SEMESTER 1, 2013-14

MODULES ON OFFER FROM THE COLLEGE OF SCIENCE

Understanding Course Codes/Levels

The structure of a module's code is made up of a sequence of letters and numbers. The module code starts with two letters which denote the Discipline teaching the module (e.g., AN – Anatomy, BI – Biochemistry, SI Physiology etc). The remainder of the module code is made up of three numbers.

The first number in the sequence indicates the year the module is delivered to e.g. PH101 is a physics course offered to first year domestic students. AN219 is an anatomy module offered to second year domestic students. BI319 is a biochemistry module offered to third year domestic students etc. Module codes starting with the numbers 4 or 5 are normally offered to 3rd and/or 4th year students. Visiting students are offered courses from 1st, 2nd, 3rd and 4th year.

Most courses available to visiting students are not at a foundation level and therefore require applicants to have previously studied in the discipline. The higher the first number in the sequence, the more advanced the course is.

Visiting students wishing to take science courses other than those offered to first year domestic students must have previously studied in the discipline. The more advanced the course on offer, the greater must be the applicant's previous familiarity with material in that discipline.

Code	Module Title	Sem	ECTS	Examination Arrangements
AN219	Cell Biology	1	5	Two hour examination
AN224	Structure of the Fundamental Tissue (Please note this module can only be taken together with AN219. It is not available on its own)	1	5	Two hour examination
AN230	Human Body Structure	1	5	Two hour examination
BI208	Protein Structure and Function	1	5	Two hour examination
BI309	Cell Biology	1	5	Two hour examination
BI318	Human Nutrition	1	5	Two hour examination
BI319	Molecular Biology	1	5	Two hour examination
BO201	Molecular and Cell Biology	1	5	Two hour examination
BO202	Evolution and the Tree of Life	1	5	Two hour examination
BPS202	Fundamentals in Aquatic Plant Science	1	5	Two hour examination
BPS302	Plant Ecology	1	5	Two hour examination
BPS303	Soils, Climate and Palaeoecology	1	5	Two hour examination
CH203	Physical Chemistry	1	5	Two hour examination
CH204	Inorganic Chemistry	1	5	Two hour examination
CH207	Computers in Chemistry	1	10	Continuous Assessment
CH311	Organic Chemistry	1	5	Two hour examination
CH326	Analytical Chemistry and Molecular Structure	1	5	Two hour examination
CH332	Drug Design and Drug Discovery	1	10	Two hour examination
CS211	Programming and Operating Systems	1	5	Two hour examination
EOS104.I	Introduction to Earth and Ocean Sciences A	1	5	Two hour examination
EOS229	Properties of the Ocean	1	5	Two hour examination
EOS230	Ocean Processes	1	5	Two hour examination
EOS321	Igneous Petrology	1	5	Two hour examination
EOS322	Metamorphic Petrology	1	5	Two hour examination
EOS323	Sediments and the sedimentary record	1	5	Two hour examination
EOS324	Applied Palaeobiology	1	5	Two hour examination
MI202	Laboratory Skills in Microbiology I	1	5	Two hour examination
MI306	Marine Microbiology	1	5	Two hour examination
MI324	Immunology and Recombinant Techniques	1	5	Two hour examination
MI326	Microbial Metabolic and Molecular Systems	1	5	Two hour examination
MP231	Mathematical Methods I	1	5	Two hour examination
MP236	Mechanics I	1	5	Two hour examination
MP305	Modelling I	1	5	Two hour examination
MP345	Mathematical Methods I	1	5	Two hour examination
PH101 *	Physics	1 & 2	15	Two hour examination each semester
PH101.I	Physics	1	5	Two hour examination
PH215	Electricity, Magnetism & Electrical Circuits	1	5	Two hour examination
PH216	Mechanics	1	5	Two hour examination
PH222	Astrophysical Concepts	1	5	Two hour examination
PH328	Physics of the Environment I	1	5	Two hour examination
PH331	Wave Optics	1	5	2 hour examination
PH332	Electronics	1	5	Two hour examination
PH333	Quantum Physics	1	5	Two hour examination

Code	Module Title	Sem	ECTS	Examination Arrangements
PH334	Computational Physics	1	5	Two hour examination
PH339	Radiation and Medical Physics	1	5	Two hour examination
PH341	Measurement of health hazards at work	1	5	Two hour examination
PH421	Quantum Mechanics	1	5	Two hour examination
PH422	Solid State Physics	1	5	Two hour examination
PH423	Applied Optics and Imaging	1	5	Two hour examination
PH426 *	Problem Solving and Physics Research Skills	1 & 2	5	Departmental Assessment
PH428	Atmospheric Physics and Climate Change	1	5	Two hour examination
PH430	Biophotonics	1	5	Two hour examination
PH466	Astrophysics	1	5	Two hour examination
PM208	Fundamental Concepts in Pharmacology	1	5	Two hour examination
PM209	Applied Concepts in Pharmacology (Please note this module can only be taken together with PM208. It is not available on its own)	1	5	Two hour examination
PM311	Introduction to Toxicology	1	5	Two hour examination
SI206	Introduction to Physiology and Gastrointestinal	1	5	Two hour examination
SI207	Nerve and Muscle	1	5	Two hour examination
SI311	Neurophysiology	1	5	Two hour examination
SI312	Endocrinology	1	5	Two hour examination
SI317	Human Body Function	1	10	2 x two hour examination
SI326	Advanced Cardiovascular Physiology	1	5	Two hour examination
ZO207	Comparative and adaptive physiology	1	5	Two hour examination
ZO317	Evolutionary Biology	1	5	Two hour examination
ZO318	Geographic Information Systems and Biostatistics	1	5	Two hour examination
ZO319	Marine Zoology	1	5	Two hour examination

* Year long module examined in Semester I and Semester 2 each year.

ANATOMY

Code	Module Title	Semester	ECTS	Examination Arrangements
AN219	Cell Biology	1	5	Two hour examination

The aim of this module is to facilitate an understanding of the organization and compartmentalization of the eukaryotic cell, cellular communications and motility, the cell cycle, cell death and cellular differentiation.

On successful completion of this module the learner should be able to:

1. Describe the basic organisation of a eukaryotic cell, name the major organelles
2. and describe their function.
3. Describe the main components of the cytoskeleton in eukaryotic cells and know
4. what their function is.
5. Describe the junctions which form between eukaryotic cells.
6. Be familiar with the types of signal that cells send and receive and the main signaling mechanisms utilized by eukaryotic cells
7. Describe the eukaryotic cell cycle and understand the processes of mitotic and meiotic cell division.
8. Describe cell death and know that this can occur by several mechanisms including apoptosis and necrosis.
9. Describe what stem cells are and the basics of the process of cell differentiation from stem cells to the specialized cell types of the human body.
10. Describe the basics of how loss of cell control can cause cancer.

Code	Module Title	Semester	ECTS	Examination Arrangements
AN224	Structure of the Fundamental Tissue *(Please note this module can only be taken together with AN219. It is not available on its own)*	1	5	Two hour examination

The module covers the histological structure and functional relationships of the fundamental tissues, including the microvascular system. There is a strong emphasis on the common principles of tissue architecture that underly the structure of the fundamental tissues. How these common principles are modified to provide unique tissue specific structures and functions is also emphasized. Tissue turnover and dynamics are also considered, especially in the context of the response to injury and cancer development. The role of stem cells in tissue maintenance and the potential for tissue engineering in vitro are also addressed. The lectures are complemented by practicals using virtual microscopy in which the student will learn to recognize and classify all of the fundamental tissues and their cellular and non-cellular components

On successful completion of this module the learner should be able to:

1. Describe the ways in which cells interact with one another to form tissues and organs
2. Describe the means by which tissues and organs interact with their surrounding environment
3. List the fundamental tissues and state functions for each.
    a. Give locations for each
4. For each of the fundamental tissues you will:
    a. Describe the types of cells and extracellular matrix that make up the tissue
    b. Explain how different types of the tissue are classified and the basis of this classification
    c. List and describe any special features of the cells which make up the tissue and relate this to overall tissue function
    d. Where relevant, describe the tissue dynamics of growth and repair
5. Explain turnover and tissue dynamics in respect of each of the fundamental tissues
    a. Compare and contrast these factors between different tissues
    b. Explain the role of stem cells in each of the above processes
    c. Relate these concepts to tissue healing and the development of cancer

Code	Module Title	Semester	ECTS	Examination Arrangements
AN230	Human Body Structure	1	5	Two hour examination

This module will develop concepts for the understanding of the normal anatomical body structures, organisation and function and will help predicting how impairment may impact on those parametrs.

On completion of this module, students will be able to:

- Describe the structure of cells, formation of tissues and general organisation of human body.
- Describe the organisation and functional anatomy of the musculoskeletal, cardiovascular , repiratory, gastrointestinal and reproductive systems as well as a basic understanding of the organisation of the topographic organisation of the brain.

BIOCHEMISTRY

Code	Module Title	Semester	ECTS	Examination Arrangements
BI208	Protein Structure and Function	1	5	Two hour examination

This course will provide a comprehensive understanding of the fundamental concepts of the biochemistry of proteins and their vital role as the molecular tools of living cells. Using examples, the relationship between structure on biochemical function will be discussed. Students will be introduced to the essential role of Enzymes as biocatalyts in living cells. The practical course will introduce students to the main concepts and methodologies for biomolecule measurement in biochemistry.

On successful completion of this module the learner should be able to:

1. Describe fully the general molecular structure and function of proteins
2. Demonstrate the role of enzymes as nature's own biocatalysis at the molecular level from studies of kinetics and molecular structure
3. Develop an understanding of the main experimental approaches and concepts for biomolecule analysis
4. Manipulate biochemical reagents and perform biochemical assays
5. Perform core techniques for measuring properties and quantities of the four main classes of biomolecules, including proteins
6. Demonstrate an ability to present and interpret scientific results
7. Draw scientifically grounded conclusions from observations and explain these in writing
8. Explain the main units of biochemical measurements and perform the basic calculations used in biochemistry

Code	Module Title	Semester	ECTS	Examination Arrangements
BI309	Cell Biology	1	5	Two hour examination

Module Description: The course will provide students with a knowledge of the structure and function of typical eukaryotic cells, the fundamental concepts of how cells communicate and how the cells of the human immune system function. Practical classes will give students an understanding of laboratory safety, good laboratory practices, solutions and buffers, eukaryotic cells, and antibodies as biochemical reagents.

Code	Module Title	Semester	ECTS	Examination Arrangements
BI318	Human Nutrition	1	5	Two hour examination

The Human Nutrition module covers

a) Basic principles of healthy eating, historical aspects of the Irish Diet, aspects of food safety, food technology, food labelling.

b)The relationship between diet and disease - heart disease, diabetes, obesity, eating disorders.

c)Specific nutritional needs of different population subgroups - infants, children,teenagers, older people, ethnic groups, and sports people.

d) Clinical nutrition includes enteral and parenteral nutrition

e) Food Policy

On successful completion of this module the learner should be able to:

1Demonstrate knowledge of the basic nutrients in food
2Describe the relationship between diet and both prevention and treatment of disease
3Explain the special nutritional needs of different population subgroups
4Explain the importance of nutrition in a clinical setting
5Describe nutrition poilicy both in Ireland and Internationally

Code	Module Title	Semester	ECTS	Examination Arrangements
BI319	Molecular Biology	1	5	Two hour examination

Module Description: This course will provide students with an understanding of the eukaryotic cell cycle and DNA replication, the genomes of eukaryotic cells, regulation of eukaryotic gene expression, and viruses. Practical aspects of the course will give experience of key fundamental techniques used in molecular biology including plasmid DNA preparation, restriction endonuclease digestion, polymerase chain reaction and agarose gel electrophoresis.

Botany and Plant Science

Code	Module Title	Semester	ECTS	Examination Arrangements
BO201	Molecular and Cell Biology	1	5	Two hour examination

Module Description: This course aims to provide students with the key molecular concepts of the biology of living cells. The basic structure and organisation of prokaryotic and eukaryotic cells will be described, with an emphasis on understanding the similarities and differences between cells from these main domains of life. The composition, structure and importance of the four major groups of biomolecules will be reviewed. Fundamental topics on genomes and genome organization will also be covered.

Code	Module Title	Semester	ECTS	Examination Arrangements
BO202	Evolution and the Tree of Life	1	5	Two hour examination

Module Description: This module is focused on key concepts in evolutionary biology including evolution at the molecular and organismal levels, palaeontology and an introduction to classification and phylogeny. It will also include some of the major evolutionary events in biology such as the origin of the first prokaryotic and eukarytoic cells and the origin of plants and animals as well as systematics of the major groups of organisms.

Code	Module Title	Semester	ECTS	Examination Arrangements
BPS202	Fundamentals in Aquatic Plant Science	1	5	Two hour examination

This module will introduce key aspects of the biology of aquatic photosynthetic organisms including seaweeds, microalgae and other aquatic plants. In particular it explores the aquatic environments including lakes and marine systems as habitats for aquatic plant and algal growth and provides fundamentals of algal diversity, functionality and ecology, and plant/algal environment interactions.

On successful completion of this module the learner should be able to:

- Outline and appreciate the importance of different algal groups (including both microalgae and macroalgae) in ecology and their applications in biotechnology
- Describe and characterise environments (terrestrial, freshwater, marine) suitable for algal growth, with particular detail on growth requirements and controlling factors regarding seaweeds and phytoplankton
- Appreciate the diversity of different algal groups, their distinguishing biological features including morphological growth forms, and identify common representatives of native Irish algal groups
- Describe and appreciate the different interactions between algae and their abiotic (physical, chemical) and biotic (living) environments
- Describe the origin and relationships between different photosynthetic organisms
- Understand key physiological processes in algae and their modifications to different environmental challenges

Code	Module Title	Semester	ECTS	Examination Arrangements
BPS302	Plant Ecology	1	5	Two hour examination

Plant ecology is the study of plants and plant interactions in the context of their environments, with a particular focus on ecological concepts and processes. Students are introduced to the concepts and practice of vegetation analysis and ecology, phytosociology and plant-soil relationships.

On successful completion of this module the learner should be able to:

1 Understand the principles and concepts of plant ecology

2 Understand the concepts of phytosociology, as applied to the principal Irish plant communities

3 Underake a phytosociology vegetation analysis and complete a field report of this analysis

4 Have a scientific appreciation of the ecology, structure and vegetation description of principal habitats in Ireland

5 Develop skills in use of computers for the analysis of phytosociological data

6 Understand the effects of different soil types and characterisics on plant communities

Code	Module Title	Semester	ECTS	Examination Arrangements
BPS303	Soils, Climate and Palaeoecology	1	5	Two hour examination

Module provides an introduction to plant interactions with their physical environment (soil and climate). Key geological concepts of relevance to plants are introduced (rock type, geological time, fossilisation process). Causes & consequences of climate changes during the Quaternary period are considered in relation to vegetation. Use of pollen and leaf shape analysis to interpret past environments and measurement of soil characters. Research essay to build critical analysis/writing skills.

On successful completion of this module the learner should be able to:

1 Understand the causes of changes in plant communities over the last 2.5 million years (Quaternary period).

2 Understand basic geological concepts such as geological time and the processes of plant fossilisation
.
3 Understand the causes and consequences of climate change over the last 2.5 million years, including modern climate change issues.

4 Be able to undertake some of the most common palaeobotanical techniques (pollen analysis and CLAMP (leaf shape) analysis).

5 Understand the concepts and uses of key climate proxies for interpreting past periods of climate change

6 Describe, measure and calculate key soil characteristics and critically assess the links between plants, soil and environmental variables.

7 Be able to research and write a scientific research essay and under.

CHEMISTRY

Code	Module Title	Semester	ECTS	Examination Arrangements
CH203	Physical Chemistry	1	5	Two hour examination

Module Description: This course comprises lectures and tutorials and a practical component, expanding upon the fundamentals of chemistry covered in year 1. The course provides an introduction to the physical principles that underlie chemistry with a focus on the properties of gaseous matter, laws of thermodynamics, chemical equilibrium and kinetics and introduction to spectroscopy

Code	Module Title	Semester	ECTS	Examination Arrangements
CH204	Inorganic Chemistry	1	5	Two hour examination

Module Description: In this module the students will learn about organic chemical functional groups and their reactions & reactivity, building on the knowledge gained in year one. There will be a theory and practical component. The theory component will deal with mechanism,reactions, reactivity and structure. In the practical component basic synthetic and analytical techniques used in the organic chemistry laboratory will be introduced

Code	Module Title	Semester	ECTS	Examination Arrangements
CH207	Computers in Chemistry	1	10	Continuous Assessment

Module Description: The module consists of a number of units designed to provide hands on experience of the most important softwages packages currently being used by professional chemists, and other molecular scientists. These include Word and Excel (graphing), molecular modelling and graphics software, and e-literature search tools; a presentation is prepared using PowerPoint, and delivered to the group. The module is assessed on the basis of reports submitted for each unit.

Code	Module Title	Semester	ECTS	Examination Arrangements
CH311	Organic Chemistry	1	5	Two hour examination

This course comprises lectures and tutorials, and expands upon the fundamentals of organic chemistry covered in years 1 and 2. Heterocyclic chemistry, chemistry of biomolecules, structure and reactivity, determination of reaction mechanism, retrosynthesis and stereochemistry are introduced and studied in detail. The course emphasizes chemistry of relevance to modern industry, including the (bio)pharmaceutical industry.

On successful completion of this module the learner should be able to:

1. Understand the structure, bonding and the influence of the heteroatom(s) of pyridine, pyrrole, indole, thiophene, furan, diazoles, triazoles and tetrazoles, and the affect on reactivity.
2. Write reaction schemes and give curly arrow mechanisms for aromatic substitutions on the above heterocycles, as well as Diels-Alder and 1,3-dipolar cycloaddition reactions.
3. Understand the chemistry of peptide synthesis
4. Understand how organic structure and reactivity are related quantitatively & approaches to determining organic reaction mechanism
5. Use a retrosynthetic approach to design a multistep synthesis for a carbon based molecule
6. Apply basic stereochemical principles to the structure and reactions of carbon based molecules
7. Demonstrate knowledge of the structure and function of biomolecules
8. Demonstrate an understanding of protein structure in the context of the properties of amino acid residues, the peptide backbone and environmental factors

Code	Module Title	Semester	ECTS	Examination Arrangements
CH326	Analytical Chemistry and Molecular Structure	1	5	Two hour examination

A variety of analytical techniques and their application will be covered. Also included will be methods (e.g. NMR, IR, MS, X-ray crystallography) which are used in structure determination of chemical compounds. This is a theory based module. A practical component related to this module will run parallel with this course (Experimental Chemistry I).

On successful completion of this module the learner should be able to:

- Understand the basic principles and main components of important surface analytical techniques such as SEM-EDX, SIMS and XPS and be able to interpret the chemical and structural data obtained using these techniques.
- Understand the basic concepts of crystallography such as crystal systems and Bravis lattices and have the ability to index simple X-ray powder diffraction patterns and to calculate unit cell parameters and densities from X-ray powder data.
- Relate their knowledge of the theory and instrumentation of gas-liquid chromatography to the design of a variety of seprations.
- Explain the theory of X-ray Fluorescence spectroscopy and the origin of the spectral lines.
- Describe the basic experimental and theoretical issues involved in obtaining an NMR spectrum and to deduce the structure of a molecule on the basis of information obtained from its 1H- and 13C- NMR spectra.
- Understand the theoretical principles, instrumentation, operation and data interpretation of thermogravimetry and differerential scanning calorimetry. They will also understand the theoretical principles and applications of gas sensors based on electrochemical and combustion methods.
- Explain the machinery and chemical basis behind mass spectrometry including ion generation, separation, detection and the fragmentation mechanisms and be able to apply mass spectra to the analysis of known and unknown compounds.
- Describe the operation of analytical HPLC instruments in relation to pumping systems, injection valves, columns and detectors and to identify the key features in HPLC applications relating to the analysis of pharmaceuticals and related materials.

Code	Module Title	Semester	ECTS	Examination Arrangements
CH332	Drug Design and Drug Discovery	1	10	Two hour examination

This module deals with how basic concepts regarding molecular structure and function relate to drug design & discovery. The module will have a theory and practical component. The theory component will deal with thermodynamics, molecular modeling, protein structure, natural products, heterocycles and how these related to drug design & drug discovery. The practical component will focus on computational methods and how they are appied in drug design.

On successful completion of this module the learner should be able to:

1. Relate concepts in molecular mechanics to thermodynamic properties of ligand-protein interactions (enthalpy, entropy, the role of solvent)
2. Understand classical mechanical force fields and molecular dynamics simulations
3. Be competent in accessing and retreiving data from structure databases, and in using computational software to analyze and vizualize molecular complexes
4. Define the issues associated with computational conformational sampling, automated docking, and binding energy calculations
5. Understand the historical and current importance of natural products as drugs and drug leads and identify the most important natural sources for drug discovery
6. Describe the advantages, challenges as well as concepts and methods used in natural product drug discovery
7. Describe the role of heterocyclic molecules in drug discovery, including the mechanism of action of anticancer and antiviral agents (e.g. mitomycin C and AZT)
8. Understand biosynthetic and drug activation reactions involving DNA, RNA, ATP, cAMP, S-adenosyl methionine and NQO1.

COMPUTER SCIENCE

Code	Module Title	Semester	ECTS	Examination Arrangements
CS211	Programming and Operating Systems	1	5	Two hour examination

This course introduces operating systems, the most fundamental piece of software running on any computer.

On successful completion of this module the learner should be able to:

1. Name and describe the main tasks of an operating system;
2. Explain the concept and purpose of a process in an operating system;
3. Represent the life cycle of a process in a diagrammatical fashion;
4. Describe and compare various scheduling strategies;
5. Explain and implement a queue data structure;
6. Apply a semaphore as a tool in concurrent programming;
7. Explain the necessary conditions for deadlock;
8. Describe and apply an algorithmic strategy for deadlock detection.

EARTH & OCEAN SCIENCE

Code	Module Title	Semester	ECTS	Examination Arrangements
EOS104.1	Introduction to Earth and Ocean Science	**1**	**5**	

This module will introduce students to the breadth of topics covered in Earth & Ocean Sciences. It assumes no previous knowledge of subjects such as geography. It will outline the following: The Solar System; Earth's Structure; Oceanography; Hydrogeology; Earth's Crust; Tectonics; The Biosphere; Geo-environments and Natural Hazards. The lecture course will be linked to practical sessions in a choice of one out of four time-slots per week.

Structure

- Solar system, galaxies and stars, the Sun, the planets.
- Gravity and Earth rotation, seismic structure, magnetic field.
- Evolution of atmosphere, chemical and physical oceanography.
- Hydrogeology, the water cycle, ground water and its protection.
- Minerals and rocks, Geological time, surface processes.
- Seafloor spreading, plate tectonics, dating of rocks
- Evolution of organisms, fossils.
- Energy resources, Irish ore deposits, natural hazards.

Code	Module Title	Semester	ECTS	Examination Arrangements
EOS229	Properties of the Ocean	1	5	Two hour examination

Structure, energy flow through, and circulation of, the atmosphere.
Air-Sea Interaction and exchange of heat, water and gases
Geology of ocean basins
Sources of material and elements to the ocean
Properties of water, ions in seawater-salinity and nutrients
Temperature and salinity variation in the ocean, water column structure
Distribution of water column properties and mapping water masses
Light and sound in the ocean
Ocean instrumentation

Code	Module Title	Semester	ECTS	Examination Arrangements
EOS230	Ocean Processes	1	5	Two hour examination

Module Description:

Global Thermohaline Circulation
Waves and Tides
Sedimentary Processes on continental margins
Hydrothermal Circulation
Photosynthesis and nutrient cycling
Biogeochemical cycling of gases in the ocean
Biogenic sediment formation and distribution

Code	Module Title	Semester	ECTS	Examination Arrangements
EOS321	Igneous Petrology	1	5	Two hour examination

Module Description:
This module explores the generation, transport and emplacement of magma in the Earth's crust. It introduces the range of igneous rocks encountered in the field through studies of hand specimens and thin sections during practical sessions.

Code	Module Title	Semester	ECTS	Examination Arrangements
EOS322	Metamorphic Petrology	1	5	Two hour examination

Module Description:
This module explores all changes that affect rocks resulting from the metamorphic agents of pressure, temperature and fluid composition in the Earth's crust. The new metamorphic minerals and textures formed are explained and studied in thin section. Particular emphasis is on Barrovian and Buchan style metamorphism of mudstones, siliceous dolomites and basic igneous rocks.

Code	Module Title	Semester	ECTS	Examination Arrangements
EOS323	Sediments and the sedimentary record	1	5	Two hour examination

Module Description:
The course will cover: sandstone petrography; the origin of limestones and carbonate reefs; volcaniclastic sediments; fluid mechanics and the formation of sedimentary structures; depositional environments through geological time; deltas, estuarine and shallow marine environments; sedimentary geochemistry; deep marine sedimentation and turbidities.

Code	Module Title	Semester	ECTS	Examination Arrangements
EOS324	Applied Palaeobiology	1	5	Two hour examination

This module will focus on the use of fossils as tools for interpreting past (palaeo) environments.

MICROBIOLOGY

Code	Module Title	Semester	ECTS	Examination Arrangements
MI202	Laboratory Skills in Microbiology I	1	5	Two hour examination

Module Description: The study of microorganisms requires that first they be isolated in pure culture and then that their identity can be determined. This laboratory based module will provide instruction in the basic techniques by microbiologists to culture and identify significant groups of bacteria. Culturing techniques and basic microscopy will be the main emphasis of the module. The module will be supplemented by 6 lectures that will provide the theoretical background necessary to understand the laboratory methodologies.

Code	Module Title	Semester	ECTS	Examination Arrangements
MI306	Marine Microbiology	1	5	Two hour examination

Module Description: Introduction to marine microbiology and microbial ecology. Overview of marine microbes. Marine primary productivity, The role of bacteria in marine food webs and the global carbon cycle. Marine carbon cycle, Marine nitrogen cycle. Marine viruses. Unveiling marine microbial diversity; Molecular microbial ecology and techniques (e.g. nucleic acids extraction, PCR, gene cloning)

Code	Module Title	Semester	ECTS	Examination Arrangements
MI324	Immunology and Recombinant Techniques	1	5	Two hour examination

Module Description: Overview of DNA structure, physicochemical properties. Purification of nucleic acids. Manipulation of genetic material through DNA- and RNA-modifying enzymes. PCR. Vectors for cloning and gene expression. Applications of recombinant DNA technology. Ethical considerations. Overview of the immune system. Brief history of immunology. Innate immunity. Adaptive immune responses – humoral and cell-mediated. Antibody structure, function, diversity and mode of action. T lymphocytes. T cell receptor structure, diversity and functioning. Memory and vaccination. MHC: classes, structure, function, diversity, assembly and antigen presentation. Complement: activation, pathway cascade and effector functions. Immunological tolerance. Immunodeficiencies. Immunotechniques *in vitro* and *in vivo*.

Code	Module Title	Semester	ECTS	Examination Arrangements
MI326	Microbial Metabolic and Molecular Systems	1	5	Two hour examination

Module Description: Microbial growth and metabolism. Nutrition, metabolism and other factors influencing microbial growth with specific emphasis on cellular catabolic and anabolic systems of microorganisms. Genetics of microbial cells. Nucleic acids structure, properties and function; Replication in Procaryotes. Transcription and translation in Procaryotes. Control of gene expression involved in the metabolism of simple sugars and amino acids (lactose operon, tryptophan operon) ; Genetic recombination events in microbes and the use of mutants in the analysis of gene location and function and expression.

MATHS PHYSICS

Code	Module Title	Semester	ECTS	Examination Arrangements
MP231	Mathematical Methods I	1	5	Two hour examination

MP231 – Maths Methods I
This course covers mathematical methods (principally from Calculus) that are important in applications. Included are differentiation and integration of functions of multiple variables and associated applications such as optimization (Lagrange Multipliers), critical points, Fourier series, and area/volume calculations.

Module Learning Outcomes: On successful completion of the module the learner should be able to:

- Calculate partial differentials of a function of two or three variables, and determine the critical points
- of functions of two variables, including constrained systems using Lagrange multipliers.
- Determine Fourier series for periodic functions; utilize even/odd properties of functions to optimize
- Fourier series calculations; define the periodic extension of a function defined in an interval.
- Carry out multiple integrals of a function; interpret results in terms of area and/or volume; calculate
- the area bounded by multiple curves.
- Exhibit Green's theorem by calculating the relevant double integral and single (line) integrals.

Code	Module Title	Semester	ECTS	Examination Arrangements
MP236	Mechanics I	1	5	Two hour examination

1 Dimensional analysis: fundamental units, derived units, dimensionless quantities, the Buckingham pi theorem, analysing systems using dimensional analysis, similarity, scale models

2 Calculus of variations: some examples of variational problems – shortest distance between two points, minimal surface area of revolution, Fermat's principle. Derivation of the Euler-Lagrange equation, some first integrals of the Euler-Lagrange equation, solution of some problems, the Euler-Lagrange equations for several functions

3 The Lagrangian formulation of mechanics: coordinate systems, degrees of freedom, generalised coordinates, holonomic systems, constraint forces, the action integral and Hamilton's principle, derivation of the Lagrange equations of motion for a holonomic system, examples of solving mechanics problems using Lagrange's equations

4 Rigid body motion: the motion of the centre of mass of a system of particles, angular momentum and torque, motion about the centre of mass of a rigid body, angular velocity, the moment of inertia tensor, kinetic energy of a rigid body, the solution of some problems for rigid bodies.

Code	Module Title	Semester	ECTS	Examination Arrangements
MP305	Modelling I	1	5	Two hour examination

This course consists of four separate areas of application of Mathematical Modelling. The approach taken is to develop the appropriate mathematical and computational techniques required to model and analyse various real world problems. The course is available in semester I only.

Who Can Take This Course?

This course is an option for science students who have passed a second year course in mathematical physics or mathematics.

The following four topics are covered:
Network Flow Models
Critical Path Analysis
Traffic Flow Models
Game Theory
Students are expected to attend one weekly two hour Maple practicals where various aspects of these topics are illustrated. No previous experience with Maple programming is required.

Code	Module Title	Semester	ECTS	Examination Arrangements
MP345	Mathematical Methods I	1	5	Two hour examination

This course introduces some advanced methods of mathematical physics for solving ordinary differential equations, and presents some applications of complex analysis.
Amongst the topics covered are:
(i) solution methods for second order linear differential equations with constant coefficients;
(ii) power series and Frobenius series solutions of second order linear ordinary differential equations with variable coefficients;
(iii) orthogonality relations for trigonometric functions, Legendre functions, and Bessel functions;
(iv) the calculation of some real integrals using complex contour integration;
(v) complex analytic functions.

Module Learning Outcomes: On successful completion of the module the learner should be able to:

- Find the general solution to a second-order linear differential equation with constant coefficients
- when it is homogeneous, and a particular solution when it is inhomogeneous;
- Find a second, linearly independent, solution to a second-order differential equation when one is
- known;
- Compute the first few terms of a power series or Frobenius series solution to a second-order linear
- equation with variable coefficients, when it exists;
- Derive orthogonality relations for trigonometric, Legendre and Bessel functions;
- Compute real integrals using the theorems of complex contour integration;
- Draw fields described by complex analytic functions.

PHYSICS

Code	Module Title	Semester	ECTS	Examination Arrangements
PH101 *	Physics	1 & 2	15	Two hour examination each semester

A one year introductory course in Physics consisting of lectures on topics such as the following: Mechanics, heat, sound, Electricity and magnetism, Light atomic and nuclear physics.
Students also attend a weekly laboratory session

*This is a full year course.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH101.I	Physics	1	5	Two hour examination

Section A: Mechanics, properties of matter and heat

- Vectors
- Statics
- One dimensional motion - Mark's Kinematic Equations Solver
- Newton's laws
- Work and energy
- Momentum
- Motion in a plane
- Circular motion
- Rigid bodies
- Properties of matter, gases
- Temperature, gas laws, thermal properties

Code	Module Title	Semester	ECTS	Examination Arrangements
PH215	Electricity, Magnetism & Electrical Circuits	1	5	Two hour examination

This module provides an in-depth study of Electric and Magnetic fields and forces using calculus and vector techniques. The principles developed will be applied to dc and ac circuit analysis.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH216	Mechanics	1	5	Two hour examination

In this module calculus and vector techniques are used to study the motion of objects and see how forces affect this motion. Linear motion and rotational motion are both considered. Energy-based methods are applied to study problems involving non-uniform forces. This module also includes a short introduction to the use of computational methods and computers to solve physics problems.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH222	Astrophysical Concepts	1	5	Two hour examination

Major astrophysical concepts and processes such as radiation, dynamics and gravity are presented. These concepts are illustrated by wide ranging examples from stars and planets to nebulae, galaxies and black holes.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH328	Physics of the Environment I	1	5	Two hour examination

Emphasis is on environmental **physics** and how physical properties may be monitored.

Introductory Physics background
Molecular transfer processes. Diffusion and convection currents.
Measurement of relative humidity, temperature, pressure.
The electromagnetic radiation spectrum.

Air Quality
Heat conduction, convection, and radiation.
Global warming. Greenhouse gases. Ozone and UV radiation.
Aerosols. Air quality measurement and control. Air Quality Standards.
Clean room technology.
Effects of aerosols and pollutants on climate.

Built environment
Insulation. Heat pumps.
Thermal pollution. Humidity/condensation.
Fluid transport. Fluid dynamics.
Physical sensors for water quality monitoring.
Elementary data logging, recording, and analysis.
Acoustics. Noise in the environment.
Renewable energy sources.
Environmental aspects of renewable energy sources.
Energy use/waste in society.

Spectroscopy and radiation
Spectroscopic techniques for pollutant monitoring.
Overview of visible, UV, IR spectroscopy. Raman scattering.
Remote sensing.
Light and its measurement. Illumination. Microwaves.
Radiation monitoring. Effects of ionizing and non-ionizing radiation.
Nuclear energy. Fission, fusion, and radioactive waste.
Waste treatment.
Overview of hazardous materials.
Environmental protection studies.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH331	Wave Optics	1	5	2 hour examination

This module provides an in-depth introduction to wave optics and its applications. It will cover topics required for the understanding of modern imaging and photonics, including polarisation, diffraction and interference. The course involves developing skills in solving practical problems, and students will perform relevant optics experiments in the laboratory (Michelson interferometer, Fourier Optics, Scanning monochromator, ray tracing).

Code	Module Title	Semester	ECTS	Examination Arrangements
PH332	Electronics	1	5	Two hour examination

This module provides students with an overview of the key components and systems in analog and digital electronics. The underlying principles of semiconductor materials, binary numbers, Boolean logic, and sequential logic, form the platform for understanding of higher level device/circuit design and performance. The functionality of some of the more common and useful specific electronic devices is explored. We explain the integration of such components into higher-level microprocessors, and study the instructions sets used to programme them.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH333	Quantum Physics	1	5	Two hour examination

This module provides an introduction to quantum physics. It describes the origin of quantum physics using the theories of Planck for blackbody radiation and Einstein for specific heat. The course then progresses to describe matter using wave functions. The Schrodinger equation is introduced and solved for a number of model problems. The development of operators to extract information from matter waves is considered next. The formal structure of quantum mechanics is then introduced. The course finally considers a two identical particle problem and introduces the concept of the Pauli Exclusion Principle.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH334	Computational Physics	1	5	Two hour examination

Techniques and applications of computational physics are described. In accompanying practical classes, programs are written in a modern computer language to investigate physical systems, with an emphasis on dynamical problems.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH339	Radiation and Medical Physics	1	5	Two hour examination

This module provides an introduction to the medical imaging and instrumentation aspects of real imaging environments, ranging from obsolete modalities to the modern tomographic imaging modalities (such as PET and SPECT). This module also covers the fundamental processes involved in forming images using ionising radiation, safety issues associated with ionising radiation and methods of radiation detection.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH341	Measurement of health hazards at work	1	5	Two hour examination

This course outlines the general approach for the assessment of the health risks associated with exposure to hazardous substances in a workplace environment. It addresses the theory and practice of sampling many of the chemical and biological workplace hazards for example, particulates, bioaerosols, gases, vapours. Students will cover the following subjects; Introduction to Occupational Hygiene, Thermal environment, workplace gases and vapours, workplace dusts, workplace case studies

Code	Module Title	Semester	ECTS	Examination Arrangements
PH421	Quantum Mechanics	1	5	Two hour examination

This module will provide students with an in-depth understanding of the principles of Quantum Mechanics. The principles will be used to analyse simple physical systems and to approximate more complex problems successfully.

On successful completion of this module the learner should be able to:

- define terms and explain concepts relating to the physical principles covered by this module's syllabus.
- describe the physical laws that connect terms and concepts covered by this module's syllabus and, where appropriate, derive the mathematical relationships between those terms and concepts.
- outline applications to real-world situations of the physical principles covered by this module's syllabus.
- analyze physical situations using concepts, laws and techniques learned in this module.
- identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH422	Solid State Physics	1	5	Two hour examination

This module provides students with an advanced understanding of the fundamental properties of solids due to the regular arrangement of atoms in crystalline structures. Simple models are developed using quantum-mechanical and semi-classical principles to explain electronic, thermal, magnetic and optical properties of solids.

On successful completion of this module the learner should be able to:

1. define terms and explain concepts relating to the physical principles covered by this module's syllabus.
2. describe the physical laws that connect terms and concepts covered by this module's syllabus and, where appropriate, derive the mathematical relationships between those terms and concepts.
3. outline applications to real-world situations of the physical principles covered by this module's syllabus.
4. analyze physical situations using concepts, laws and techniques learned in this module.
5. identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH423	Applied Optics and Imaging	1	5	Two hour examination

This module will be an in-depth course on Applied Optics and Imaging, building on previous courses, in particular PH3X1 Wave Optics. Students will learn to solve advanced problems on both geometrical and wave optics, and will carry out assignments using ray tracing software and Matlab or similar. The course will include an introduction to modern imaging techniques, including adaptive optics, as applied to imaging through turbulence.

On successful completion of this module the learner should be able to:

1. define terms and explain concepts relating to the physical principles covered by this module's syllabus.
2. describe the physical laws that connect terms and concepts covered by this module's syllabus and, where appropriate, derive the mathematical relationships between those terms and concepts.
3. outline applications to real-world situations of the physical principles covered by this module's syllabus.
4. analyze physical situations using concepts, laws and techniques learned in this module.
5. identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH426 *	Problem Solving and Physics Research Skills	1 & 2	5	Departmental Assessment

There are two components to this module:

1. Researched essay on an assigned Physics topic: Each student will be mentored by a supervisor, who will provide feedback to the student. Skills developed will include literature searching and structuring evidence-based scientific arguments to support viewpoints. Students will learn how to cite reference material correctly. Students will also be instructed on plagiarism and the ethics of scientific writing.

2. Problem solving: A lecture-based course will develop problem-solving skills including problem definition, solution searching, dimensional analysis and application of physics skills learned in the first three years of the programme. In particular, topics from different courses will be combined to widen students' appreciation of problem solving away from the tightly-defined context of lecture courses.

***This is a full year programme. Students must be enrolled for a full year to take this course.**

Code	Module Title	Semester	ECTS	Examination Arrangements
PH428	Atmospheric Physics and Climate Change	1	5	Two hour examination

This course provides a thorough introduction to atmospheric processes and their relevance to current topics of interest such as climate change, ozone depletion, and air pollution.

On successful completion of this module the learner should be able to:

1. define terms and explain concepts relating to the physical principles covered by this module's syllabus.
2. describe the physical laws that connect terms and concepts covered by this module's syllabus and, where appropriate, derive the mathematical relationships between those terms and concepts.
3. outline applications to real-world situations of the physical principles covered by this module's syllabus.
4. analyze physical situations using concepts, laws and techniques learned in this module.
5. identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.
6. discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in physics research and technology.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH430	Biophotonics	1	5	Two hour examination

The module provides a broad introduction to light interaction with biological materials (including human tissue, both in vivo and ex-vivo) and how it can be harnessed for sensing, imaging and therapy.

On successful completion of this module the learner should be able to:

1. define terms and explain concepts relating to the physical principles covered by this module's syllabus.
2. describe the physical laws that connect terms and concepts covered by this module's syllabus and, where appropriate, derive the mathematical relationships between those terms and concepts.
3. outline applications to real-world situations of the physical principles covered by this module's syllabus.
4. analyze physical situations using concepts, laws and techniques learned in this module.
5. identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.
6. discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in biomedical physics and medical physics.

Code	Module Title	Semester	ECTS	Examination Arrangements
PH466	Astrophysics	1	5	Two hour examination

In this course, we look at a number a number of astrophysics problems that have not been examined in detail in other modules in the programme. The course begins with an analysis of non-thermal radiation processes including synchrotron radiation, Compton scattering and inverse Compton scattering. We then examine these processes in different astrophysical environments – pulsars, active galactic nuclei, shocks in the interstellar medium, accretion disks and supernovae.

On successful completion of this module the learner should be able to:

1. define terms and explain concepts relating to the physical principles covered by this module's syllabus.

2. describe the physical laws that connect terms and concepts covered by this module's syllabus and, where appropriate, derive the mathematical relationships between those terms and concepts.

3. outline applications to real-world situations of the physical principles covered by this module's syllabus.

4. analyze physical situations using concepts, laws and techniques learned in this module.

5. identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

6. discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in astrophysics.

PHARMACOLOGY

Code	Module Title	Semester	ECTS	Examination Arrangements
PM208	Fundamental Concepts in Pharmacology	1	5	Two hour examination

This module introduces students to core concepts in Pharmacology. These include Pharmacokinetics: how drugs are administered, absorbed, distributed around the body, metabolized and excreted; and Pharmacodynamics: how drugs act on their targets in the body, for instance activating or inhibiting proteins, effects of increasing dose, and the clinical consequences of both drug pharmacdynamics and pharmackinetics.

Code	Module Title	Semester	ECTS	Examination Arrangements
PM209	Applied Concepts in Pharmacology (Please note this module can only be taken together with PM208. It is not available on its own)	1	5	Two hour examination

This module introduces students to drug action on the autonomic nervous system and to the process of discovering and developing new drugs

Code	Module Title	Semester	ECTS	Examination Arrangements
PM311	Introduction to Toxicology	1	5	Two hour examination

The aim of this module is to introduce key principles and concepts of Toxicology to science students with an interest in poisons and to enable these student to apply these principles and concepts to specific toxicants.
The course is delivered in Semester 1 with lectures divided into blocks linked to specific learning objectives. The lecture blocks are:
Fundamentals of Toxicology: Introduction to key principles of toxicology
Toxicokinetics: Factors affecting toxic responses including absorption, distribution, metabolism, elimination
Mechanisms of Toxicity: Mechanism of toxic action including biochemical toxicology and mechanisms of cell death
Target Organ Toxicology: The concept of target organ toxicity and Liver, Lung, Skin, and Nervous System Toxicity
Toxicity Assessment: How toxicity is assessed and challenges faced in extrapolating risks to man, in vitro and in vivo testing.

PHYSIOLOGY

Code	Module Title	Semester	ECTS	Examination Arrangements
SI206	Introduction to Physiology and Gastrointestinal	1	5	Two hour examination

This course aims to:

1. Provide a modern education in physiology for students with different intellectual interests and a variety of career aspirations.
2. Focus on a quality academic education including where appropriate the acquisition of technical skills.
3. Advance students' knowledge of fundamental principles in a range of physiological subjects.
4. Provide an educational environment within which students can develop an interest in and enthusiasm for their subject, and realise their potential by acquiring intellectual, scientific, technical and study skills appropriate to self-directed study and lifelong learning.
5. Foster learning through the study of the scientific literature, including original research papers.and immune function.

Code	Module Title	Semester	ECTS	Examination Arrangements
SI207	Nerve and Muscle	1	5	Two hour examination

This course aims to:

1. Provide a modern education in physiology for students with different intellectual interests and a variety of career aspirations.
2. Focus on a quality academic education including where appropriate the acquisition of technical skills.
3. Advance students' knowledge of fundamental principles in a range of physiological subjects.
4. Provide an educational environment within which students can develop an interest in and enthusiasm for their subject, and realise their potential by acquiring intellectual, scientific, technical and study skills appropriate to self-directed study and lifelong learning.
5. Foster learning through the study of the scientific literature, including original research papers.and immune function.

Code	Module Title	Semester	ECTS	Examination Arrangements
SI311	Neurophysiology	1	5	Two hour examination

The module in Neurophysiology will provide students with a knowledge of the function of the brain and spinal cord. Topics covered will include organisation and function of cells of the central nervous system, motor and somatosensoty processing, physiology underlying vision, hearing, sleep, learning, emotion, language, hunger and thermoregulation. Theoretical learning and understanding of will be aided by laboratory practicals investigating the physiology of vision and hearing.

Code	Module Title	Semester	ECTS	Examination Arrangements
SI312	Endocrinology	2	5	Two hour examination

This module will provide students with a comprehensive introduction to the function of the endocrine system with an emphasis on human endocrinology. It will include an introduction hormonal classification and the molecular mechanisms of hormone action, hormone receptors and their signal transduction pathways. The structure and function of classical endocrine glands will be discussed and the pathophysiology of endocrine disorders will be discussed.

Code	Module Title	Semester	ECTS	Examination Arrangements
SI317	Human Body Function	1	10	2 x two hour examination

This module is a fundamental course in Physiology. Its aim is to allow students to study some of the main principles underlying health and disease. It provides an introduction to haematology, cardiac function, nerve and muscle function, lung function and the hormones.

Code	Module Title	Semester	ECTS	Examination Arrangements
SI326	Advanced Cardiovascular Physiology	1	5	Two hour examination

The module in Cardiovascular Physiology will provide students with a knowledge of the function of the cardiovascular system in health and disease. Topics covered will include cardiac and vascular smooth muscle physiology, endothelial cell function, the microcirculation, control of blood vessels, cardiovascular reflexes, co-ordinated cardiovascular responses, the cardiovascular system in disease . Theoretical learning will be aided by practicals investigating heart and blood vessel function.

ZOOLOGY

Code	Module Title	Semester	ECTS	Examination Arrangements
ZO207	Comparative and adaptive physiology	1	5	Two hour examination

Module Description: Physiology is about the physics and chemistry of life. This course deals with specific aspects of animal physiology that include immunology, the body's defence mechanisms against pathogens and tumors, sexual reproduction and development, and special physiological adaptations of animals. The course will also include comparative physiology, that is how did evolution generate different physiological mechanisms to cope with specific challenges faced by different species, and what have been the forces driving changes in physiology.

Code	Module Title	Semester	ECTS	Examination Arrangements
ZO317	Evolutionary Biology	1	5	Two hour examination

This module is focused on key concepts in evolutionary biology including the mechanisms operating on molecules, on populations and those involved in the formation of new species. It will also include topics such as evolutioary repatterning of development, evolutionary constraint and bias and evolutionary innovation.

On successful completion of this module the learner should be able to:

1. Describe the evolutionary forces acting on alleles and genotypes.
2.Explain what is meant by molecular evolution and how it is employed to study evolution of species.
3 Describe in detail different types of speciation, including detailed discussion on the degree and type of isolation, selection and genetic mechanisms at play.
4. Describe the evolutionary origin of development and of metazoans
5. Explain the different modes in which development can be repatterned during evolution
6. Discuss how developmental processes can affect the direction of evolution
7. Display enhanced skills in writing essays on selected key concepts of evolutionary biology

Code	Module Title	Semester	ECTS	Examination Arrangements
ZO318	Geographic Information Systems and Biostatistics	1	5	Two hour examination

This module is focused on using data analysis to understand the environment. It includes an introduction to statistical analyses using examples from field ecology. There is also an introduction to mapping ecological data using geographic information systems (GIS).

On successful completion of this module the learner should be able to:
1.Demonstrate an understanding of the different types of data used in ecology and geographic analyses
2. Explore data using descriptive statistics and apply inferential statistics
3. Understand the role of statistics in planning, validating and communicating the findings of ecological research
4. Have an understanding of databases for managing information
5. Be able to create, edit and analyse spatial data using geographic information systems
6. Produce maps for visualisation and interpretation of ecological data

Code	Module Title	Semester	ECTS	Examination Arrangements
ZO319	Marine Zoology	1	5	Two hour examination

This module focuses on habitats in the marine evironment from the coastal zone to the deep sea. This module will explore the distribution of animals in different marine habitats and how animals have adapted to particular environmental conditions in those habitats.

On successful completion of this module the learner should be able to:

1. Describe the particular challenges faced by animals living in the deep sea and how they have overcome these challenges.
2. 2.Discuss the animal groups that are commonly associated with deep sea fauna and discuss the evolutionary implications of this pattern.
3. 3 Discuss concepts in coastal community processes e.g. 'supply-side' ecology
4. 4 Compare and contrast the challenges faced by creatures in rocky and soft sediment intertidal benthos

(Practical outcome) collecting data, carrying out data analysis and plotting results for intertidal community patterns