FHEQ Level 4: Year 1
Geology Module Catalogue
2018-2019

The information provided in this handbook was correct at the time of writing. Students should, however, regularly consult the Geology and Geoscience notice boards, their electronic mail account and both Geography, Geology and the Environment and the Planning and Academic Administration web pages for new information and changes to procedures. In addition, this handbook does not replace the entries in the University Prospectus and Calendar, which are authoritative statements. In case of conflict, University regulations take priority. If you require the Handbook or any other materials in an alternative format, please let us know. The statements of School policy in this Handbook are made in good faith. It may however be necessary from time to time to vary courses, procedures, and other arrangements.

Last Update August 31, 2018

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Sustainability Statement

In 2015 the United Nations adopted 17 sustainability goals to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved by 2030.

Understanding geological phenomena and the Earth through deep time are fundamental to the delivery of the United Nations Sustainable Development Goals. A knowledge of the Earth's resources, processes and history is essential to understand how any changes in our economic or societal behaviour may impact upon the environment (and vice versa).

The geology programmes at Keele will highlight the links between geology and the UN sustainability goals so that you will not only become aware of these sustainability concepts but are able to use and disseminate that knowledge as geologists towards a more sustainable future.

At Level 4 (Year 1) you will be introduced to the Earth's major controlling systems and history, and you will gain valuable insight into the interactions between them.

We recommended you familiarise yourself with the United Nations Sustainable Development Goals and how they relate to geology.
www.un.org/sustainabledevelopment/sustainable-development-goals/

ESC-10062 (Both Semesters: Dual & Single Honours)

Module Title: Earth Structure & History
Credits: 30 Credits
Module Tutors: Dr Ian G. Stimpson (co-ordinator)
Dr Michael Montenari, Dr Stuart Egan &
Dr Steven Rogers

Module Outline
This module introduces the origin, structure and composition of the Earth and the geological paradigms of plate tectonics, deep time and uniformitarianism. It covers the geological history of the Earth and the terminology and classification of geological structures, and how they both relate to plate tectonics. It includes two field courses to reinforce the lecture and practical content.

Intended Learning Outcomes
At the end of the module students should be able to:

- Describe the structure and composition of the solid Earth
- Explain the major geoscience paradigms of plate tectonics, deep geological time and uniformitarianism.
- Describe and classify geological structures and relate their formation to plate tectonics.
- Explain the principles of stratigraphy and describe the geological evolution of the Earth.
- Document geological information in the field.

Skills
Taking lecture notes, keeping a laboratory notebook, understanding of plagiarism and how to reference source material. Extract and interpret geological information from a variety of sources.

Formative Assessment
De-briefing sessions at end of laboratory practical classes; Discussion of material on one-to-one basis during practical classes.

Summative Assessment
Method
Laboratory Notebooks (40%)
Class Tests (40%)
Field Course Assignments (20%) – Qualifying fail mark 30%
Pembrokeshire 16%; Wenlock Edge 4%

Dates
Practical books: Throughout module
Class Tests: see week-by-week schedule
Field Courses: Pembrokeshire – end of field course; Wenlock – end Week 11.

Recommended reading: ESC-10062 Reading List

Benton, M. & Harper, D. (1997) Basic Palaeontology. Pearson Prentice Hall.
Doyle, P., Bennett, M. R. & Baxter, A.N. (2001): The Key to Earth History – An Introduction to Stratigraphy. John Wiley & Sons.
Foote, M. & Miller, A.I. (2007) Principles of Palaeontology. Freeman.
Hunter, A. & Easterbrooke, G. (2004): The Geological History of the British Isles. The Open University.
Fossen, H. (2016) Structural Geology, Cambridge University Press
Park, R.G. (1997) Foundations of Structural Geology, Routledge.
Kearey, P., Klepeis, K.A. & Vine, F.J. Global Tectonics. WileyBlackwell (ISBN: 1405107774).
Lunnie, J. Earth Evolution of a Habitable World. Cambridge (Second Edition) (ISBN: 0521615194)
Marshak, S. (2015) Earth Portrait of a Planet. Norton & Co. (Fifth Edition) (ISBN: 978-0-393-93750-3)
Ogg, J. G., Ogg, G. & Gradsein, F. (2016): The Concise Geologic Time Scale. Elsevier. ISBN: 978-0444637710
Selden, P. & Nudds, J. (2004): Evolution of Fossil Ecosystems. Manson Publishing.

Semester 1

Wk	Lecture Titles	Tutor
1	Universe and solar system	IGS
2	Planetary accretion	IGS
	Meteorites	IGS
3	Internal Structure of the Earth 1	IGS
	Internal Structure of the Earth 2	IGS
4	Internal Structure of the Earth 3	IGS
	Plate tectonics 1	IGS
5	Plate tectonics 2	IGS
	Plate tectonics 3	IGS
6	Earthquakes and Tsunamis	IGS
	Heat Flow	IGS
7	TBC	TBC
8	Convection & Plate Forces	IGS
	Earth's magnetic field	IGS
9	Gravity and Isostasy	IGS
	The Wilson Cycle	IGS
10	Geology of the Moon	IGS
	Geology of Mercury and Venus	IGS
11	Geology of Mars	IGS
	Geology of Jupiter's Satellites	IGS
12	Geology of Saturn's Satellites	IGS
	Geology of Neptune & Uranus's Satellites	IGS

Wk	Practical Classes	Tutor
1	Induction Week: No Practical Class	
2	Note taking, laboratory notebooks, referencing and plagiarism	IGS

3	Field Safety	IGS
4	Field Notes and Preparation for Ercall Field Course	IGS
5	Ercall Fair Copy Maps and Reports	IGS
6	Earthquakes & Sea Floor Spreading	IGS
7	Class Test	
8	Heat Flow	IGS
9	Palaeomagnetics & Exams and Revision	IGS
10	Gravity	IGS
11	Lunar geology	IGS
12	Class Test	IGS

Semester 2

Wk	**Lecture Titles (2 lectures per week)**	**Tutor (s)**
1	Introduction, Course Content, Assessment	MM
	The Earth in Time and Space	MM
2	Principles of Stratigraphy: Biostratigraphy and Lithostratigraphy	MM
	Principles of Stratigraphy (Sequence stratigraphy, dating)	MM
3	Precambrian Processes I (abiogenic)	MM
	Precambrian Processes II (biogenic)	MM
4	Lower Palaeozoic (geodynamic processes)	MM
	Lower Palaeozoic (palaeontology)	MM
5	Upper Palaeozoic (geodynamic processes)	MM
	Upper Palaeozoic (palaeontology)	MM
6	Mesozoic and Cenozoic I	SSE
	Mesozoic and Cenozoic II	SSE
7	Structure and Maps	SLR
	Faults and Fractures	SLR
8	Folds	SLR
	Fold Systems	SLR
9	Fault Rocks and Joints	SLR
	Foliations, Lineations and Kinematic Indicators	SLR
10	Extensional Tectonics	SLR
	Contractional Tectonics	SLR
11	Strike-slip Fault Systems	SLR
	Structure of Igneous Intrusions	SLR
12	Structure of Hydrocarbon Traps	SLR
	Feedback session	SLR

Wk	**Practical Classes**	**Tutor**
1	Time and Space: SI-Units and Dimensions	MM
2	Stratigraphic Concepts + Lower Palaeozoic Class Test	MM
3	Precambrian Processes	MM
4	Lower Palaeozoic + Upper Palaeozoic Class Test	MM
5	Upper Palaeozoic	MM
6	Mesozoic and Cenozoic + Assessed Practical Class	SSE
7	Introducing Geological Maps	SLR
8	Problem Geological Map + Wenlock Briefing	SLR

9	Problem Geological Map + Class Test	SLR
10	Real Geological Maps + Pembroke Briefing	SLR
11	Real Geological Maps	SLR
12	Real Geological Maps + Class Test	SLR

Provisional Dates of Field Courses

Location	Date	Leader
Wenlock Edge	23 March 2019	Dr Michael Montenari
Pembrokeshire, South Wales	6 - 13 April 2019	Dr Ian Stimpson

IMPORTANT!
All fieldwork is compulsory. Missing a field course without good cause will result in failure of the module and having to pass the field course assessments the following year. In order to pass this module, you must attain at least 30% for the field classes.

ESC-10063 (Both Semesters: Dual & Single Honours)

Module Title: Minerals, Rocks and Fossils
Credits: 30 Credits
Module Tutors: Dr Ralf Gertisser (co-ordinator), Dr Michael Montenari, Dr Ralf Halama, Dr Steven Rogers & Dr Ian Stimpson

Module Outline
In this module you will get to learn the terminology, nomenclature and classification of minerals, rocks and fossils. You will become able to describe geological materials, both in hand specimen and under a petrological microscope, and determine the processes by which they form. You will also learn about how fossils can be used to date rocks and indicate their environment of formation. A variety of field courses will introduce you to the collection and documentation of geological information in the field, including how to make a geological map, which is an important skill that you will develop throughout the course of your degree.

Aims
This module introduces the terminology, nomenclature and classification of minerals, rocks and fossils. It covers the ability to describe geological materials, both in hand specimen and under a petrological microscope, and the processes by which they form. Field courses introduce the collection and documentation of geological information in the field, including the production of geological maps.

Intended Learning Outcomes
At the end of the module students should be able to:

- Identify, classify and describe minerals, rocks and fossils.
- Describe the processes of rock formation.
- Describe the history of life on Earth.
- Document geological information in the field and produce geological maps.

Skills
Obtain accurate descriptions of minerals, rocks and fossiliferous materials; Recognition and classification of sedimentary, igneous and metamorphic rocks and fossils; Recognition and petrographic and textural description of rocks; accurate observation, collecting and recording of geological information in the field including the production of geological maps, sedimentary logs and reports.

Formative Assessment
Discussion during and de-briefing at end of laboratory classes; Discussion of material on one-to-one basis during practical classes and in the field.

Summative Assessment
Method
Laboratory practical assessment (40%), including:

- Practical Test - Sedimentary Rocks (10%)

- Palaeontology Lab Book (10%)
- Practical Test - Minerals, Igneous and Metamorphic Rocks (20%)

2-hour written examination (40%)
Portfolio (material associated with field courses incl. field notebook, field and fair copy maps and reports) (20%)

Dates
Laboratory practical assessment:

- Practical Test - Sedimentary Rocks: SEM 1, Week 6
- Palaeontology Lab Book: SEM 1, end of week 12
- Practical Test - Minerals, Igneous and Metamorphic Rocks: SEM 2, Week 12

Field course portfolio: TBA
Written Examination (2 hour unseen exam): May 2019

On-line resources:
Located on the Keele Virtual Learning Environment and module specific websites (details will be given during lectures).

Recommended reading: ESC-10063 Reading List
BENTON, M. & HARPER, D (1997): Basic Palaeontology. Pearson, Prentice Hall.
CLARKSON, E.N.K. (1998): Invertebrate Palaeontology and Evolution. Blackwell Science.
COLLINSON, J.D., MOUNTNEY, N.P. AND THOMPSON, D.B. (2006). Sedimentary structures. Terra Publishing, England, third edition, 270 pages.
FOOTE, M. & MILLER, A.I. (2007): Principles of Paleontology. Freeman.
NICHOLS, G. 2009. Sedimentology and Stratigraphy (2nd Edition). Wiley.
SELDEN, P. & NUDDS, J (2004): Evolution of Fossil Ecosystems. Manson Publishing.
STOW, D.A.V. 2005. Sedimentary rocks in the field: A Colour Guide. Manson Publication.
TUCKER, M.E. 2001. Sedimentary Petrology: An Introduction to the Origin of Sedimentary Rocks (3rd Edition). Wiley.
DEER, W.A., HOWIE, R.A., ZUSSMAN, J. An Introduction to the Rock-forming Minerals. Mineralogical Society.
FRY, N. The Field Description of Metamorphic Rocks. Open University Press.
JERRAM, D., PETFORD, N. The Field Description of Igneous Rocks. Wiley-Blackwell.
KLEIN, C., PHILPOTTS, T. Earth Materials: Introduction to Mineralogy and Petrology. Cambridge University Press.
LISLE, R.J., BRABHAM, P., BARNES, J.W. Basic Geological Mapping. Wiley-Blackwell.
MacKENZIE, W.S., ADAMS, A.E. A Colour Atlas of Rocks and Minerals in Thin Section. Manson.
NESSE, W.D. Introduction to Mineralogy. Oxford University Press.
NESSE, W.D. Introduction to Optical Mineralogy. Oxford University Press.
TUCKER, M. Sedimentary Rocks in the Field: A Practical Guide. Wiley-Blackwell.

Semester 1

Wk	Lecture Titles (2 lectures per week)	Tutor (s)
2	Introduction to Sedimentology	SLR
	Clastic Sediments: Identification and Classification	SLR
3	Sources of Terrigenous Sediments, Erosion and Transport	SLR

	Flows, Sediments, Bedforms and Structures	SLR
4	Continental Sedimentation: Ice, Air and Water	SLR
	Marine Sedimentation	SLR
5	Carbonate Sedimentology	SLR
	Carbonate Depositional Systems: Continental/Shallow/Lacustrine	SLR
6	Carbonate Depositional Systems: Deep Water	SLR
	Feedback Session	SLR
7	No Lectures	
8	Fossil anatomy	MM
	Trace fossils	MM
9	Lagerstätten	MM
	Index Fossils	MM
10	Global Mass Extinctions	MM
	Molluscs	MM
	(including ammonites, belemnites, bivalves and gastropods)	
11	Arthropods (including trilobites)	MM
	Brachiopods and Bryozoans	MM
12	Echinoderms (including sea urchins, crinoids) &	MM
	Hemicordata (including graptolites),	
	Cnidaria (including corals) and Porifera (sponges)	MM

Wk	**Practical Classes**	**Tutor**
1	No Practical Class	
2	Sedimentary Rocks and Structures	SLR
3	Transport and Flow	SLR
4	Sedimentary Logging	SLR
5	Carbonate Sedimentary Rocks	SLR
6	Class Test: Identifying Sedimentary Rocks	SLR
7	No Practical	
8	Stromatolites and sponges	MM
9	Cephalopoda (Goniatites, Ceratites, Ammonites)	MM
10	Gastropods and Bivalves	MM
11	Trilobites	MM
12	Brachiopods, echinoids and graptolites	MM

Semester 2

Wk	**Lecture Titles (2 lectures per week)**	**Tutor (s)**
1	Introduction: The Solid Earth and its Materials	RG
	Minerals and their Identification	RG
2	Crystal Structures and Crystallography	RG
	Systematic Mineralogy I. Silicate Minerals	RG
3	Systematic Mineralogy II. Non-Silicate Minerals	RG
	Minerals and Rocks under the Microscope	RG
4	Optical Properties of Minerals	RG
	An Introduction to Igneous Petrology	RG
5	Magma Generation and Differentiation	RG
	Intrusive Igneous Processes and Bodies	RG

6	Extrusive Processes and Landforms	RG
	Extrusive Igneous Rocks I: Lava Flows	RG
7	Extrusive Igneous Rocks II: Volcaniclastic Rocks and Deposits	RG
	Metamorphic Minerals I	RH
8	Metamorphic Minerals II	RH
	Metamorphic Rocks I	RH
9	Metamorphic Rocks II	RH
	Metamorphism I	RH
10	Metamorphism II	RH
	Metamorphic Processes I	RH
11	Metamorphic Processes II	RH
	Metamorphic Rocks in the Field	RH
12	No Lectures	-

Wk	**Practical Classes**	**Tutor**
1	No Practical Class	-
2	Physical Properties of Minerals – Mineral Identification	RG
3	Crystal Structures and Crystallography	RG
4	Minerals and Rocks under the Microscope	RG
5	Introduction to Igneous Rocks	RG
6	Intrusive Igneous Rocks	RG
7	Extrusive Igneous Rocks	RG
8	Metamorphic Minerals	RH
9	Metamorphic Rocks I	RH
10	Metamorphic Rocks II	RH
11	Metamorphic Rocks III	RH
12	Practical Test	RG/RH

Provisional Dates of Field Courses

Location	***Date***	***Leader***
Ercall Quarries, Shropshire	21 October 2018	Dr Ian Stimpson
Lapworth Museum, Birmingham	10 November 2018	Dr Michael Montenari
Llangollen	30 & 31 March 2019	Dr Michael Montenari

IMPORTANT!

All fieldwork is compulsory. Missing a field course without good cause will result in failure of the module and having to pass the field course assessments the following year. In order to pass this module, you must attain at least 30% for the field classes.

ESC-10064 (Both Semesters: Single Honours Only)

Module Title: Geology Data Visualisation, Analysis and Interpretation
Credits: 30 Credits
Module Tutors: Dr Stuart Egan (module co-ordinator), Dr Stuart Clarke, Mr David Cousins, Dr Glenda Jones, and Dr Ian Stimpson

Module Outline

This module provides an introduction to a variety of techniques for the acquisition, interpretation, analysis and visualisation of a variety of geological and geophysical data, including Geographical Information Systems, remote sensing, digital mapping and geostatistics. The module is divided into the following sections which are covered by a combination of lectures and practical classes:

- Geographical/Geological Information Systems (GIS) covering an introduction to GIS, data types (e.g. raster and vector, coordinate systems), electronic maps (e.g. Geology Digimap), digital elevation models and image data.
- The Global Positioning System (GPS) and its use for geological fieldwork.
- Near-surface geophysical data interpretation, analysis & visualisation.
- Remote Sensing covering an introduction to remote sensing, remote sensing data types, aerial photo interpretation/photogeological mapping, interpretation of satellite images, and the use of Google Earth for geological investigation.
- Digital techniques and specialist software applications for the acquisition, interpretation and visualization of geological field data, including software applications for the recording field data, LiDAR data, photogrammetry, BGS Sigma Desktop for fair copy map production, and the use of Unmanned Aerial Vehicles/Drones for geological applications.
- Geostatistics: coverage of the main statistical methods for the analysis of geological data.

Aims

To provide an introduction to a variety of techniques for the acquisition, interpretation, analysis and visualisation of a variety of geological and geophysical data, including Geographical Information Systems (GIS), remote sensing, digital mapping and geostatistics.

Intended Learning Outcomes

At the end of the module students should be able to:

- Make effective use of Geographical Information System (GIS) software as a tool for the integration of a variety of geoscience data
- Make use of on-line digital maps to investigate the geology of an area
- Apply remote sensing techniques to make geological interpretations of aerial photographs and satellite imagery
- Use a variety of digital techniques and specialist software applications for the acquisition, interpretation and visualization of geological field data.
- Interpret and analyse a variety of spatially distributed geological and geophysical data, and summarise the results in the format of a scientific report.

- Select and apply geostatistical methods for the interpretation and analysis of geological data and have an appreciation of the strengths and limitations of these techniques

Skills

- Applied Geophysics, including near-surface equipment, data integration & visualisation.
- Remote Sensing, including remote sensing data types, aerial photo. interpretation/photogeological mapping, interpretation of satellite images, use of Google Earth facilities for geoscience investigation.
- Geographical/Geological Information Systems (GIS), including data types (e.g. raster and vector, coordinate systems), electronic maps (e.g. Geology Digimap), digital elevation models and image data.
- Use of GPS.
- Digital techniques and specialist software applications for the acquisition, interpretation and visualization of geological field data,
- Geostatistics

Formative Assessment

Discussion of material on one-to-one basis during practical classes.

Summative Assessment

Method

GIS assignment: Development of a GIS, along with summary report, on the Geology of your local area. (17%)
Geophysical data integration and interpretation: Laboratory based assignments on data collection, visualisation & interpretation. (17%)
Remote sensing practical assignments: Satellite image and aerial photo interpretation exercises. (17%)
Production of a geology fair copy map of a selected area (25%)
Completion of worksheets related to practical classes on geostatistics (24%)

Dates

GIS assignment: End week 7 Semester 1
Geophysical data interpretation: End week 10 Semester 1
Remote sensing practical assignments: End week 12 Semester 1
Fair copy map: End week 6 Semester 2
Geostatistics worksheets: End week 12 Semester 2

Recommended reading

Please refer to online Library reading list for the module available at:
ESC-10064 Reading List

Semester 1

Wk	Classes	Tutor
1	No Class	
2	Introduction to GIS	SSE
3	Introduction to GPS	SSE
4	Digital mapping using Digimap	SSE
5	Applied Geophysics 1	GJ
6	Applied Geophysics 2	GJ
7	Assignment completion - No class	
8	Applied Geophysics 3	GJ
9	Remote Sensing 1	IGS
10	Remote Sensing 2	IGS
11	Remote Sensing 3	IGS
12	Assignment completion - No class	

Semester 2

1	Software applications for supporting geological fieldwork	SSE
2	Using GIS and GoogleEarth for photogeological mapping.	SSE
3	Creating geological maps using ArcMap & BGS SIGMA: part 1	SMC/SSE
4	Creating geological maps using ArcMap & BGS SIGMA: part 2	SMC/SSE
5	Photogrammetry	DC/SSE
6	Assignment completion - No class	
7	Using LiDAR for geological surveying: part 1	TBA
8	Using LiDAR for geological surveying: part 2	TBA
9	Using Unmanned Aerial Vehicles for geological surveying	DC/SSE
10	Geostatistics 1	SSE
11	Geostatistics 2	SSE
12	Assignment completion - No class	

ESC-10048 (Spring Semester: Single Honours Only)

Module Title: The Earth System
Credits: 15 Credits
Module Tutors: Dr Stuart S. Egan (module co-ordinator), Dr Peter Thomas, Dr Richard I. Waller and Mr Ian Wilshaw

Module Outline
This module provides an overview and considers interactions between the Earth's major systems, including the solid earth (geosphere), biosphere, hydrosphere and atmosphere, and how they combine in terms of their physical, geochemical and environmental processes. The module also covers some of the anthropogenic causes of global environmental change and the need to mitigate the predicted effects in terms of the sustainable use and development of the planet. It also helps students gain useful experience of a range of employability skills within a geoscience context.

Aims
To provide an overview and consider interactions between all of the Earth's major systems, including the geosphere, atmosphere, biosphere and hydrosphere.

Intended Learning Outcomes
At the end of the module students should be able to:

- Demonstrate knowledge and understanding of all of the Earth's major systems.
- Show knowledge and understanding of the relationship between past, present and future changes on Earth to perturbations of its systems and interactions between systems.
- Show knowledge and understanding of the role played by society in global change.
- Show knowledge and understanding of the causes of global environmental change phenomena (e.g. mass extinctions, climate change, etc.) as well as have an appreciation of the need for the sustainable use of natural resources so that society can survive into the future.
- Develop their IT and writing skills through practical work and coursework assignments.

Formative Assessment
Discussion of material on one-to-one basis during practical classes.

Summative Assessment
Method
Spreadsheet exercises: Spreadsheet based exercises on system analysis diagrams. (15%)
PowerPoint Exercise: Development of a standalone computer-based presentation on a selected Earth Systems topic. (20%)
Review article: 750-1000 word review article on a selected Earth Systems topic. (15%)
Two-hour unseen examination (50%)

Dates

Spreadsheet exercises: End week 4
PowerPoint assignment: End week 7
Review article: End week 12
Two-hour unseen examination: May

Recommended reading

Please refer to online Library reading list for the module available at:
ESC-10048 Reading List

Wk	Topic	Content	Tutor (s)
1	Introduction to Earth System Science	Lecture	SSE
	Earth System Interactions: System Analysis Diagrams/ Box Modelling Assessment	Practical	SSE
2	The Oceans I - Structure of the Ocean Floor	Lecture	SSE
	The Oceans II - Ocean Composition	Lecture	SSE
3	The Oceans III - Ocean circulation	Lecture	SSE
	The Oceans IV – The World's Oceans	Practical	SSE
4	The Oceans V - Waves and Tides	Lecture	SSE
	The atmosphere I - Composition	Lecture	RIW
5	The atmosphere II - Energy	Lecture	RIW
	The atmosphere III – Moisture	Lecture	RIW
6	The atmosphere IV – Motion	Lecture	RIW
	The atmosphere V - Climatology and Geoscience	Lecture	RIW
7	Acquiring meteorological data: The Keele Weather Station Analysis of Keele weather data: Global warming – fact or fiction?	Practical	IW/ SSE
8	Biosphere I – The Earth-Life System I	Lecture	SSE
	Biosphere II – The Earth-Life System II	Lecture	SSE
9	Biosphere III – Global Biogeography and Biomes	Lecture	PT
	Biosphere IV – Soils: the link between geology and the living skin	Lecture	PT
10	Anthropogenic Activities I - Climate Change	Lecture	SSE
	Anthropogenic Activities II – Ozone Depletion	Lecture	SSE
11	Anthropogenic Activities III – Natural Resources I	Lecture	SSE
	Anthropogenic Activities IV – Resource Depletion	Lecture	SSE
12	Revision session (no formal classes)		