



BSc Natural Science
Course Information
(English)

Contents

Natural Science	3
Outline of Semester Structure	4
Module Information	5
Learning Agreement	25
Transcript of Records	27

Natural Science

Awards Available

Bachelor of Science (Hons) in Natural Science	4 Year Course
Bachelor of Science Natural Science	3 Year Course
Diploma of Higher Education in Natural Science	2 Year Course
Certificate of Higher Education in Natural Science	1 Year Course

Structure of Awards

Certificate of Higher Education Natural Science is a qualification in its own right and can also count as the first year of a degree programme. Students are normally expected to achieve 60 ECTS = 120 Scotcat credits during the academic year. The academic year is divided into two semesters (See college calendar).

Diploma of Higher Education Natural Science is a qualification in its own right and can also count as the second year of a degree programme. Students are normally expected to achieve 60 ECTS = 120 Scotcat credits during the academic year. The academic year is divided into two semesters (See college calendar).

BSc Natural Science is the third year of the degree programme. Students are expected to achieve 120 Scotcat credits = 60 ECTS in the course of the academic year. The course consists of a total of 8 subjects of equal value. These subjects are listed on the following pages. Each subject carries a value of 7.5 ECTS = 15 Scotcat credits.

BSc (Hons) Natural Science is the fourth year of hours degree programme. Students are expected to achieve 120 Scotcat credits = 60 ECTS in the course of the academic year. The course consists of a total of 8 subjects of equal value. These subjects are listed on the following pages. Each subject carries a value of 7.5 ECTS = 15 Scotcat credits.

Teaching Methods

Classes consist of lectures, tutorials and practical sessions. Some lectures may be delivered by videoconferencing.

Assessment Procedures

Certificate of Higher Education

Subjects are assessed by continuous assessment and/or examination.
Exams take place in December and May

Diploma of Higher Education

Subjects are assessed by continuous assessment and/or examination.
Exams take place in December and May

BSc Natural Science Year 3

Subjects are assessed by continuous assessment and/or examination.
Exams take place in December and May.

BSc Natural Science (Hons) Year 4

Subjects are assessed by continuous assessment and/or examination. Exams take place in December and May.

Recommended Reading

For information regarding background reading and other course information please contact the Curriculum Leader responsible for Natural Science:

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Coordinators

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Outline of Semester Structure

CORE

LEVEL	SEMESTER 1	SEMESTER 2
1	<p style="text-align: center;"><i>ICT</i></p> <p style="text-align: center;"><i>Principles of Biology</i></p> <p style="text-align: center;"><i>Principles of Chemistry</i></p> <p style="text-align: center;"><i>Maths and Stats for the Environmental Sciences</i></p> <p style="text-align: center;">Introduction to Global Environmental Issues or Introduction to Soil Science</p>	<p style="text-align: center;"><i>Principles of Physics</i></p> <p style="text-align: center;"><i>Principles of Geology/Earth Processes/Physical Geology of the Highlands and Islands</i></p> <p style="text-align: center;"><i>Science Investigation 1</i></p> <p style="text-align: center;"><i>Environmental Biology (Principles of Ecology)</i></p> <p style="text-align: center;">Maths and Stats for the Physical Sciences</p> <p style="text-align: center;">Introduction to Marine Science</p>
2	<p style="text-align: center;"><i>Principles of Permaculture</i></p> <p style="text-align: center;">Intro to GIS</p> <p style="text-align: center;">Ecology</p> <p style="text-align: center;">Managing Coastal and Marine Resources</p> <p style="text-align: center;">Introduction to Microbiology</p> <p style="text-align: center;">Marine Biology</p> <p style="text-align: center;">Statistics and Experimental Design</p>	<p style="text-align: center;"><i>Scientific Investigation 2</i></p> <p style="text-align: center;"><i>Natural Systems</i></p> <p style="text-align: center;">Plant Science</p> <p style="text-align: center;">Biochemistry and Molecular Biology</p>
3	<p style="text-align: center;">Research Management Skills</p> <p style="text-align: center;">Science Innovation In Industry</p> <p style="text-align: center;">Plant Physiology</p> <p style="text-align: center;">Option</p>	<p style="text-align: center;">Natural Science Project</p> <p style="text-align: center;">Option</p> <p style="text-align: center;">Option</p> <p style="text-align: center;">Option</p>
4	<p style="text-align: center;">Dissertation</p> <p style="text-align: center;">Integrated Case Study</p>	<p style="text-align: center;">Dissertation</p> <p style="text-align: center;">Option</p> <p style="text-align: center;">Option</p> <p style="text-align: center;">Option</p>

Each module has a value of 15 SCOTCAT points (= 7.5 ECTS)

Module Information

The following contains a summary of the outcomes you could achieve. It also indicates the assessments for each module. Where a module is partly assessed by examination this will involve a variety of methods. Examinations may be 'seen paper' where the paper is issued one week in advance and then reissued at the time of the exam, 'open book' exams where the student can take notes and textbooks in to the exam and 'closed book' exams where the paper is unseen and no notes or texts are allowed. Exams are usually two hours in length but the examination is usually worth more of the modules assessment as you proceed through the degree e.g. in year 1 the exam component may be 40% of the module and in year 3 it may be 60%. There will be a variety of teaching and learning styles used to deliver the modules. Some of the modules will be taught face to face in a conventional classroom setting. Others may be delivered by video-conference with supporting notes and others are available by blended learning mode where the notes and instructions will be available on: <http://blackboard.uhi.ac.uk>

There may be opportunities to audio-conference or participate in netmeeting during some of these modules.

Level 1 Modules

	ECTS	Scotcat Credits
Landscape Ecology	7.5	15
This module aims to give students an up-to- date introduction to theories, methods Information and Communication Technology		
This module introduces the student with little or no previous experience of computer systems to the use of computer application packages in their chosen vocational area and to traditional and novel communications, media, methods and technology		
<i>Learning Outcomes/Objectives</i>		
1. Select, abstract and analyse complex information from multiple sources and communicate it formally in written and oral presentations.		
2. Use operating environments and computer application packages to produce formatted documents, model prescribed situations and store and retrieve information.		
3. Deliver a presentation by videoconference.		
Maths and Stats for the Physical Sciences	7.5	15
This module aims to provide the knowledge and skills which will enable students to analyse data in a quantitative manner. It also introduces the concepts of statistical analysis of numerical data		
<i>Learning Outcomes/Objectives</i>		
Apply, solve and display functional equations.		
Interpret and apply simple exponential, logarithmic and trigonometric functions.		
State the rules of matrix and vector algebra.		
Apply the basic techniques of calculus to simple practical problems.		
Interpret and apply descriptive statistics and probability theory.		
Outline the language and terminology of basic mathematics and statistics, with particular emphasis on the areas of greatest relevance to the environmental sciences.		
Apply statistical software to the solution of practical problems.		

	ECTS	Scotcat Credits
Maths and Stats for the Environmental Sciences	7.5	15
This module aims to provide the knowledge and skills which will enable the student to understand and apply basic mathematical and statistical analysis to environmental science.		

Learning Outcomes/Objectives

1. Demonstrate numeracy, be able to calculate and manipulate numerical and algebraic expressions.
2. Be able to plot and interpret graphs based on Cartesian co-ordinates.
3. Understand simple trigonometry including angular measure, sines and cosines and their application.
4. Be familiar with the concepts of calculus and its application for simple functions.
5. Be able to interpret simple descriptive statistics and probability theory.
6. Become familiar with the language and terminology of basic mathematics and statistics, with particular emphasis on the areas of greatest relevance to the environmental sciences.
7. Develop basic skills in the use of statistical software.

Scientific Investigation 1	7.5	15
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This module gives students the opportunity to perform scientific investigations to stipulated standards using safe laboratory practices and to interpret and present the data obtained.

Learning Outcomes/Objectives

1. Practice laboratory safety procedures
2. Perform experiments to stipulated standards in biology, chemistry, physics and environmental science
3. Present and interpret scientific data
4. Present a literary review on a scientific topic

Principles of Biology	7.5	15
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To develop knowledge and understanding of biological concepts. To provide a foundation knowledge to enable subsequent levels of study

Learning Outcomes/Objectives

1. Outline of the Linnean classification system to provide understanding of the diversity of living organisms.
2. Discuss current theories about the origins and evolution of life on earth.
3. Describe basic plant and animal tissues
4. Become familiar with basic Mendelian genetics
5. Explain simple metabolic and biochemical processes in cells
6. Discuss the dynamic nature of ecosystems

	ECTS	Scotcat Credits
Principles of Chemistry	7.5	15
This module aims to provide a fundamental knowledge of the principles of general chemistry and of physico-chemical theory appropriate to understand major environmental processes.		
<i>Learning Outcomes/Objectives</i>		
Become familiar with common chemical terminology and the basic principles of IUPAC nomenclature, with particular emphasis on the areas of greatest relevance to the course.		
Relate the electronic structure of atoms to chemical reactivity.		
Apply the concepts of chemical bonding to a variety of chemical compounds.		
Write balanced chemical equations and calculate the reacting quantities.		
Describe the concepts of thermodynamics, equilibrium and kinetics that relate to chemical and physical processes in the environment.		
Conduct analytical investigations of natural water samples, to identify and/or quantify selected chemical components: record required information neatly in a laboratory notebook and produce reports following a prescribed, structured format.		
Principles of Physics	7.5	15
This module aims to enable the student to understand and apply basic principles of physics to environmental processes		
<i>Learning Outcomes/Objectives</i>		
1. Apply the principles of Newtonian mechanics to linear, circular, rotational and harmonic motion.		
2. Apply the principles of properties and states of matter to environmental phenomena.		
3. Describe various forms of energy and energy transformations.		
4. Explain the concept of conservation of energy		
Principles of Geology	7.5	15
This module aims to develop an understanding of the basic principles of geology.		
<i>Learning Outcomes/Objectives</i>		
1. Describe the structure and evolution of the earth.		
2. Identify, and describe the origin, classification and mineral composition of crustal rocks.		
3. Describe geological structures and interpret geological maps.		
4. Describe the geomorphic processes of weathering/ erosion/ transport/ deposition.		
5. Outline a brief history of the origin and evolution of life on earth		
Principles of Earth Processes	7.5	15
This provide an introduction to the earths structure, composition, endogenic and exogenic processes, and landforms which comprise the earths surface. It aims to develop the students skills in identification of rock types and landforms to a level that enables them to understand and explain physical processes taking place on the surface of the earth.		
<i>Learning Outcomes/Objectives</i>		
1. Use plate tectonic theory to explain major physical features of the Earth's surface.		
2. Identify major rock types and explain their origins, distribution and composition.		
3. Identify and interpret landforms in terms of Earth surface processes.		
4. Describe the origins, composition, distribution and classification of major soil types.		

	ECTS	Scotcat Credits
Physical Geology of the Highlands and Islands	7.5	15
To achieve a fundamental understanding of the physical geology of the Highlands and Islands		
To provide basic skills in identification of rock types and landforms.		
To introduce plate tectonic theory as a unifying paradigm and relate it to the physical geology of the Highlands and Islands		
To appreciate the dynamism of the landscape of the Highlands and Islands		
<i>Learning Outcomes/Objectives</i>		
1. Understand the geological structure of the Highlands and Islands in relation to the plate tectonic model.		
2. Understand the principal lithologies of the Highlands and Islands in relation to the plate tectonic model.		
3. Understand the glacial history and associated geomorphology of the Highlands and Islands.		
4. Understand the post-glacial processes and associated geomorphology of the Highlands and Islands.		
Sustainable Development in the Contemporary World	7.5	15
This module traces emergence of concern at local and international level and defines many of the important terms. Study will include a selected key contemporary issue.		
<i>Learning Outcomes/Objectives</i>		
1. demonstrate understanding of the theoretical foundations of Sustainable Development;		
2. understand the institutional progression towards and output of the Rio 1992 conference;		
3. have knowledge of key events and published works that have contributed towards current understanding of Sustainable Development and understand the relevance of core scientific and social science disciplines to the achievement of Sustainable Development.		
Introduction to Global Environmental Issues	7.5	15
This ranges widely over issues where human impact on the environment is of world concern. It looks at frameworks for studying the environmental impacts of human beings, examining such topics as climate change, deforestation, resource depletion, mass travel and tourism, 'free' and 'fair' trade		
<i>Learning Outcomes/Objectives</i>		
1. Define ideas and concepts including frameworks for study		
2. Understand global changes in the physical environment		
3. Understand global changes in human societies		
4. Discuss whether locally perceived effects can be linked to global changes		
5. Discuss the relationship between human actions at the local level, and global effects.		
Environmental Biology	7.5	15
This module aims to lay the foundation for further environmental studies. It includes ecosystem function, biological productivity, biogeochemical cycles, communities and succession, populations and human effects on ecosystems.		
<i>Learning Outcomes/Objectives</i>		
1. the fundamental principles of ecology		
2. the productive nature of ecosystems and		
3. the concept of a biological community		

	ECTS	Scotcat Credits
Introduction to Marine Science	7.5	15
<p>This module aims to introduce the main physical, chemical, geological and biological features and processes which occur in marine environments. This module is intended for those who have no previous knowledge of oceanography and related disciplines and is designed to be an endpoint in itself or to be used as a platform for further study of a range of marine sciences</p>		

Learning Outcomes/Objectives

1. Describe key physical and chemical properties of seawater.
2. Describe the structure and distribution of ocean basins.
3. Describe ocean currents, circulation and different types of waves.
4. Describe the trophic structure of marine communities.
5. Introduce the complexity of marine environments and their relationship with other Earth systems.
6. Investigate the distribution and abundance of selected marine resources.
7. Investigate examples of major human impacts on the marine environment.

Level 2 Modules

	ECTS	Scotcat Credits
Statistics and Experimental Design	7.5	15
<p>The aim of this module is to enable students to design logical experiments and to make statistical inferences, using a range of statistical tools in practical contexts</p>		

Learning Outcomes/Objectives

1. Outline the concept of statistical inference.
2. Apply probability and probability distributions.
3. Formulate, test and interpret statistical hypotheses.
4. Describe and apply different types of experimental design in appropriate contexts.

Principles of Permaculture	7.5	15
<p>Permaculture uses ecological principles as the basis for designing integrated systems of food production, housing, technological and community development. This unit will introduce students to this highly topical design philosophy as a radical way to approach many of the human-environment issues raised throughout the course.</p>		

This will provide the student with an alternative approach to problem solving which will benefit them throughout their educational, professional and personal lives.

Learning Outcomes/Objectives:

1. Define Permaculture.
2. Describe the development of the Permaculture concept?
3. Discuss the various types and scales of application of Permaculture.
4. Analyse the relationship between Permaculture and sustainability.
5. Carry out a Permaculture design exercise.
6. Discuss the future of Permaculture.

	ECTS	Scotcat Credits
Natural Systems	7.5	15
<p>The aim of this module is to provide the learner with a grounding in Natural Science as an interdisciplinary subject with an understanding of the types of natural processes that underpin biological and ecological systems. The module aims to integrate the learning from the other level one and level two modules and provide a platform for more advanced studies in level three and four.</p> <p><i>Learning Outcomes/Objectives</i></p> <p>At the end of the module the student will be able to demonstrate a critical understanding of processes and systems that apply in the natural world, their origins and development as theories and be able to draw upon appropriate evidence and examples to evaluate and describe their knowledge.</p> <p>The student will demonstrate competence in the use of physical, chemical, biological and mathematic concepts to describe the natural world.</p> <p>The student will demonstrate an understanding of a systems approach to environmental modelling.</p>		
Scientific Investigation 2	7.5	15
<p>This module develops the skills learned in level 1 and expands on those to include the explanation and application of the principles of methods used in analysis</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Perform analytical and physical experiments to stipulated standards. 2. Report and interpret experimental data. 3. Report and interpret literary information. 		
Plant Form and Function	7.5	15
<p>This module will give knowledge and understanding of the structure, growth and development of plants.</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Description of the structure of tissues within green plants. 2. Understanding of the function of tissues within green plants 3. Understanding of exogenous and endogenous growth factors in green plants. 4. An explanation of the development of leaf and bud primordia and secondary thickening in green plants. 5. Explanation of the adaptations of plants to different environmental conditions 		
Ecology	7.5	15
<p>This module develops the ideas introduced in level 1 Environmental Biology. Local case studies will be used to illustrate the complexity of interrelationships between living organisms and the student will learn quantitative methods for studying ecosystem change</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. describe the diversity of interrelationships which exist among animals, plants and microbes; 2. discuss the processes occurring within and between ecosystems and how these develop with time; 3. outline the range and variety of global ecosystem types and describe quantitatively the influence of man on ecosystems and the extent to which measurable changes can result with particular reference to land use, cropping, and the effects of contaminants produced by human activity. 		

	ECTS	Scotcat Credits
Ecology Field Work	7.5	15
<p>This practical module is carried out in conjunction with SESD2002 above and introduces students to taxonomy, keys and guides and allows them to develop basic skills of quantitative sampling and the opportunity to practise co-operative group work. It will be arranged in a one week block of time.</p>		
<i>Learning Outcomes/Objectives</i>		
<ol style="list-style-type: none"> 1. demonstrate basic skills for the safe performance of field work; 2. identify components of ecosystems using taxonomic keys and guides; 3. describe the patterns of distribution found in a range of habitats and demonstrate basic skills of quantitative sampling. 		
Managing Coastal and Marine Resources	7.5	15
<p>This module aims to make the student more knowledgeable and more aware of marine resources around our coasts, and the conflicts of interest which may arise between users.</p>		
<i>Learning Outcomes/ Objectives</i>		
<ol style="list-style-type: none"> 1. After completing the Module, the student shall: 2. Be familiar with the major users of the marine environment around Scotland. 3. Reflect on the role of regulatory bodies involved in monitoring and regulating major users of marine resources. 4. Examine the conflicts arising between various users exploiting the marine environment. Discuss issues relating to the management of major users and resources within the marine environment. 		
The Scope of Environmental Impact Assessment	7.5	15
<p>This module introduces students to environmental legislation and the range of European Directives. They will be guided through the steps taken in environmental impact and risk assessment and a case study will give the opportunity to see these practised.</p>		
<i>Learning Outcomes/Objectives</i>		
<ol style="list-style-type: none"> 1. be familiar the historical development of EIA; 2. be familiar with European and UK legal requirements for implementation of EIA and 3. be able to describe the key steps towards completion of an EIA. 		
Nature Conservation	7.5	15
<p>This module introduces students to the history of the conservation movement. It allows students to appraise the concept of nature conservation and to understand the statutory and voluntary means by which it is implemented. Students will gain experience of the management planning process.</p>		
<i>Learning Outcomes/Objectives</i>		
<ol style="list-style-type: none"> 1. To understand nature conservation from a historical perspective 2. To evaluate the concept of ‘value’ in nature conservation. 3. To explain the framework of nature conservation and the roles and responsibilities of agencies and voluntary organisations involved with nature conservation. 4. To appraise habitat management techniques 5. To devise a conservation management plan for a chosen area. 		

Remote Sensing and GIS

A comprehensive introduction to the fundamental principles and range of techniques used in Remote Sensing and Geographical Information Systems appropriate to environmental studies. It develops the students skills in this field to a level which enables them to operate relevant software systems in an environmental context

Learning Outcomes/ Objectives

1. Describe the elements of Geographical Information Systems.
2. Apply techniques of Geographical Information Systems to environmental applications.
3. Understand the methods of detecting radiations.
4. Have knowledge of the sources of digital images, and describe and apply the methods of digital image processing on remotely sensed images.
5. Apply the techniques of image interpretations to aerial photographs and satellite images.
6. Describe the techniques of remote sensing to monitoring and evaluating the environment.
7. Understand how to integrate the skills of Remote Sensing and Geographical Information Systems techniques.

Introduction to Digital Imagery and Photography

7.5 15

To equip students with skills for a dynamic working environment, examining principles and processes of technology. The emphasis will be on the planning and implementation of appropriate materials, such as imaging and visual communication in Science.

Learning Outcomes/ Objectives

The successful student will be able to:

1. Demonstrate an understanding of the operating principles of traditional cameras.
2. Demonstrate an understanding of the operating principles underlying digital imaging equipment
3. Select and apply the techniques of traditional film based technology in order to provide an imaging solution for an appropriate science based problem.
4. Select and apply the techniques of digital photographic technologies in order to provide an imaging solution for an appropriate science based problem.
5. Identify and acquire, with ethical considerations, the visual material required to support communication in a scientific paper.
6. Identify and discuss a range of potential applications of digital imaging in recording and communicating aspects of science. To critically evaluate the role of both traditional and digital techniques in the support of science.

Environment and Human Impact

7.5 15

Applying and building on existing scientific knowledge in order to explore and understand the stresses imposed on the environment by man's activity, how these can be mitigated and the role of legislation in dealing with human impact

Learning Outcomes/ Objectives

1. Describe and analyse the principle ways in which land use affects habitats and biodiversity.
2. Describe and interpret the environmental impacts of major anthropogenic pollutants.
3. Describe key elements of UK, E.U. and selected international environmental policies. Assess how these policies translate into environmental management.

Introduction to Microbiology

This module aims to develop an understanding of micro-organisms and the techniques and technologies used to study them.

Learning Outcomes/Objectives

1. Describe and discuss the history of microbiology
2. Describe the differences between prokaryotes and eukaryotes
3. Describe the features of a micro-organism
4. Describe the structure of a typical prokaryotic cell
5. Describe and investigate the requirements for microbial growth
6. Explain the principles, use and importance of selected microbial techniques in culture experiments

Marine Biology

This module aims to develop an awareness of the diversity of marine life and familiarity with the major taxonomic groups. To provide basic skills in identification

Learning Outcomes/Objectives

1. Explain the basic concepts underpinning biological oceanography and describe the spatial and temporal distribution of productivity in the marine environment
2. Describe the morphologies and life-histories of the major taxonomic groups in the marine ecosystem, with special focus on producers
3. Describe trends in the distribution of marine biodiversity in relation to geography, latitude and depth, and discuss the main hypotheses proposed to account for these patterns
4. Describe and discuss adaptations to life in various marine ecosystems
5. Develop skills to identify marine organisms and to use and construct dichotomous identification keys

Biochemistry and Molecular Biology

This module aims to develop an understanding of the functional biochemistry of organisms, the control of these processes and the techniques and technologies used to study them.

Learning Outcomes/Objectives

1. Describe the molecular and cellular building blocks of living organisms.
2. Explain specific biochemical pathways and their role in cellular metabolism.
3. Understand chemical and thermodynamic principles underlying biochemical reactions.
4. Discuss the links between biochemistry and environment.
5. Describe and discuss some control mechanisms of biochemical reactions.
6. Understand the scope, applications and potential of selected modern molecular and biochemical techniques.

Marine and Estuarine Systems

To allow students to develop an understanding of the complexity of marine-influenced environments and to describe how the physical and chemical conditions have led to adaptation of aquatic organisms to life in these environments

Learning Outcomes/Objectives

1. Describe the geographic distribution and physical characteristics of major marine and estuarine systems.
2. Describe the chemical and geomorphological processes that determine the character of the selected environments on a variety of scales.
3. Describe the biological community structure and ecological dynamics of the selected marine and estuarine ecosystems.
4. Investigate and discuss the biology and adaptations of the major groups of organisms, characteristic of the selected marine and estuarine ecosystems.
5. Recognise that marine systems reflect complex and dynamic interactions between physical, geochemical and biological systems, requiring interdisciplinary approaches to their study.
6. Develop skills in essay planning and the preparation of scientific abstracts.

Marine Resources

7.5 15

To develop an understanding of the main commercially viable marine resources.

Learning Outcomes/Objectives

1. Describe the origin of marine hydrocarbons and techniques for exploration and extraction.
2. Describe the composition, extraction and economic importance of marine aggregates and the potential importance of volcanogenic metal sulphides and ferromanganese nodules.
3. Describe the use of wind and wave energy in the generation of hydroelectricity.
4. Outline the global distribution of fisheries and their current status, and describe the main techniques used in fishing.
5. Outline the global distribution and economic importance of marine aquaculture. Describe the techniques used to culture the major species of interest and the environmental impacts of aquaculture.
6. Describe the exploitation of chemical resources from the sea and discuss the potential of marine biotechnology.
7. Discuss the economic importance of the sea to the tourist industry and as a provider of 'Ecosystem Services'.

Marine Geology

7.5 15

To develop an understanding of the formation of the worlds oceans, large scale geological ocean processes, the geology of the seabed and coastal zones

Learning Outcomes/Objectives

1. Outline the basic principles of palaeoceanography and the evolution of ocean basins.
2. Describe the principles of ocean basin formation ocean crust structure and composition and tectonic evolution.
3. Describe and explain the distribution of the different types of deep-sea sediment.
4. Describe and explain shelf/slope sedimentary environments and processes.
5. Outline the different types of marine carbonates.
6. Describe coastal sedimentary environments and processes.
7. Describe the principles of fluid flow and the mechanics of sediment transport, deposition and erosion

Approaches to Sustainable Development

This aims to familiarise the student with approaches to the implementation of sustainable development strategies and which of these is appropriate in a given set of circumstances.

Learning Outcomes/Objectives

1. appreciate the difference between top down and bottom up approaches to sustainable development;
2. have a working knowledge of key policy instruments for the implementation of sustainable development (both top down approaches, e.g. Convention on Climate Change and bottom up e.g. Local Agenda 21);
3. have the ability to identify the appropriate level (local, national, regional etc) at which sustainable development strategies should be implemented, when faced with a particular scenario and
4. recognise that a positivist solution to sustainable development is often not available. What represents Sustainable Development may in many cases be subjective, Sustainable Development often being a process rather than a definable end-point.

Natural Science Project

7.5	15
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This module will develop the planning, performance, analytical and reporting skills which are essential attributes of a competent scientist

Learning Outcomes/Objectives

1. Produce, with guidance, a set of hypotheses to be tested.
2. Produce a schedule for the project and its reporting (both written and oral).
3. Perform, monitor and report on the progress of the project.
4. Analyse data using statistics as necessary and draw appropriate conclusions.
5. Produce a concise and clearly presented written report.
6. Summarise the report in an oral presentation or defend it in a *viva voce* examination

Research Management Skills

7.5	15
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To develop the student's ability to successfully carry out research projects and effectively communicate their findings. This module is designed to enable students to carry out both the Science Project module, the undergraduate dissertation and to prime them for subsequent postgraduate research.

Learning Outcomes/Objectives:

1. Develop an understanding of what research is.
2. Identify a research topic and formulate suitable hypotheses.
3. Select appropriate methods for carrying out the research.
4. Manage the available resources to complete the project.
5. Make use of appropriate literature.
6. Collect relevant data, analyse and interpret in order to test the hypotheses.
7. Communicate the findings in an appropriate manner for the intended audience.

	ECTS	Scotcat Credits
<p>Science Innovation In Industry</p> <p>This module aims to introduce the student to the context in which science and technology are applied in real industrial situations</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Gather and present information about an industrial situation, and draw up recommendation for solution. 2. Give examples of problems faced by industries, and innovative approaches taken towards solutions. 3. Use the Internet to search for data to apply to problem solution. 4. Ask questions and provide information on problems. 	7.5	15
<p>Microbial Ecology</p> <p>To develop an understanding of the ecological role and adaptations of marine microorganisms including the use of advanced microbial methodology</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Describe and discuss the adaptations, associations and interaction of micro-organisms with their biotic and abiotic environment. What it means to live in a microbial world. 2. Assess the importance of marine micro-organisms within a range of marine planktonic and benthic ecosystems, and assess their importance and use to man. 3. Explain the principles and use of, and discuss the importance of, selected advanced microbial techniques used in marine studies. <p>Assessment</p> <p>A combination of techniques will be used:</p> <ul style="list-style-type: none"> • Laboratory reports for investigation into aspects of microbial ecology using methods learned during Level 2, and selected advanced microbiological techniques assessed by practical exercises. This may involve group work in order to develop and allow evaluation of appropriate PPCs (personal and professional capabilities) • knowledge and understanding will be assessed by a written examination at the end of the module and by submitted course work. 	7.5	15
<p>Plant Physiology</p> <p>To develop an understanding of the various physiological processes involved in plant growth and development.</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Demonstrate understanding of the process of photosynthesis including photosystems 1 and 2, electron chains and proton pumps 2. Demonstrate understanding of the ways in which environmental factors influence the photosynthetic process. 3. Demonstrate understanding of the process of transpiration and the factors controlling transpirational loss and water uptake in different environmental situations. Understanding of stomatal mechanism. 4. Demonstrate understanding of the process of translocation and the factors controlling movement of organic and inorganic materials. 5. Demonstrate understanding of the processes involved in flower initiation and flowering 	7.5	15

Marine Zoology

To develop a detailed understanding of marine animals, their biodiversity and the way in which they are structurally, functionally, and behaviourally adapted to different marine environments. To address the wider implications of these adaptations to organism evolution and ecosystem function. It enables the student to develop a deeper understanding of the relationship between environmental stresses, the physiology of animals and their evolution.

Learning Outcomes/Objectives

1. Review the phylogenetic relationships of marine animal groups.
2. Discuss the structural, functional, ecophysiological and behavioural adaptations of marine animals to different environments.
3. Discuss the importance of these adaptations in the context of evolution and ecosystem function.

Marine Biotechnology

To develop an understanding of the principles, technology, scope and limitations of marine biotechnology, particularly of genetic manipulation

Learning Outcomes/Objectives

1. Discuss the potential of molecular techniques in biotechnology and their economic implications.
2. Describe the working principles of molecular technologies and assess their risks and limitations in a marine context.
3. Describe the features of the marine environment that will lead to its increasing importance in industrial biotechnology.
4. Describe the main uses and potential uses of marine biotechnology.
5. Compare the use of the oceans as a source of biotechnological innovation and as an economic area for biotechnological application.
6. Evaluate the benefits and risks of genetic manipulation of marine organisms.

Marine Pollution

To develop an understanding of contaminants and their behaviour in marine environments. To examine the various sources of contamination in the marine environment, to examine pollutant interactions in the aqueous and solid phases; to describe major effects on the biota, to develop an awareness of the various methodologies of impact assessment.

Learning Outcomes/Objectives

1. Describe sources and types of marine contamination. This now includes genes
2. Describe processes involved in contaminant transport.
3. Discuss chemical and biological degradation and physical dilution processes and their role in ameliorating the effects of pollution.
4. Describe chemical and biological parameters that lead to bioaccumulation, particularly relating to food webs.
5. Describe mechanisms by which contaminants affect biotic processes.
6. Investigate and discuss the consequences of pollution..

	ECTS	Scotcat Credits
<p>Environmental Impact Assessment and Risk Assessment</p> <p>This provides students with a deeper understanding of EIA legislation, process and practice in the UK and Europe and requires them to apply the principles of environmental risk assessment and management</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. be able to demonstrate practical competency in EIA; 2. have a basic knowledge of the principles of environmental risk assessment and 3. understand legislative requirements for principle elements of BATNEEC and BPEO assessments. 	7.5	15
<p>Biodiversity, Evolution and Dynamics of Populations</p> <p>This module introduces students to the significance of behavioural adaptations of organisms to their environment and examines the evolutionary mechanisms involved. It develops an understanding of the concepts and principles of biodiversity. Students will study the changes arising in individuals and populations in response to the environment including the effect of human intervention on natural populations</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Discuss the theories of evolution of species, using examples from the Animal and Plant Kingdoms. 2. Describe the patterns of behaviour in a range of named examples and relate this to their survival in the natural environment. 3. Discuss the principles of population dynamics and control in terms of changes taking place in populations in response to environmental factors and the influence of human intervention. 3. Evaluate the effects of human intervention on natural populations in terms of sustaining biodiversity. 	7.5	15
<p>Rehabilitation of Degraded Habitats and Ecosystems</p> <p>To examine current principles and practice of improving habitat conditions in a range of situations and the reasons for environmental degradation</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Discuss the fundamental ecological processes that sustain ecosystems and habitats and associated species 2. Assess the condition of a range of habitats using current standard surveying and evaluation methodology 3. Evaluate management options for a range of degraded habitats 	7.5	15
<p>Reconstructing Geological Environments</p> <p>This module aims to equip students with the skills necessary to interpret the geology of an area and reconstruct environments of deposition</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Examine the role of plate tectonics in creating igneous, metamorphic and sedimentary rocks and shaping the Earth's surface. 2. Examine the stratigraphy of the British Isles with special reference to Northern Scotland. 3. Assess the use of sedimentology to reconstruct depositional environments. 4. Assess the use of palaeontology to reconstruct depositional environments. 5. Investigate the geology of an area and reconstruct the palaeo-environment. 	7.5	15

Soil Science

Analysis of physico-chemical elements of soil structure and processes, soil erosion and procedures for soil conservation; analytical science and numerical methods applicable to soil science; macrobiological and microbiological processes; interactions between soil processes and plant growth; reactions to pollutants

Learning Outcomes/Objectives

1. Describe and analyse the physico-chemical aspects of soil structure and processes.
2. Develop an understanding of and evaluate soil erosion and conservation procedures.
3. Develop knowledge, skills and techniques in analytical scientific methods and numerical analysis applicable to soil science.
4. To develop an understanding of the macrobiological and microbiological processes which occur within soils and which affect soil structure and composition.
5. To develop an understanding of the interactions between soil process and plant growth.
6. To relate and evaluate reactions to and changes within soils to pollutants, pesticides and fertilisers.

Environmental Change

7.5	15
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Fundamental characteristics of the earths climatic system and processes, evidence for selected aspects of environmental change induced by natural and anthropogenic processes at various temporal and spatial scales; discussion of geological, archaeological, historical and instrumental records of climate, vegetation and sea level changes. Particular attention will be paid to environmental changes experienced since the last glacial.

There is a focus on satellite image processing and application of this to environmental analytical studies.

Learning Outcomes/ Objectives

1. Understand the global atmospheric circulation and the distribution patterns of climate, vegetation, animals and soil.
2. Understand fundamental principles of reconstructing palaeo-environment.
3. Have experience in examining evidence for environmental change.
4. Understand the causes of climatic change and global sea level changes.
5. Develop an knowledge of geomorphological evolution in the British Isles since the maximum of the last glaciation.

Assessment

- Knowledge and understanding will be assessed by a written examination at the end of the module and by submitted course work; course work may include structured summary notes, essays or discussion and explanation of principles.

	ECTS	Scotcat Credits
<p>Applications of GIS and RS In Environmental Studies</p> <p>Development of advance knowledge and operational skills of Geographic Information Systems and Remote Sensing, relation of ground information to original and processes digital information to improve skills in data interpretation</p> <p><i>Learning Outcomes/ Objectives</i></p> <ol style="list-style-type: none"> 1. Understand map projection, scale and composition and appreciate advantages of digital maps. 2. Understand vector GIS and models of database management systems and query language and have relevant experience in this particular area. 3. Be able to evaluate relative advantages and disadvantages of vector and raster data structures in selected application areas; and to appreciate the importance of data quality. 4. Be able to understand and apply processing techniques for remotely-sensed images and to discuss the pros and cons of the techniques. 5. Be able to relate ground information to processed digital images and hence to improve skills in data interpretation. 	7.5	15
<p>Marine Elemental Cycling</p> <p>To develop an understanding of the transport and transformation of elements in the natural environment, as seen in a marine context, and to introduce the role the oceans play in the global biogeochemical cycling of these elements</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Use the basic hydrological cycle to explain how substances are transported through the hydrosphere, atmosphere and lithosphere. 2. Describe in detail the marine carbon, nitrogen, sulphur and phosphorus cycles. 3. Describe the cycling of trace metals (e.g. iron, aluminium, copper, zinc and lead). 4. Discuss the interactions between the different cycles. 	7.5	15
<p>Integrated Case Study</p> <p>This module will consolidate the interdisciplinarity and the multi-disciplinarity of natural science through the consideration of currently topical or important issues. Analytical, presentational and team-working skills will develop towards those expected of a professional scientist.</p> <p><i>Learning Outcomes/Objectives</i></p> <p>On completing the module the student shall be able to investigate issues in science where conflict exists between environmental, economic and community interests. Students will be expected to be able to identify and describe:</p> <ul style="list-style-type: none"> • The <i>Values</i> being expressed and how they conflict • The <i>Economic</i> consequences of development/non-development for both the company and the wider economy • Community issues and how community health/integrity is threatened/strengthened by the proposal/development. 	7.5	15

Dissertation

The aim of the dissertation module is to provide the student with the opportunity to undertake a substantial piece of research requiring advanced levels of : self motivation; presentation; time and resource management in addition to independence and creativity of thought. The dissertation will test many of the skills important to employers, which are difficult to assess as part of a taught module. The dissertation will give students the opportunity to undertake in-depth investigations into a relevant topic of personal interest. Students will, however, be guided towards inter-disciplinary approaches to research that cut across conventional subject boundaries. Interdisciplinary research will help the student synthesise the various strands to the taught elements of the course

Learning Outcomes/Objectives

Within his/her chosen subject area the student shall be expected to:

1. Produce a set of hypotheses to be tested.
2. Demonstrate originality and thoroughness of approach – the student shall be expected to undertake lines of research which are either wholly original or take an original perspective on existing work.
3. Demonstrate personal resourcefulness: initiative, good organisation and self-motivation.
4. Apply professional standards in the execution of work, analytical methods of data analysis and in the content of the writing of the dissertation document.
5. Demonstrate within their analysis the ability to consider marine science from different perspectives where appropriate cutting across the boundaries of conventional academic disciplines.

Microbes and Man

7.5	15
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To develop an advanced understanding of the various types of microorganisms; their significance in the world today and the techniques and technologies used to study them.

Learning Outcomes/Objectives

1. Acquire understanding of the structure and function of viruses and develop critical evaluation of their importance to man.
2. Acquire understanding of the structure and function of fungi and develop critical evaluation of their importance to man.
3. Critically analyse the pathogenicity of bacteria and their impact on man.
4. Acquire understanding of chlorophyta and protista and develop critical evaluation of their significance to man.

History and Philosophy of Science

7.5	15
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This module aims to provide the student with an introduction to the study of the history and philosophy of science, as a source of additional insight into scientific ideas and also as an intellectual discipline in its own right

Learning Outcomes/Objectives

1. Describe and critically discuss some leading scientific ideas in the context of the historical and cultural settings which gave rise to them.
2. Describe some of the various cultures across the world which shaped science, and critically analyse some of the particular contributions each made.
3. Critically evaluate the contributions made by particular scientific thinkers.
4. Compare particular worldviews.

	ECTS	Scotcat Credits
<p>Environmental Ethics and Sustainability</p> <p>This introduces the general concepts of environmental ethics and philosophy and explores the extent to which ethical presumptions influence the approaches to sustainability and sustainable development</p> <p><i>Learning Outcomes/Objectives</i></p> <p>On completing the module the student would be expected to:</p> <ol style="list-style-type: none"> 1. Appreciate the various ethical underpinnings of man's relationship with the natural world; 2. Understand the link between the developmental stages of society and the evolution of environmental ethics; 3. Have a clear understanding of the difference between anthropocentric and ecocentric values; 4. Understand how changing ethics drive environmental policy and decision making 	7.5	15
<p>Applied Environmental Science</p> <p>This builds on the understanding of environmental assessment taught in previous levels and deals with the uncertainties which emerge. There will be a detailed study of the tools and techniques used in integrated assessment</p> <p><i>Learning Outcomes/Objectives</i></p> <p>After completing this module the student will be able to:</p> <ol style="list-style-type: none"> 1. Critically appraise the strengths, weaknesses and limitations of conventional EIA. 2. Demonstrate competence in basic environmental risk assessment techniques. 3. Critically appraise the main alternative approaches to the assessment of environmental impact. 	7.5	15
<p>Communicating Science</p> <p>To provide the student with the knowledge and skills to communicate science effectively in a variety of situations. Students will also critically evaluate the communication process and examine its context and consequences.</p> <p><i>Learning Outcomes/Objectives</i></p> <ol style="list-style-type: none"> 1. Analyse the role of science in society, and examine the way in which it is communicated. 2. Discuss and apply the main principles of communication as a two-way process in terms of identified audiences and target markets. 3. Demonstrate a broad knowledge and understanding of the media and their economic and social context. 4. Develop expertise in spoken, written, and presentational skills for communicating science. 5. Analyse and apply the main principles and practicalities of event organisation, and gather experience in organising a science communication activity. 6. Critically evaluate the quality and effectiveness of examples of science communication. 	7.5	15

Marine Modelling

This module aims to introduce prediction of the dynamics of complex systems through the techniques of simple mathematical modelling; to describe theory of the ecology of individuals, populations and communities of organisms and the linkages between these levels of ecological organisation.

Learning Outcomes/Objectives

- Outline the formal rationale of mathematical modelling of marine systems
- Compare the alternative approaches to marine modelling, the scenarios in which they are appropriate and their limitations.
- Analyse the theory of population dynamics, including age- and size-structured approaches, individual based models, populations of predators and prey, parasites and hosts, and competing species.
- Describe the techniques used in the modelling physical processes.
- Gain familiarity with a range of modelling platforms.

Renewable Energies and Waste Minimisation

7.5	15
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A fundamental tenet of sustainable development is the prudent use of natural resources. Two areas with a major influence on this are renewable sources of energy and waste management/minimisation. This module will provide the student with a clear picture of the range of renewables options, particularly as they exist in the Highlands and Islands, and sufficient technical background to enable comparisons between them and permit assessment of their suitability in a wide variety of situations. The module will also describe the background to the waste situation in the UK and Europe and the strategies adopted to deal with this. The understanding gained will enable the student to develop improved approaches to waste management.

Learning Outcomes/Objectives

On completing this module the student should:

- have a basic understanding of the technical background to the energy industry;
- evaluate a wide range of methods of harnessing renewable forms of energy in terms of their suitability for meeting the energy needs of a variety of communities;
- be able to analyse the main types and sources of materials entering the waste stream and
- evaluate the strategies currently used to manage waste and justify appropriate methods in a range of situations.

Landscape Ecology

7.5	15
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This module aims to give students an up-to-date introduction to theories, methods and applications of the rapidly widening discipline of Landscape Ecology. The module will give the student access to recent developments in this field and so give them new insights into topics as wide ranging as conservation biology, sustainable development, managing resources and the relationship between economics and ecology.

Genuine opportunities also exist to link with the GIS modules through the design exercise assessment.

Learning Outcomes/Objectives

1. Describe what is meant by the term Landscape Ecology.
2. Outline the development of the concept of Landscape Ecology.
3. Discuss some of the underlying theories of Landscape Ecology.
4. Understand some the methodologies available to Landscape Ecologists.
5. Analyse actual and potential application of Landscape Ecology.
6. Be able to analyse environmental information using an appropriate Landscape Ecological approach.

(1) **Course unit code:**

Refer to the ECTS information Package

(2) **Duration of course unit:**

Y = 1 full academic year

1S = 1 semester 2S = 2 semesters

1T = 1 term/trimester 2T = 2 terms/trimesters

(3) **Description of the institutional grading system:**

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(4) **ECTS grading scale:**

ECTS Grade	% of successful students normally achieving the grade	Definition (only of failing grades)
A	10	
B	25	
C	30	
D	25	
E	10	
FX	-	FAIL – some more work required before the credit can be awarded
F	-	FAIL – considerable further work is required

(5) **ECTS credits:**

1 full academic year = 60 credits

1 semester = 30 credits

1 term/trimester = 20 credits