between hydrological, thermal and ecological processes and the impact of wildfire disturbance on wetland development.		
List of module topics:	• Evapotranspiration • Groundwater flow • Soil moisture • Water shed hydrology • Soil temperature • Ecohydrology • Wildfire		
Key Skills:	Computer skills, quantitative methods, computer modelling, laboratory skills, essay writing.		
Delivery:	Lectures, computer practicals, laboratory practicals		
Assessment:	Three 2000 word-equivalent research papers (33.333%). Students will have the option to submit an additional 2000 word research paper in Semester 1 for feedback.		
Assessment Submission dates *	Research papers: Semester 1, weeks 8 and 11. Semester 2, weeks 1 and 2		
Essential Texts:	Charman, D.J. 2002. Peatlands and Environmental Change, Wiley, Chichester. Hendriks, M.R. 2010. Introduction to Physical Hydrology. OUP (352pp). Rydin, H. & Jeglum, J. 2006. The biology of peatlands, Oxford University Press, Oxford.		

03 27192	GGM317	Biodiversity and Conservation Management	20 credits
Level: H	**Semester: 1**	**Module Leader: Lesley Batty**	
NB: A 10-credit version of this module (03 27621), that can be taken in Semester 1, is available. Please contact the School.			
Description:	The module applies ecological theory acquired in *GGM214 (03 18182) Ecological Systems* to focus on the issues around global and local biodiversity and its management. The module will provide background on both policy and legislation and how this can be used to provide a structure for conservation. Major concepts of small populations, ecosystem function and fragmentation will be discussed in the context of practical conservation. Current issues and developments in conservation policy such as biodiversity offsetting will be highlighted. The module will use a variety of case studies from the terrestrial, aquatic and marine environments to illustrate key ecological concepts within the context of conservation.		
Learning Outcomes:	Present and synthesise information related to the key threats to biodiversity Critically assess how biodiversity is measured for conservation purposes Appreciate the range and complexity of legislation associated with conservation Identify key strategies used to design, protect and manage habitats Use case studies to appraise how strategies are used to conserve and restore habitats and species Evaluate current developments in conservation policy Integrate and evaluate information acquired through lectures, directed reading and site visits to formulate an ecological management plan for a local nature reserve.		
List of module topics:	Biodiversity and how to measure it Key threats to Biodiversity including fragmentation, climate change, pollution and invasive species Conservation legislation and policy Habitat and Species Management The issues of small populations Biodiversity offsetting and Ecosystem Services		
Key Skills:	Oral Presentation Skills Field note recording Critical Analysis of literature Management Plan writing Essay writing		
Delivery:	Lectures 16 hours Seminars 3 hours Project Supervision 3 hours Workshops 5 hours Fieldwork 3 to 6 hours (To be confirmed) Supervised Independent Work 6 hours		
Assessment:	Assessments: 3000 word management plan (50%) 3000 word essay (50%) Formative Assessment: Group presentations within seminars Feedback on field notebook Canvas based discussion		
Assessment Submission dates *	Essay Semester 1, week 9 Management Plan, Semester 2 week 1		
Essential Texts:	Gaston, K.J. & Spicer, J.I. (2004) Biodiversity: an introduction. 3nd Edition. Blackwell Science. Primack, R.B. (2002) Essentials of Conservation Biology. 3rd Edition, Sinauer Associates, Inc. Sutherland, W.J. & Hill (eds) (1995) Managing habitats for conservation, Cambridge University Press		

03 21780	GGM342	Environmental Governance	20 credits
Level: H	**Semester:2**	**Module Leader: Julian Clarke**	
Description:	This module examines the ways in which uses of the natural environment are regulated, from policy and law to market-based approaches, through the lens of governance. Based around this concept the module will consider how relationships between societies and the natural resources and environments on which they depend are currently organised (through policies, law/regulation, discourses of sustainability and ecological modernisation etc.), and what alternatives might be considered. Themes to be explored include: theories of environmental governance; environmental policy – local, regional, national, global case studies; environment and capitalism; the interrelations between governance and sustainable development; trading the environment; key concepts in environmental law; international environmental politics; and seminars and key texts in environmental governance.		
Learning Outcomes:	By the end of the module the student will be able to: • understand the evolution and contemporary manifestations of environmental governance, its underlying theories and methods. • appreciate its practical application through examination of specific case studies. • critically assess the effectiveness of current governance frameworks in policy settings including climate change, agriculture, water governance, nature conservation and landscape protection. • acquire transferable skills including presentational techniques, critical thinking and application of group work activities, debate and discussion of complex issues, and individual research.		
List of module topics:	***Indicative only (2013-14 academic year; lectures may vary year on year)*** • Introducing environmental governance (x2) • The UK and the challenge of environmental governance • Policy case study: (1) agri-environmental governance (2) water governance (3) waste governance (4) governance and English and Welsh planning • Governance as markets: trading the environment • Global environmental governance: the case of the European Union • Seminar presentations • Revision session		
Key Skills:	Individual research (data analysis, synthesis), presentational techniques, and critical thinking. Group work activities, debate and discussion of complex issues.		
Delivery:	Lectures, research-led case studies and group presentations. 20 hours lectures, 10 hours workshops, 2 hours seminars		
Assessment:	1x 2500 word essay (33%); 1x2hr exam (students to answer 2 essay style exam questions; 67%)		
Assessment Submission dates *	Semester 2, Week 11		
Essential Texts:	Carter N 2007 The politics of the environment CUP Cambridge Clapp J, Dauvergne P 2005 Paths to a green world: the political economy of the global environment. MIT Press, Cambs. Mass. Eckersley, R. 2004 The green state: rethinking democracy and sovereignty MIT Press, Cambs. Mass. Jasanoff S, Martello (eds) 2004 Earth politics: local and global in environmental governance MIT Press, Cambridge, Mass. Lafferty W (ed.) 2004 Governance for sustainable development Edward Elgar, Cheltenham Paavola J, Lowe I (eds) 2005 Environmental values in a globalising world: nature, justice and governance. Routledge, London Park J, Conca K Finger M (eds.) 2008 The crisis of global environmental governance: towards a new political economy Routledge, London		

03 23145	GGM322	Gender, Body & Performance	20 credits
Level: H	**Semester: 2**	**Module Leader: Phil Jones**	
Prohibited combination with:	GGM312 Landscape and Urban Ecology GGM342 Environmental Governance GGM314 Applied Micrometeorology		
Description:	Geographies of gender and the body have become increasingly prominent within academic debates over the last decade. This module will combine an exploration of this growing body of theory, with a series of practical exercises and activities which will provide insights into the operationalisation of these concepts. Non-representational and performative theories will form the core of the course and these will be examined to see how they can be used to inform a variety of different issues. Student-centred work will be undertaken to explore these themes within the urban spaces of Birmingham. A variety of 'performances' will be undertaken including psychogeographic mapping, sense walking and artistic interventions. The field work will form the basis of fortnightly workshops with non-assessed informal presentations to feedback on the activities.		
Learning Outcomes:	• understand the key debates in the literature on geography, gender and the body • apply performative theories to a variety of field-based activities, synthesising different approaches • critically evaluate everyday relations between bodies and spaces through key theoretical lenses		
List of module topics:	Week 1 Bodies & exploration Week 2 Affectual and emotional geographies Week 3 Indisciplined bodies Week 4 Mapping the body Week 5 The Porous Body Week 6 Virtual Bodies Week 7 Art & Performance Week 8 Bodies in Motion Week 9 Liminality sex & the carnivalesque Week 10 Summary of themes & exam prep		
Key Skills:	Critical thinking Presentation skills Team work Creative practice		
Delivery:	20 hours lecture 13 hours workshops 4 x independent group fieldwork activities within Birmingham (~8-12 hours)		
Assessment:	1 x 3000 portfolio essay (50%) 1 x 90 minute exam, two unseen essay answers		
Assessment Submission dates *	Portfolio essay: Semester 2 week 9		
Essential Texts:	*Debord G (2006 [1958]) Theory of the Dérive in Knabb K* Situationist International Anthology *Revised and Expanded Edition, Bureau of Public Secrets, Berkley Ca.* *Pile S (2010) Emotions and affect in recent human geography* Transactions of the Institute of British Geographers *35;1 5-20* *Foucault M (1977) Discipline and punish: the birth of the prison London, Allen Lane Chapter 3 'Panopticism'*		

03 27193	GGM332	Cultural Geographies of Development	20 credits
Level: H	**Semester: 1**	**Module Leader: Pat Noxolo**	
Prohibited combination with:	GGM305 Environment and Landscape Change GGM312 Landscape and Urban Ecology GGM314 Applied Micrometeorology GGM348 Remote Sensing of the Cryosphere		
Description:	There was a time in development theory and practice when 'culture' was seen as a collection of inconvenient local traditions that would be swept away by modernisation. But culture has proved remarkably adaptable, so that globalisation has only increased cultural diversity and the awareness of difference. This module explores what is meant by culture and its changing relationships with the spaces and places of development. How is culture changing and adapting in relation to a range of development practices, and what are the challenges of living and working with cultural difference in an increasingly mediated and interconnected world? What roles can cultural practices, skills and knowledges play in social, political and economic development? And what are the implications for development of the increasingly diverse cultures of development practitioners, organisations and institutions?		
Learning Outcomes:	By the end of the module students should be able to 1. Discuss some of the major theories and critical issues surrounding the cultural geographies of development, including questions of inequality, voice, and participation 2. Critically assess the roles of culture in a range of practices and experiences of development. 3. Analyse and evaluate a range of cultural representations in terms of what they convey about changing cultural geographies of development.		
List of module topics:	**Week one**: Introduction **Weeks two to five**: Culture in development geographies These four lectures push past the idea that culture is a 'backward' force of traditionalism in development and engage with recent reassessments of the dynamism and value of culture for development, as well as the roles of cultural processes and practices in mediating and critiquing the often dramatic and rapid changes brought about by development. **Weeks six to ten**: Cultural geographies of development These five lectures turn the critical spotlight on the cultural geographies of development practitioners, organisations and institutions. They draw on a range of critical theories that aim to make cultural assumptions and biases visible, and, using a range of case studies, they interrogate the value of reflexivity and self-awareness in the face of enduring material inequalities. **Week eleven**: Revision		
Key Skills:	• Have a conceptual understanding of the ways in which geographers and others conceive of the world and be able to contest and challenge the provisional nature of that geographical knowledge and understanding • Analyse, evaluate and synthesise published geographical information • Communicate geographical concepts, ideas and results to a professional standard and through reasoned argument by written, oral and visual means • Work effectively and efficiently, both individually and as a member of a group • Plan, design and conduct a piece of independent geographical research and produce a final report by: o evaluating the issues involved in the design and execution of a field-based or other type of research activity (including its ethics and a risk assessment). o collecting, recording, processing and integrating data from a variety of sources using appropriate techniques Presenting the findings of the research project to a professional standard		

Delivery:	One lecture per week, with some in-class discussion, plus a more student-led seminar every other week. A lengthy reading list will be given at the outset, with key readings for each lecture. Instructions and readings for seminars will be given one week prior to each seminar.
Assessment:	1 x 3000 word essay (50%) This assessment tests your ability to undertake independent work, and to apply critical theory to cultural representations. It will involve you drawing on reading from the reading list and beyond to analyse and evaluate relevant cultural representations in relation to the cultural geographies of development. 1 x 1.5 hour exam (50%) This assessment tests your understanding of the theories and critical issues raised in the lectures, and your own critical ability to compare, contrast and evaluate the lecture material, using relevant examples and concepts from your independent reading.
Assessment Submission dates *	Semester one, week eleven for the coursework
Essential Texts:	There are no essential textbooks for this module, and an extensive reading list will be given in the module handbook at the start of the module. However, if you would like to do some preliminary reading, the following would be worthwhile starting points: Crewe, E. and Harrison, E. (1998) *Whose Development? An Ethnography of Aid*. London: Zed. (especially Chapter 2, and Chapter 7) Noxolo, P., Raghuram P., and Madge, C (2011) 'Unsettling responsibility: postcolonial interventions', in *Transactions of the Institute of British Geographers*, 37, 3: 418-429 Noxolo, P. (2012) 'One world, big society: a discursive analysis of the Conservative Green Paper on International Development', in *Geographical Journal*, 178, 1: 31-41 Olson, E. (2008) Common belief, contested meanings: development and faith-based organisational culture, in *Tijdschrift voor economische en sociale geografie*, 99 (4), pp. 393-405 Sitko, N. (2008) 'Maize, food insecurity and the field of performance in Southern Zambia' *Agriculture and Human Values*, 25, pp. 3-11

03 25907	GGM337	War and Peace in the Middle East	20 credits
Level: H	**Semester: 1**	**Module Leader: Adam Ramadan**	
Prohibited combination with:	GGM305 Environment and Landscape Change GGM349 River Processes and Environments		
Description:	This course aims to give students a critical understanding of the political geography of the contemporary Middle East. It will introduce students to a series of key approaches in postcolonial and political geography, through which conventional images and stereotypes of the region might be unsettled and problematised. The course explores colonial legacies, geopolitical imaginaries and contemporary realities through a series of in-depth case studies. These case studies are inserted within a broad overview of regional geopolitical relations, from the First World War to the 'War on Terror'. Topics will be explored through critical theoretical approaches to geopolitics, power, sovereignty and territory. This will include work by Edward Said, Geroid Ó Tuathail, Giorgio Agamben, Derek Gregory and Stuart Elden. Students will be expected to gain a working knowledge of these theoretical approaches, and be able to use them in analysing events in today's Middle East.		
Learning Outcomes:	By the end of the module the students will be able to: Demonstrate a critical understanding of the complex geographies, colonial legacies and postcolonial realities of the Middle East. Critically analyse religious, national and political identities, and their roles in conflict Understand and utilize approaches from postcolonial theory and political geography in their work. Think critically about their own relationship(s) with the Middle East, and the forms of power/knowledge that enable such relationships.		
List of module topics:	Topics will include: - Orientalism and the politics of representation; - Zionism, nationalism and sectarianism; - The Arab-Israeli conflict and the 'peace process'; - Palestinian refugees and national liberation; - The Lebanese civil war and urban geopolitics; - The Gulf wars; - The 'War on Terror'; - Obama's 'new beginning'; - Contingent sovereignty and drone warfare; The 'Arab Spring'.		
Key Skills:	Essay writing Political problem solving		
Delivery:	Lectures: 20 hours Seminars: 10 hours		
Assessment:	1 x 2,200 word essay (33%) 1 x 2 hour exam (67%)		
Assessment Submission dates *	Semester 1, week 11		
Essential Texts:	Said, E.W. (1978, 1995) *Orientalism*. London: Vintage Gregory, D. (2004) *The Colonial Present*. Oxford: Blackwell. Agamben, G. (1998) *Homo Sacer: Sovereign power and bare life*. Stanford: Stanford University Press.		

03 27196	GGM338	Understanding Nature-Society Relations: the Ecological Century	20 credits
Level: H	**Semester: 1**	**Module Leader: Jon Oldfield**	
Prohibited combination with:	GGM310 Weather, Climate and Society GGM349 River Processes, Deposits and Environments		
Description:	The 20th century has been referred to as the ecological century, a period in which humankind became aware of its overwhelming influence on the wider environment and environmental agendas began to influence policy decisions at the very highest levels. It witnessed the emergence of large-scale, international scientific initiatives (e.g. 1957-8 International Geophysical Year), popular environmental protest, and global environmental policy agendas underpinned by concepts such as sustainable development. The course explores these issues and associated understandings of the relationship between humankind and the wider environment. It pays particular attention to the experience of the Soviet Union and the West.		
Learning Outcomes:	• Demonstrate an understanding of dominant socio-environmental concepts and thinking during the 20th century • Appreciate the ways in which the Cold War and Big Science contributed to our understanding of the physical natural environment • Critically evaluate the effectiveness of sustainable development and related concepts • Show an appreciation of the differences and similarities between Soviet/Russian and Western engagements with the natural environment • Present ideas and arguments related to the key features of the course in a clear and concise manner both orally and in written form		
List of module topics:	Main topics include: • Biospheres, noospheres and the anthropocene • Rise of ecology and the ecological sciences • Cold War and the environmental sciences • Soviet understandings of the physical environment • Socialism and the environment • Popular environmental awakening • The rise of international environmental politics and agendas • Sustainable development		
Key Skills:	**Academic Skills:** Effective note-taking Essay writing Group discussion Critical thinking **Personal /Professional development:** Written communication Oral communication Organisational skills		
Delivery:	Lectures: 20 hours Seminars: 10 hours		
Assessment:	1 x 3000 word essay (50%) 1 x 1.5 hour exam, essay style (50%)		
Assessment Submission dates *	Semester 2, Week - TBC		
Essential Texts:	McNeill, JR. 2000. Something new under the sun: an environmental history of the 20th century Penguin Simmons, IG. 2008. Global environmental history 10000BC – 2000AD, Edinburgh University Press McNeill, JR. and Ungar, C.R. (eds) 2010. Environmental histories of the Cold War, CUP		

03 26337	GGM339	Environmental Justice	20 credits
Level: H	**Semester: 2**	**Module Leader: Rosie Day**	
Prohibited combination with: GGM351 Geographies of Incarceration			
Description:	Through this module, students will explore the intersections of environmental issues and social justice, conceptual territory often termed environmental justice or environmental inequality. They will be introduced to various notions of social justice, including distributional theories, procedural theories and those concerning 'recognition'. These theories will be applied to understand various cases studies from the UK and form other parts of the world, in order to understand and analyse how various environmental issues such as pollution and climate change have different impacts on different sectors of the population. We will also consider how and why different people might experience the environment differently, and how their ability to derive benefits might not be equal. As well as analysing problems, students will consider policy perspectives: both how best to avoid engendering injustice in environmental policy making, and what kinds of policies might be needed to address existing inequalities. Substantive topics considered in the course of the module might include the distribution of air pollution and its effects; vulnerability to natural hazards; inclusive environmental design; fuel poverty. The module will complement other areas of study in the environmental, social and planning pathways of the geography undergraduate programme. It will develop key skills in critical conceptual thinking, problem solving and policy analysis and should be highly relevant to students considering careers in environmental, social and energy policy; planning and urban design; natural resource management; and social work as well as those more generally needing strong analytical and independent thinking skills for graduate level employment.	
Learning Outcomes:	By the end of the module students should be able to: - understand and explain how different sectors of the population such as older people, children and different racial groups may be differentially affected by environmental problems and environmental change - articulate different theories of social justice including theories of distribution, procedure and recognition; and apply these to understand the effects of environmental problems and environmental change on people - analyse complex situations to understand people-environment relations from competing and complementary conceptual perspectives - show an awareness of how environmental inequalities and injustices may operate across different scales, from the local to the global - consider the justice implications of policies that have positive or negative environmental impacts.	
List of module topics:	**Lecture topics to include:** Distributional environmental justice and environmental racism; access to greenspace and nature; Procedural justice, environmental knowledge and participation; Recognition, disability and inclusive design; Vulnerability, childhood and the environment; Gender, eco feminism and the environment; Energy justice and fuel poverty; Vulnerability to natural hazards	
Key Skills:	Application of theory to real world situations; equality analysis skills; critical policy analysis; discussion and debate; discussion chairing; general analytical and critical thinking skills; empathy and ability to understand others' positions	
Delivery:	20 hours lectures; 10 hours seminars	
Assessment:	34% 2,000 word essay; 66% exam. 2 essay questions must be answered in 2 hours	
Assessment Submission dates *	Essay Semester 3, week 1	
Essential Texts:	Walker, G (2012) Environmental Justice Schlosberg, D (2007) Defining environmental justice: theories, movements and nature	

03 24539	GGM351	Geographies of Incarceration	20 credits
Level: H	**Semester: 2**	**Module Leader: Dominique Moran**	
Prohibited combination with: GGM339 Environmental Justice			
Description:	The so-called 'punitive turn' has brought about new ways of thinking about geography and the state, and has highlighted spaces of incarceration as a new terrain for exploration by geographers. This module introduces 'carceral geography' as a geographical perspective on incarceration, tracking the ideas, practices and engagements that have shaped its development, informed by and extending theoretical developments in geography, but also interfacing with contemporary debates over hyperincarceration, recidivism and the advance of the punitive state. The module will convey a sense of the debates, directions, and threads within carceral geography, tracing the origins of this sub-discipline of human geography, its synergies with criminology and prison sociology, and its likely future trajectories. The module will cover three main themes; the nature of carceral spaces and experiences within them; spatial or distributional geographies of carceral systems; and the relationship between a notion of the 'carceral' and an increasingly punitive state. By synthesizing existing work in carceral geography, and by exploring the future directions it might take, the module will develop a notion of the 'carceral' as spatial, emplaced, mobile, embodied and affective.		
Learning Outcomes:	By the end of the module students should be able to: • Demonstrate a critical understanding of the theoretical underpinnings of carceral geography, and its relationship to theory-building within contemporary human geography. • Demonstrate a critical understanding of the transdisciplinary nature of carceral geography and its relationship to the cognate disciplines of criminology and prison sociology. • Show an awareness of the relationship between the debates and discourses within carceral geography and contemporary criminal justice policy in the UK and elsewhere. • Critically analyse and evaluate scholarship around three themes: (the nature of carceral spaces and experiences within and between them; spatial or distributional geographies of carceral systems; and the relationship between the carceral and an increasingly punitive state) drawing on appropriate literatures and case studies		
List of module topics:	1. Preview 2. Space and Agency 3. Carceral TimeSpace and Embodiment 4. Prison Location 5. Carceral Mobility 6. Inside/Outside 7. Reoffending and Reintegration 8. The carceral 'churn' 9. Carceral Landscapes 10. Overview PPT slides and reading lists will be provided in advance of classes.		
Key Skills:	Critical thinking Intellectual and interdisciplinary engagement Essay writing		
Delivery:	10 x 2hr lectures Up to 5 x 2hr seminars based on directed reading and focussed on exam ad coursework answers Up to 5 x 2hr interactive film discussion sessions		

Assessment:	One 1.5hr essay-style examination with unseen questions. 2 questions to be answered from a selection of c10 (50%) One 3000 word essay based on set reading materials (50%). An *optional* mock exam under exam conditions, with feedback on exam answers, will be offered. Feedback on coursework will be provided in Semester 3.
Assessment Submission dates *	Semester 2 Week 11.
Essential Texts:	Moran, D (forthcoming2014) Carceral geography: Spaces and Practices of Incarceration Ashgate, Farnham Moran, D., N Gill a7 D Conlon (Eds) (2013) Carceral Spaces: Mobility and Agency in Imprisonment and Migrant Detention Ashgate, Farnham Dirsuweit, T 1999 Carceral spaces in South Africa: a case study of institutional power, sexuality and transgression in a women's prison Geoforum 30 71-83

03 27194	GGM354	Network Geographies	20 credits
Level: H	**Semester: 1**	**Module Leader: Emmanouil Tranos**	
Prohibited combination with:	GGM348 Remote Sensing of the Cryosphere GGM310 Weather Climate and Society		
Description:	This module aims to introduce, advance, and critically evaluate a 'network understanding' of our world. Networks have long formed a distinctive element of geographical study. Various sub-fields of geography, such as transport, economic and urban geography, are heavily based on networks both from a conceptual and an analytical point of view. Moreover, the digital revolution, associated with developments in social media and connectivity as well as heightened flows of information within and between urban regions, has greatly enhanced the relevance of a network approach to contemporary socio-economic and cultural trends. This module will approach the above issues both from a theoretical and practical perspective.		
Learning Outcomes:	By the end of the module, students should be able to: • Understand the network structure of cities • Recognise the function of networks in transport geography and their impact in spatial economy • Possess an enhanced knowledge of basic social network analysis tools • Access and use data from social media		
List of module topics:	Cities as networks Urban networks and the spatial economy Basic notions of transport geography Social Network Analysis, tools and concepts Big Data: what is this, why is it relevant for geographer and how can we use it?		
Key Skills:	Social Network Analysis with the use of user-friendly software Spatial Interaction Models Access and utilise digital data for research purposes		
Delivery:	2hrs lectures per week and 2hrs of computer practicals every second week		
Assessment:	1 x 3000 word equivalent essay (50%) 1 x 1.5 hour exam (50%)		
Assessment Submission dates *	TBC		
Essential Texts:	RODRIGUE J.-P. (2013) *The geography of transport systems*. Routledge, Oxon. BATTY M. (2013) *The New Science of CIties*. MIT Press, Cambridge, Massachusetts. NEAL Z. (2013) *The Connected City: How Networks are Shaping the Modern Metropolis*. Routledge, New York		

03 27140	GGM355	Alternative Economies	20 credits
Level: H	**Semester: 2**	**Module Leader: John Round**	
Description:	Within economic geography there is an overarching belief that the formal neo-liberal market is the predominant form of economy and that even those countries that do not operate such a system are moving towards it. There is little consideration of both alternative forms of economy and the ways in which individuals, families, households and/or networks employ a range of both formal and informal practices to sustain their everyday lives. In other words our everyday lives have little relation to the textbook neo-liberal economic module. Even though this model is a relatively recent construct, and informal practices, by definition, have existed for much longer in disciplines such a management studies there is currently much excitement about the discovery of 'the informal'. Therefore, this module explores the nature of alternative economies through an examination of informal practices, the role of networks, state/society relations, migration and how all of these relate to space and place. Building on the themes developed in the second year economic Urban & Regional Economy and Social and Political modules this course looks at how we can theorise everyday life and practices through an alternative economies lens. It draws upon in-depth research, conducted by the module's leader, and empirically based case studies from Birmingham, Russia and Japan. Theoretically the course draws from geography, sociology, labour studies and management disciplines and is based in a post-structuralist political economy approach. The module is made up of 10 2 hour lectures and 10 1 hour workshops, students will be asked to make group presentations within the workshops on an alternative economy of their choosing. For this they will be expected to undertake a small amount of participant observation research upon which the presentation will be based.		
Learning Outcomes:	Critically analyse the different forms of economic practices that exist across the world Demonstrate a clear understanding of the power, class and gender relations that exist within different economic forms Present clear understandings, in both written and verbal forms, of the academic and popular press literature on alternative economies Apply theories discussed in the course to real world issues		
List of module topics:	**Lecture Outline:** 1. What is 'the economy?' 2. Neo-liberalism and the role of international actors 3. The informal practices of everyday life 4. Work and informality 5. Migrants and the precariat – Who wants to be informal? 6. The illegal economy 7. Tax and the discourse of 'off-shore' 8. Welfare and care 9. The informal and the entrepreneur 10. Module overview and exam preparation		

	Workshop Outline 1. Thinking about the economy 2. Power and international actors 3. Reading Gibson-Graham 4. Discussing work experiences 5. Preparing the presentations 6. Debate on migration 7. Presentation work 8. Our informal practices 9. Presentations Exam preparation
Delivery:	Lectures 20 hrs Seminars 10 hrs
Assessment:	1x1.5 hour exam (50%) – essay style 2,500 word essay (40%) – on an aspect of the informal economy of the student's choice Small groups Presentation and class participation (10%)
Assessment Submission dates *	Semester 2, week to be confirmed
Essential Texts:	Gibson-Graham, J.K. (1996) The End of Capitalism as We Knew It? A Feminist Critique of Political Economy. Oxford: Blackwell. Williams, C., Round, J. and Rodgers, P. (2013) The role of informal economies in the post-Soviet world: the end of transition? Routledge, Oxford. Round, J., Williams, C. and Rodgers, P. (2010) The Role of Domestic Food Production in Everyday Life in post-Soviet Ukraine. Annals of the Association of American Geographers. Vol. 100, No. 5, pp. 1197 – 1211.

03 27894	GGM356	Geographies of Children and Young People	20 credits
Level: H	Semester: 2	Module Leader: Sophie Hadfield-Hill	
Prohibited combination with:	GGM312 Landscape and Urban Ecology GGM314 Applied Micrometeorology		
Description:	This module addresses the theoretical and methodological underpinnings of understanding children and young people's everyday lives in the context of urban, social, cultural and environmental change. The sub-discipline of Children's Geographies has bought increased academic and policy attention to the importance of understanding children and young people's everyday lives. The module will draw on contemporary research projects, literature and academic and policy debates about the socio-spatial lives of children. Importantly the module will address the diversity of childhood experiences, offering distinctions between and within majority and minority worlds. Thinking geographically about children and young people's use of environment, positionality, culture, participation, agency and citizenship is key to exploring the social constructions of childhood. The content will be delivered over ten, two hour lectures, five one hour workshops and a local half-day Midlands based external visit.		
Learning Outcomes:	By the end of the module students should be able to: a) Discuss the significance of geography for understanding the everyday lives of children and young people; b) Evaluate and narrate the changing conceptualisations of children and childhood; c) Demonstrate a clear understanding of the diversity of childhood experiences across and within environments d) Apply theoretical and methodological understandings of Children's Geographies in their analysis of space and place.		
List of module topics:	**Lecture Outline:** 1. What is geographical about childhood? 2. Shifting conceptualisations of childhood 3. Childhood and the 'cultural turn' 4. Urban planning and design 5. Rights and participation 6. Institutional childhoods 7. Childhood and work 8. Children and development 9. Thinking methodologically and ethically 10. Summary and revision		
Key Skills:	Reflecting writing Critical thinking		
Delivery:	10 x 2 hour lectures Seminars / External visits		
Assessment:	- 1 x 2,500 word report (45%) - 1 x 2 hour exam (55%) 1x 1,000 formative reflective narrative		
Assessment Submission dates *	TBC		
Essential Texts:	James, A. and Prout, A. (1997) *Constructing and reconstructing childhood: contemporary issues in the sociological study of childhood.* Falmer: London Holloway, S. and Valentine, G. (2000) *Children's Geographies: Playing, Living, Learning*. Routledge: London. Valentine, G. (2003) Boundary Crossings: Transitions from Childhood to Adulthood. *Children's Geographies,* 1 (1): 37-52. Valentine, G. (1996) Angels and devils: moral landscapes of childhood. *Environment and Planning D,* 14 (5): 581-599. *An extensive reading list will be given with each lecture.*		

08 10698	URS305	Contemporary Issues in Urban Development and Planning	20 credits
Level: H	**Semester: 1 & 2**	**Module Leader: Austin Barber**	

NB: For students who are only here for one Semester, this module can be taken in either semester 1 or 2 but remains at 20 credits. Please contact the School. Please note there is limited space on this module.

Description:	This module explores contemporary aspects of the urban development process and the role of planning in mediating diverse interests in complex city environments. It is designed to enable you to develop knowledge and skills that will provide a foundation for pursuing careers in planning, property, urban design and related professional fields. It begins by examining the development process, including property market dynamics and the roles of key actors. It considers the tensions and trade-offs between developers, residential and business communities, and public sector interests, and how these are played out through the planning system. Using case studies we look at how these trade-offs shape the development of the built environment in terms of mixed uses, urban design, public space and other respects. The module takes a practical and applied approach to the topic. Students engage in hands-on work on development sites in Birmingham and the programme includes contributions from planning, property and urban design practitioners from the private and public sectors in the city. In the second half of the module students undertake group project work in conjunction with planning and regeneration organisations in Birmingham. These projects are based around real-life development and place-making processes in the city and the student work feeds directly into policy making activity in these areas.
List of module topics:	National Planning debates; contested priorities Urban Development Process: actors and interests The role of Planning in the development process Public-private relations in shaping the built environment Principles of Place-making and Urban Design Site planning appraisal briefing and presentations Practitioner case studies of city developments Jewellery Quarter case study briefing and visit
Key Skills:	Report writing and layout for professional audiences Site planning appraisal and analysis Basic creative masterplanning for site development Visual and oral presentation skills Engagement with professional practitioners as clients Project management and team work
Delivery:	**Semester 1:** 20 hours of scheduled lectures, presentation sessions, practitioner seminars, and site visit to the Jewellery Quarter district of Birmingham **Semester 2:** project work in association with planning practitioners, combining 3 scheduled sessions at professional workplaces around the city (including final presentations) plus independent fieldwork and preparation.
Assessment:	• An individual report of up to 3,000 words on planning challenges and the mediation of contested interests in the urban development process (50%); this draws upon work undertaken for group site appraisal presentations in the autumn semester. • A Planning Project (50% total); this comprises a group presentation to professional practitioners (10%) and an associated individual project report (40%)
Assessment Submission dates *	Report: Semster 2, Week 2 (formative presentations semester 1, week 7) Planning project: group presentations semester 2, week 10; individual report semester 3, week 1.
Essential Texts:	Adams, D. and Tiesdell, S. (2013) *Shaping Places: Urban Planning, Design and Development*, London: Routledge. Rydin, Y (2011) *The Purpose of Planning: Creating Sustainable Towns and Cities,* Bristol: Policy Press Punter, J. ed (2009) *Urban Design and the British Urban Renaissance*, London: Routledge.

08 22865	URS306	Regenerating Urban Communities	20 credits
Level: H	**Semester: 1 & 2**	**Module Leader: Mike Beazley**	
NB: For students who are only here for one Semester, this module can be taken in either semester 1 or 2 but remains at 20 credits. Please contact the School.			
Description:	This module is designed to explore the experience of communities engaged in urban regeneration by means of drawing on specific experience in the field. Regeneration is multi-faceted and complex and is also primarily about people's lives. The module is a good opportunity to build a framework within which that story can be heard. There is an explicit focus on community involvement and the role it plays in relation to the regeneration of urban neighbourhoods. There is a focus on exploring the experience of community-based solutions and activities in relation to urban regeneration. It combines teaching, class discussion, visits and project work to enable students to experience at first hand the regeneration process at work from a community perspective. The programme of study comprises of a 20 credit module delivered over two semesters. The classes in Semester 2 will explicitly focus on the Castle Vale case study via a student-centred learning project that will explore the notion of what makes Castle Vale work as an example of involving local communities in the process of urban regeneration. The intention is to identify what potential lessons we can learn from this experience that will help inform contemporary urban regeneration activities elsewhere.		
Learning Outcomes:	By the end of the module you are expected to: • Understand what we mean by "community" in particular contexts • Identify and analyse of the value and purpose of community involvement in the regeneration process • Have an understanding of the context of urban regeneration and how it has changed • Have a practical understanding of actual examples of community involvement in action • Identify key lessons from the case study for the future of regeneration activity		
List of module topics:	The module will cover the theory and policy context of community and urban regeneration in British urban communities and explore the impact upon those communities and their involvement in the process. The aim of this module is to provide students with an appreciation of the theory and practice of community involvement and urban regeneration from the perspective of the resident. There is a deliberate and explicit "hands-on" applied feel to the module. This module sets out the key issues and concepts that pertain to urban regeneration and the involvement and engagement of residents. In recent years ideas of community and citizen engagement in various forms have been at the top of both central and local government agendas in key areas of regeneration policy. This module examines the potential contribution of local communities and the role that citizens are being asked to take as key stakeholders in the regeneration process and the mechanisms through which that involvement takes place.		
Key Skills:	Essay writing Synthesising key concepts Project Management Presentation Group working		

Delivery:	20 hours of lectures in Semester 1 10 hours of workshops in Semester 2
Assessment:	There are 3 pieces of assessment: 1. Essay (maximum 3,000 words). This will constitute 50% of the total module mark. 2. Group Project Presentation worth 10% of the mark 3. Individual Project Report worth 40% of the mark.
Assessment Submission dates *	1. Essay titles will be issued in Semester 1, Week 4. Deadline for submission will be Semester 2, Week 2. 2. Presentations –Semester 2, Week 10 3. Individual Report –Semester 2, Week 11
Essential Texts:	Gallent, N and Robinson, S (2012) Neighbourhood Planning, Communities and Governance, Bristol: The Policy Press Mornement, A. (2005) No Longer Notorious: The Revival of Castle Vale, 1993-2005, Castle Vale Housing Action Trust Tallon, A. (2013) Urban Regeneration in the UK, London: Routledge (2nd Edition)

Year 4 (MSci): all Programmes

Module Information (* Submission dates are an indication only and may be subject to change)

PLEASE NOTE THAT THE PASS MARK FOR ALL 4TH YEAR MODULES IS 50%

03 24681	**ESCM424**	**Inorganic Chemistry and Groundwater**	**10 credits**
Level: M	**Semester: 1**	**Module Leader: John Tellam**	
Prohibited combination with: ESCM318/418 Sedimentary Basin Analysis (not prohibited but slight timetable clash week 4 only)			
Description:	The aim of this Semester 1 10 credit module is to help students to develop a quantitative understanding of aqueous inorganic chemistry, and to interpret groundwater chemistry data sets in the context of water-rock interactions to solve problems of regional flow, pollution and well design.		
Learning Outcomes:	By the end of the module, students should be able to: (i) develop conceptual models for groundwater systems using hydrogeological and chemical data; (ii) be able to test these conceptual models quantitatively		
List of module topics:	The module firstly covers aqueous inorganic chemistry theory as it relates to groundwater, and then uses the understanding acquired to develop qualitative and quantitative interpretation skills for application to groundwater chemistry data sets. Aqueous inorganic chemistry theory lectures cover: concentration units and activities; dissolution-precipitation reactions (including equilibrium constants); acid-base reactions (including carbonate and silicate systems); use of thermodynamic data (to determine reaction viability and equilibrium constants for any reaction at any temperature); reduction-oxidation reactions (including E_H(pe)/pH diagrams); sorption-desorption reactions (oxides and clays); mixing effects (in aquifers and in boreholes); isotopes (stable and unstable) and trace gases. developing interpretation skills: regional groundwater flow systems; site scale contaminant.		
Key Skills:	Ability to use environmental datasets to develop conceptual models and then test them out quantitatively using both scoping calculations and more rigorous computer package calculations.		
Delivery:	Hours of various activities are tailored to the group concerned, but typically around 16 hours of lectures, 8 hours of practicals, and 2-3 hours of revision chemistry sessions for those wanting them. Practical sessions include use of a geochemical computer model.		
Assessment:	Assessment is entirely by examination. The examination is 1.5 hours long with a compulsory question and a choice of 1 from 3 other questions. The compulsory question covered a good deal of basic theory, and is multi-part, most parts involving a calculation element. Two of the other three questions are multi-part, covering theory and applied aspects, sometimes parts requiring calculations. The final question is the interpretation of a regional groundwater chemistry data set.		

Essential Texts:	The module does not cover any particular text, but there are a few very good texts, including probably most relevantly: APPELO, C.A.J. & POSTMA, D. 2002. Geochemistry, Groundwater and Pollution (2nd Ed). CRC Press / A.A. Balkema, Leiden, The Netherlands, ISBN 04 1536 428 0. See also http://www.xs4all.nl/~appt/a&p/index.html. See also general hydrogeology texts, e.g. Hiscock, K.M. 2005. Hydrogeology: Principles and Practice. Blackwell Publishing, 389pp [ISBN 0-632-05763-7] Available as ebook from Library: http://findit.bham.ac.uk/ [New edition due out in 2014 – Hiscock & Bense (2014)]

03 24680	**ESCM426**	**Environmental Geophysics**	**10 credits**
Level: M	**Semester: 2**	**Module Leader: Stefan Krause**	
Prohibited combination with: ESCM308/408 Petroleum Geoscience			
Description:	**Aim:** To develop an understanding of the application of geostatistical methods, GIS and geophysics to environmental problems. **Description:** Principles and application of geostatistical methods and Geographical Information Systems (GIS) in the environmental sciences. Principles of examining the shallow subsurface using a variety of geophysical techniques, but with the emphasis on electrical and electromagnetic surveys. Basic wireline-logging techniques. Applications of environmental geophysics.		
Learning Outcomes:	By the end of the module, students should be able to: • Analyse spatial data for their geostatistical properties • Apply and critically assess different spatial interpolation methods using state of the art GIS techniques • describe the application of geophysics in environmental investigations; • and develop strategies for shallow subsurface investigations.		
List of module topics:	- introduction into statistical analyses in the earth and environmental sciences - descriptive statistics and hypothesis testing - geostatistical analysis methods - spatial interpolation methods, statistical and non-statistical - introduction into geographical information systems (GIS) - advanced land surface analysis by GIS - Introduction into Environmental Geophysics - Introduction into Electric Resistivity Tomography - Introduction into Ground Penetrating Radar		
Key Skills:	Key skills to acquire include statistical and geostatistical analysis skills, quantitative and geostatistical problem solving skills, theoretical geophysical surveying skills and geophysical interpretation skills.		
Delivery:	18 hours lectures, 14 hours practical		
Assessment:	Class Test (40%) & 1.5 hour examination (60%). Exam includes a range of complex questions to specific topics of the module of which a selection has to be answered by the student		
Assessment Submission dates *	Assessment consists of an in-class test which will be scheduled in the 2nd half of semester 2. Specific date to be confirmed.		
Essential Texts:	Walford, N. Practical Statistics for Geographers and Earth Scientists. Wiley-Blackwell, 2011. Kennedy, M. Introducing Geographical Information Systems with ArcGIS. Wileys, 2006 Reynolds J M. An Introduction to Applied & Environmental Geophysics 1997.		

03 24881	ESCM428	Groundwater Organic Contaminant Pollution & Remediation	20 credits
Level: M	**Semester: 1 & 2**	**Module Leader: Mike Rivett**	
NB: This module is only available to those students who will be in attendance for the full academic year			
Prohibited combination with: ESCM329 Managing Geological Hazards and Anthropogenic Impacts			
Description:	**Aim:** To provide the organic contaminant hydrogeological knowledge base that will underpin potential future professional activity in the field of groundwater organic contaminant remediation. **Description:** Pollution of groundwater by organic contaminants remains a key driver of exceedingly expensive contaminated land and groundwater investigation and remediation efforts. This module seeks to provide the organic contaminant hydrogeological knowledge base that will underpin a student's potential future professional activity in this field. The module will cover contaminant source terms, contextual toxicology and environmental standards and legislation; organic contaminant phase partitioning to air, water, solids; conceptual models of contaminant migration; processes of sorption, chemical reaction, biodegradation; and, NAPL multi-phase flow. These will be illustrated by contaminant case studies throughout. Student learning will be underpinned by set calculation problem sheets. These theoretical aspects will underpin more industry applied / research-based subsequent learning on contaminated land / groundwater legislative frameworks, groundwater; groundwater risk assessment (industry-led ConSim workshop), site investigation and groundwater monitoring practice and groundwater remediation options. Remediation will predominantly focus on organic contaminants, but also include some discussion of related fields of metals - hydrochemistry, radiological and microbiological contaminant. Remediation will cover a range of representative modern technologies as well as groundwater protection initiatives and relevant waste disposal practice.		
Learning Outcomes:	By the end of the module, students should be able to: ○ Show advanced understanding of processes controlling organic contaminant fate and transport in groundwater systems – this understanding should be from both organic/physical chemistry and hydrogeology standpoints ○ Demonstrate quantified understanding of topics and undertake appropriate hand calculations ○ Demonstrate theoretical and applied understanding of groundwater – contaminated land remediation implementation including accompanying aspects of site investigation/monitoring, risk assessment and regulatory contexts. ○ Demonstrate research-level literature awareness of the specialised topics selected for the coursework projects.		
List of module topics:	Semester 1: Contaminant source terms, contextual toxicology and environmental standards and legislation; organic contaminant phase partitioning to air, water, solids; conceptual models of contaminant migration; processes of sorption, chemical reaction, biodegradation; and, NAPL multi-phase flow. Student learning will be underpinned by set calculation problem sheets (non assessed). Semester 2: Topics may have some variation year to year reflecting current trends and interests. Remediation overview; Pump-and-treat remediation; Containment walls; Landfill; Risk assessment incl. Consim workshop; Groundwater monitoring and site investigation; In-situ groundwater remediation technologies; Groundwater legislation; Pesticides and nitrates; Metals remediation.		

Key Skills:	Organic contaminant hydrogeology; Remediation application; Short technical report writing; Use of model software; Undertaking of organic contaminant chemistry based calculations
Delivery:	50 hours contact comprising lectures, practicals /workshop, set calculation problems, industry guest lectures and demonstrations. Optional attendance on MSc Hydrogeology day field trips (usually 1.5 days).
Assessment:	1.5 hour written examination (65%) and coursework project (35%) comprising short reports on applied (i) organic contaminant fate in Semester 1 and (ii) site remediation implementation in Semester 2.
Assessment Submission dates *	Semester 2, Week 1 Semester 2, week 9
Essential Texts:	Contaminant Hydrogeology, Fetter, C.W. Journal and report citations will be provided for each lecture.

Notes:

- **Where students are only in attendance for Semester 1, but take a module which has an examination in Semester 2, an alternative assessment will be offered.**
- **Additional module are available at level M (Masters). However, it should be noted that Masters level modules have different assessment Regulations to Undergraduate. Please contact the School direct.**
- **There may be timetabling constraints with some module combinations where students have selected across different levels. Should this be the case, students will be ask to choose alternative module(s) following the publication of the timetables in September.**