NUI Galway
OÉ Gaillimh

College of Science

Undergraduate Book of Modules

2017/18

AN223: Embryology & Development (Semester:4 Group not available to select online)

Module Details

Title Short:	Embryology & Development APPROVED
Module Code:	AN223
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 2
Module Delivered in	7 programme(s)
Module Owner:	PETER DOCKERY
Module Discipline:	AN - Anatomy
Module Description:	Study of embryonic and fetal development. The module will cover: fertillization, blastocyst development and implantation, placenta, early embryonic events that accompany the formation of the three germ layer and the folding of the embryo (gastrulation, neurulation, somitogenesis) and provide the basis for the body plan, and finally with the specific development of: CNS, CVS, Respiratory system, GIT, Urogenital tract, neck, and face

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	have acquired knowledge on the early events of embryonic development
LO2	have a clear overview on the initial full process of prenatal development
LO3	have a clear understanding on how the body plans are established early in development
LO4	have acquired knowledge on the basic steps of development of: CNS, heart and major vessels, lungs and airways, gastrointestinal system, uro-genital system, neck, and face
LO5	have clear understandings on basic concepts on causes of occurrence of variations and birth defects and of their importance
LO6	have knowledge on the formation of the placenta and its functions

AN225: Human Gross Anatomy
(Semester:3 Core)

Module Details

Title Short:	Human Gross Anatomy APPROVED
Language of Instruction:	English

Module Code:	AN225

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	SIOBHAN MCMAHON

Module Discipline:	AN - Anatomy

Module Description:	This is a distance learning module that will challenge your organisational skills and continuous learning approaches, while learning the anatomical structures and their function within the body.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand basic anatomical terminology
LO2	Understand the anatomy of the musculoskeletal system
LO3	Understand the organisation of the vascular supply in the body

AN226: Systems Histology (Semester:4 Group not available to select online)

Module Details

Title Short:	Systems Histology APPROVED
Language of Instruction:	English

Module Code:	AN226

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	8 programme(s)

Module Owner:	HELEN DODSON

Module Discipline:	AN - Anatomy

Module Description:	Systems histology Students will sit a 2 hour exam at the end of semester 2 based on systems histology. Continuous assessment will be carried out in the form of practical exams.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the histological structure of various body systems by light microscopy
LO2	Know the structure and function of the skin, respiratory system, cardiovascular system, reproductive systems, endocrine system, lymphatic system, genitourinary system, gastrointestinal system and blood.
LO3	Discuss the histological structures with correlation to function of various system of the body

AN325: Anatomy Research Mini Project (Semester:6 Optional)

Module Details

Title Short:	Anatomy Research Mini Project APPROVED
Language of Instruction:	English

Module Code:	AN325

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	HELEN DODSON

Module Discipline:	AN - Anatomy

Module Description:	The module builds on the knowledge and skills the student has accumulated in the " Research methods in Biomedical science" module and involves carrying out a research project in a laboratory in one of the Biomedical Science disciplines. Students will research, design and implement a research project. The results of the projects will be presented in the form of a poster presentation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Research a scientific topic
LO2	Design an experimental plan to implement a research project
LO3	work as part of a team in the overall research effort
LO4	Carry out the technical components of the research
LO5	write a report of the results
LO6	critically analyze data
LO7	design and deliver a poster of the research results
LO8	Defend the design of the experiment and the results obtained

AN326: Neuroanatomy
(Semester:5 Optional)

Module Details

Title Short:	Neuroanatomy APPROVED
Language of Instruction:	English

Module Code:	AN326

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	DARA CANNON

Module Discipline:	AN - Anatomy

Module Data:	1.7 - 2 LAB

Module Description:	This module describes the anatomy of the central and peripheral nervous systems. The cells of the nervous system will be described in detail. Students will learn the function of the neuroanatomical components of the central nervous system and understand how they work together, in particular the cerebral cortex, brainstem, cerebellum, spinal cord, limbic system, thalamus, hypothalamus, visual pathway, etc. Students will sit a 2 hour end of semester exam and will be assessed by a practical exam.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the neuroanatomical structures of the nervous system
LO2	Explain the function of the neuroanatomical structures of the nervous system
LO3	Describe how the neuroanatomical components of the central nervous system work together and impact each other
LO4	Describe the structure and function of neurons and glial cells
LO5	Understand the structure and function of the somatosensory and motor sytems
LO6	Describe cortical organisation, the limbic system, the hypothalamus, vision, hearing and speech and language
LO7	Identify neuroanatomical structures on models, prosected specimens, histological images, medical images and gross anatomy specimens.

AN327: Head and Neck Practical (Semester:6 Optional)

Module Details

Title Short:	Head and Neck Practical APPROVED
Language of Instruction:	English

Module Code:	AN327

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	BRENDAN WILKINS

Module Discipline:	AN - Anatomy

Module Description:	In this module you will explore the anatomy of the head and neck, principally through cadaveric dissection. Your own dissections will be supplemented by use of prosected specimens, images, videos, models and software apps. The material covered will build on your knowledge of the peripheral components of the nervous system and as well as extending your knowledge of key parts of the digestive, respiratory and cardiovascular systems. On completion of the module you will have sound anatomical knowledge of the structure and structure function relationships of the human head and neck.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the bones and other skeletal elements, regions, spaces, fasciae, contents, muscles, nerves, blood and lymphatic vessels and glands of the head and neck
LO2	Understand the functional anatomy of the head and neck, including but not limited to, the supra and infra hyoid muscles, muscles of facial expression, muscles of mastication, extra ocular muscles, intrinsic muscles of the larynx, pharyngeal musculature, glands, and the organs of special sense
LO3	Demonstrate the ability to write concise accurate descriptions of the anatomical structures, organs, regions and relations of the head and neck using appropriate anatomical terminology
LO4	Demonstrate the ability to competently dissect the head and neck on a cadaver, or dissect isolated regions of the head and neck on other specimens and to record, document and report the dissection
LO5	Be able to identify and answer questions about anatomical structures, organs, regions and relations of the head and neck on cadavers, prosected specimens, skeletons and bones, images and models

AN437: Advanced Cell Biology and Development (Semester:8 Optional)

Module Details

Title Short:	Advanced Cell Biology and Development APPROVED
Language of Instruction:	English

Module Code:	AN437

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	HELEN DODSON

Module Discipline:	AN - Anatomy

Module Description:	The module builds on prior learning of the student throughout the anatomy learning cycle, but particularly expands on material covered in year 2. Up to 4 cell biology and 4 developmental biology topics will be addressed in the module. The specific topics covered will vary from year to year. The topics will be chosen to illustrate how the experimental approach(es) developed a key theoretical point or paradigm. In all cases investigation of the topic will involve reading the associated primary scientific literature and any relevant review papers and understanding the experiments and experimental approaches contained therein. At the end of the module students will be expected to explain how key experiments and investigations led to our current views on the topics covered.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	For each of the topics covered a. Outline the initial theory, idea, or paradigm b. Offer a critical analysis of the above, especially in regard to any gaps, inconsistencies or inaccuracies c. Outline the experimental approach(es) to resolve the problems identified above d. Describe the key experiments, the questions they posed and the results they generated e. Offer a critical analysis of the above f. Explain how the results of these investigations changed the theory, idea, or paradigm g. Offer a critical analysis of the current theory, idea or paradigm h. Suggest additional investigations and experiemnts that could be performed to strengthen or refute the current theory, idea or paradigm
LO2	More generally, understand and appreciate how an evidence based scientific approach modifies theories, ideas or paradigms over time a. Critically discuss the above using one specific example of your own choice (not from the list of topics covered)

AN440: Advanced Neuroanatomy (Semester:7 Optional)

Module Details

Title Short:	Advanced Neuroanatomy APPROVED
Language of Instruction:	English

Module Code:	AN440

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	SIOBHAN MCMAHON

Module Discipline:	AN - Anatomy

Module Description:	This module will provide an understanding of the neuroanatomical functions of the body and how components of the central nervous system work together. The module involves a series of lectures on particular neuroatomical topics. The module will also involve practical dissections of specific regions of the brain and/or spinal cord from cadavers.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the neuroanatomical structures of the nervous system
LO2	Explain the function of the neuroanatomical structures of the nervous system
LO3	Further develop the ability to critique and discuss advanced neuroanatomical topics and issues including applied methods such as microscopy and neuroimaging techniques
LO4	Describe in detail the neuroanatomy of specific regions of the central nervous system including association fibers, limbic system, cerebellum, etc.
LO5	Dissect and identify regions of the brain and/or spinal cord

AN441: Physical Anthropology (Semester:8 Optional)

Module Details

Title Short:	Physical Anthropology APPROVED
Module Code:	AN441
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 2
Module Delivered in	2 programme(s)
Module Owner:	ALEXANDER BLACK
Module Discipline:	AN - Anatomy
Module Description:	This module addresses several major questions: What kind of animal are we? Why are we the way we are? What makes us the species that we are? In order to ask these questions, and attempt to answer them, the module covers a very broad scope of material, from biology to geology. These topics include but are not limited to: Theories of Evolution: before and after Darwin; Primates; Extinct & Extant primates; The human family; The use of fire, tools and art; Food - where, why and what; European Bog Bodies; What can the study of bones tell us about our past?

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the theory of Evolution
LO2	Describe the important features of primates
LO3	Describe the major extinct and extant priamte groups using specific examples
LO4	Describe the concept of ‘human’ with reference to the hominid lineage
LO5	Describe the major species accepted to be in the hominid lineage
LO6	Describe current and past thinking of the relationship between Homo sapiens and Homo Neanderthalensis
LO7	Describe and discuss the importance of fire and tool use in the evolution of the hominids
LO8	Describe and discuss European Bog Bodies, their relevance and the scientific basis of their preservation
LO9	Understand and describe, citing specific examples, the practice of forensic osteology

AN444: Research Project (Semester:8 Optional)

Module Details

Title Short:	Research Project APPROVED
Module Code:	AN444
ECTS Credits:	20
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 2
Module Delivered in	3 programme(s)
Module Owner:	HELEN DODSON
Module Discipline:	AN - Anatomy
Module Description:	This module presents students with an anatomical research question to be addressed. Students may be given an individual question, or placed in a group. Research questions may require laboratory training or may be literature based. Students will present their research findings orally and will be required to write a short thesis on their research question which will be examined by a panel of academics; students may be called for a confirmation viva voce examination.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Illustrate and explain in detail the background to the research question that is being addressed
LO2	Illustrate and explain in detail the methodology used in addressing the research question
LO3	Illustrate and clearly state the results of the experiments performed
LO4	Discuss and explain the significance of the results obtained with reference to the extant literature.
LO5	Suggest further research avenues stemming directly from, or at least related to, the research that has been performed.
LO6	Demonstrate competency in the research skills required for the project
LO7	Demonstrate a professional approach to research to include punctuality and reliability
LO8	Demonstrate an excellent level of independent thought and self-motivation
LO9	Demonstrate an ability to perform a thorough literature review using pertinent sources
LO10	Express him/herself in writing that is fluent and uses correct scientific language and terminology
LO11	Be able to carry out appropriate analysis for their designated project

AN445: Scientific Writing
(Semester:7 Optional)

Module Details

Title Short:	Scientific Writing APPROVED

Module Code:	AN445

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	HELEN DODSON

Module Discipline:	AN - Anatomy

Module Description:	This module involves a series of lectures where students will be taught the basics of: abstract writing; critical analysis; creating a title for research papers; deciphering the aims/objectives of published research, and hypothesis determination.?Students will be required to formally present a research paper of their choosing in the form of a journal club meeting. Students will sit a 2 hour exam at the end of semester 1 based on scientific writing. Continuous assessment will be carried out in the form of journal clubs and abstract writing/critical analysis of scientific papers.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Write an abstract for a research paper based on paper content
LO2	Create a title for a paper based on paper content
LO3	Define the aims and hypothesis of a research paper based on the paper content
LO4	Write a critical analysis of a research paper
LO5	Feel confident in presenting a research paper as part of a journal club meeting
LO6	Understand, and be confident in participating in, the peer review process and know about journal impact factors
LO7	Use basic biostatistical methods and summarise data numerically and graphically. Comment on the use of statistics in research papers.
LO8	Understand the ideas underlying hypothesis testing, including p-values

AN2101: Cells and Tissues (Semester:3 Group not available to select online)

Module Details

Title Short:	Cells and Tissues APPROVED
Language of Instruction:	English

Module Code:	AN2101

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	6 programme(s)

Module Owner:	HELEN DODSON

Module Discipline:	AN - Anatomy

Module Description:	This module describes the basic organisation and function of a eukaryotic cell and its major organelles. Communication and signalling between cells will be covered, as well as the cell cytoskeleton, cell cycle, cell differentiation and cell death. The module will also explore 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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Synthesize, integrate and critically assess the factual content of the module.
LO2	Describe the basic organisation of a eukaryotic cell including the organelles and cytoskeleton. Describe the cell cycle and cell death and appreciate how changes in normal cellular activities can lead to cancer development and progression.
LO3	Describe the ways in which cells interact with one another to form tissues and organs and how they interact with their surrounding environment.
LO4	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
LO5	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

AN2102: Histology of the Fundamental Tissues (Semester:3 Optional)

Module Details

Title Short:	Histology of the Fundamental Tissues APPROVED
Language of Instruction:	English

Module Code:	AN2102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	HELEN DODSON

Module Discipline:	AN - Anatomy

Module Level:	Honours

Module Description:	This module is an overview of the histological structure of the fundamental tissues. The structure, function, and relations of epithelium, connective tissue, cartilage, bone, muscle, nerve and microvasculature are all covered. The module examines how cells are assembled into tissues and how these tissues accomplish coordinated functions.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain how cells can assemble into the fundamental tissues and explain the role and function of each of the fundamental tissues.
LO2	Describe the microscopic structure of epithelia, connective tissues, cartilage, bone, muscle, nerve, vascular and lymphatic tissues and explain how the structure contributes to the function of the tissue.
LO3	Recognize the microscopic appearance of epithelia, connective tissues, cartilage, bone, muscle, nerve, vascular and lymphatic tissues and differentiate between them.
LO4	Investigate and document the microscopic structure of the epithelia, connective tissues, cartilage, bone, muscle, nerve, vascular and lymphatic tissues using virtual microscopy

AN3105: Gross Anatomy I: Upper limb, back, thoracic and anterior abdominal walls (Semester:5 Optional)

Module Details

Title Short:	Gross Anatomy I: Upper limb, back, thoracic and anterior abdominal walls APPROVED
Language of Instruction:	English

Module Code:	AN3105

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	ALEXANDER BLACK

Module Discipline:	AN - Anatomy

Module Level:	Honours

Module Description:	This module covers the gross anatomy of the human upper limb, back, thoracic and anterior abdominal walls. Instruction is by lectures, cadaveric dissection and directed self learning.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the bones, joints, muscles, fasciae, membranes, blood and lymphatic vessels, and nerves of the upper limb, back, thoracic and anterior abdominal walls.
LO2	Understand the functional anatomy of the upper limb, back, thoracic and anterior abdominal walls, and demonstrate the ability to integrate, extend and critically analyse that knowledge.
LO3	Demonstrate the ability to write concise accurate descriptions of anatomical structures, regions and relations of the upper limb, back, thoracic and anterior abdominal walls using appropriate anatomical terminology.
LO4	Demonstrate the ability to competently dissect the upper limb, back, thoracic and anterior abdominal walls on a cadaver, and to record, document and report the dissection.
LO5	Be able to identify and answer questions about anatomical structures, regions and relations of the upper limb, back, thoracic and anterior abdominal walls on cadavers, prosected specimens, skeletons and bones, images and models

AN3106: Gross Anatomy II: Thoracic and Abdominal Cavities and Contents (Semester:6 Optional)

Module Details

Title Short:	Gross Anatomy II: Thoracic and Abdominal Cavities and Contents APPROVED
Language of Instruction:	English

Module Code:	AN3106

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	BRENDAN WILKINS

Module Discipline:	AN - Anatomy

Module Level:	Honours

Module Description:	This module covers the gross anatomy of the thorax and abdomen and their contents. Instruction is by lectures, cadaveric dissection and directed self learning.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the boundaries, divisions, mesothelial linings, contents, fasciae, blood and lymphatic vessels, and nerves of the thorax and abdomen.
LO2	Understand the functional anatomy of the thorax and abdomen and demonstrate the ability to integrate, extend and critically analyse that knowledge.
LO3	Demonstrate the ability to write concise, accurate descriptions of anatomical structures, organs, regions and relations of the thorax and abdomen using appropriate anatomical terminology.
LO4	Demonstrate the ability to competently dissect the thorax and abdomen on a cadaver, and to record, document and report the dissection.
LO5	Be able to identify and answer questions about anatomical structures, organs, regions and relations of the thorax and abdomen on cadavers, prosected specimens, skeletons and bones, images and models

AN4101: Gross Anatomy III: Posterior abdominal wall, Retroperitoneal space, Pelivs, Peri (Semester:7 Optional)

Module Details

Title Short:	Gross Anatomy III: Posterior abdominal wall, Retroperitoneal space, Pelivs, Peri APPROVED
Language of Instruction:	English

Module Code:	AN4101

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	PETER DOCKERY

Module Discipline:	AN - Anatomy

Module Level:	Honours

Module Description:	Introductory lectures and practical cadaveric dissection of the retroperitoneal space, posterior abdominal wall, pelvis and perineum, and lower limbs, according to instruction, and under supervision. The module is 12 weeks long and entails 4 hrs of dissection each week. At the end of the module there will be a practical examination on the cadaver and an exam paper in essay form

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the skeletal elements and corresponding joints of the posterior abdominal wall, pelvis, and lower limb
LO2	Describe the origin, insertion, shape, actions, blood supply, innervation, and topographic relations of the muscles of posterior abdominal wall, pelvis, and lower limb
LO3	Demonstrate the ability to competently dissect the posterior abdominal wall, retroperitoneal space, pelvis, perineum, and lower limb, and, record and document and report on the dissection
LO4	Write concise and accurate description of anatomical structures, regions, and relations of the posterior abdominal wall, retroperitoneal space, pelvis, perineum, and lower limb using appropriate anatomical terminology
LO5	Identify anatomical structures of the posterior abdominal wall, retroperitoneal space, pelvis, perineum, and lower limb on cadavers, prosections, skeletons, and images
LO6	Acquire sound knowledge and understanding of the Functional Anatomy of structures of the posterior abdominal wall, retroperitoneal space, pelvis, perineum, and lower limb

AN4103: Microscopy and Imaging
(Semester:7 Optional)

Module Details

Title Short:	Microscopy and Imaging APPROVED
Language of Instruction:	English

Module Code:	AN4103

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	2 programme(s)

Module Owner:	KERRY THOMPSON

Module Discipline:	AN - Anatomy

Module Level:	Honours

Module Description:	Lectures on tissue preparation for biological microscopy, staining and immunostaining, electron microscopy, light microscopy modes including confocal microscopy, non diffraction limited microscopy, image analysis and stereological techniques and methods. Lectures are supplemented with some structured practical exercises and assignments.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Have an appreciation of, and be able to describe, the steps involved in the preparation of a biological tissue for light or electron microscopy, including sample selection, fixation, embedding, sectioning and staining, including immunostaining.
LO2	Have an appreciation of, and be able to describe, basic imaging and image analysis techniques and the theory and practice of design based stereology, including sampling strategy, probes, and methods for producing unbiased estimates of parameters including number, length, surface, volume, particle sampling etc.
LO3	Write concise accurate and complete descriptions of the methods used to prepare biological tissues for microscopy, the principles and instrumentation underlying light and electron microscopy, basic methods of image analysis, and the theory and methods of design based stereology.
LO4	Conceive, plan and outline (either as a simulation or in practice) a microscopic study of a biological tissue or process, including choosing the most appropriate mode(s) of microscopy, staining technique(s), sampling strategy(s), image analysis(es) selection of appropriate probes for design based stereology.
LO5	Demonstrate the ability to process and stain a biological tissue(s) by a number of different methods, analyse tissue images including writing accurate and appropriate description(s) of the tissues and identifying unknown tissues, and to make design based stereological measurements of given parameters on sets of images.

AN4104: Clinical Neuroimaging & Radiological Anatomy (Semester:8 Optional)

Module Details

Title Short:	Clinical Neuroimaging & Radiological Anatomy APPROVED
Language of Instruction:	English

Module Code:	AN4104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	DARA CANNON

Module Discipline:	AN - Anatomy

Module Level:	Honours

Module Description:	This series of lectures and workshops will introduce you to medical imaging modalities, including imaging equipment, techniques/methods of image acquisition, and basic image processing and analysis using matlab. It will explore the applications and integration of medical imaging with anatomical, clinical and in vivo research applications in human anatomical and neuroscience research settings with a focus on biological psychiatry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Translate and integrate knowledge of gross anatomy and neuroanatomy to modern medical images
LO2	Describe and compare the basics regarding the equipment, acquisition method or technique of image acquisition
LO3	Recognize and differentiate medial image types used in diagnostic radiology, describe basic image properties in particular the measurements represented and interpret changes or differences presented in a given image
LO4	Demonstrate basic abilities in medical image processing and a general understanding of image visualization, processing and analysis methods
LO5	Compare and integrate the use of medical imaging and neuroimaging modalities in anatomical, clinical or research neuroscience applications in vivo in humans
LO6	Ultimately you should develop the capacity to effectively research any imaging or neuroimaging modality you encounter in the future

AR347: Palaeoecology - Reconstructing Past Environments (Semester:8 Optional)

Module Details

Title Short:	Palaeoecology - Reconstructing Past Environments APPROVED
Module Code:	AR347
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	22 programme(s)
Module Owner:	KAREN MOLLOY
Module Discipline:	AR - Archaeology
Module Description:	The Irish landscape as we know it today is governed by what has happened in the past. Both climate change and anthropogenic factors have played significant roles in shaping the development of the landscape. The objectives of this module are to introduce the student to palaeoenvironmental methods, in particular pollen analysis, as a means of interpreting the past 15,000 years of vegetation and environmental change in Ireland.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an understanding of the main principles of pollen analysis
LO2	Interpret a pollen diagram
LO3	Analyse the key vegetation changes that have occurred in Ireland since the end of the Ice Age
LO4	Discuss the role people have played in shaping the Irish landscape
LO5	Use a microscope and identify the pollen of the most common Irish trees

AY104: Introduction to Financial Accounting (Semester:1 Core)

Module Details

Title Short:	Introduction to Financial Accounting APPROVED
Language of Instruction:	English

Module Code:	AY104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	14 programme(s)

Module Owner:	MELISSA O'HEA

Module Discipline:	AY - Accountancy & Finance

Module Description:	The course will provide a good basic foundation in Financial Accounting for both students who do not intend to specialise in Accounting and those who will progress to more advanced study of accounting in the future. Upon course completion, students will be expected to be capable of preparing and interpreting financial statements and have achieved an understanding of the needs of financial statements users.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Accounting Information: Upon completing this section students should be able to: understand the meaning and purpose of accounting; distinguish between financial and management accounting; discuss the accounting requirements of different types of business entities; identify the users of accounting information and discuss their needs; describe the sources of regulation of accounting information; identify the components of financial statements and explain the accruals concept; explain the criteria underlying the presentation of financial statements and understand accounting policies.
LO2	Preparation of Financial Accounts: Upon completing this section students should be able to understand the terms used in financial statements, the accounting equation and dual nature of transactions; record transactions in T accounts and balance accounts; extract a trial balance and prepare a statement of comprehensive income and statement of financial position; distinguish between an accrual basis of accounting and a cash basis; calculate accruals and prepayments; understand the meaning of depreciation and calculate straight line and reducing balance depreciation; record the disposal of an asset and calculate the profit or loss on disposal; record the purchase of an asset; understand bad de
LO3	Financial Analysis: Upon completion of this section the student should be able to understand the purpose of financial statement analysis; calculate liquidity, gearing, profitability, activity and investor ratios; interpret information given in ratios; and understand the limitations of ratio analysis.

BG110: Biotechnology I
(Semester:1 Core)

Module Details

Title Short:	Biotechnology I APPROVED
Language of Instruction:	English

Module Code:	BG110

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	ANDREW FLAUS

Module Discipline:	BI - Biochemistry

Module Description:	An introduction to the foundation concepts and contemporary applications of biotechnology. The lectures cover the aims of biotechnology, recombinant DNA, genomics, DNA forensics, proteins production, microbes and medical biotechnology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the goals and historical background of biotechnology
LO2	Outline the properties of genes and of genomes, and how they can be accessed
LO3	Explain the methods and applications of recombinant DNA technology
LO4	Describe the principles of DNA forensic analysis and its applications
LO5	Detail the properties of proteins and their biotechnology applications
LO6	Describe the properties of microbes and their uses for biotechnology
LO7	Outline the contribution of biotechnology to modern medicine, including practical and ethical challenges

BG111: Biotechnology Skills with French/German (Semester:1 Core)

Module Details

Title Short:	Biotechnology Skills with French/German APPROVED
Language of Instruction:	English

Module Code:	BG111

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	ANDREW FLAUS

Module Discipline:	BI - Biochemistry

Module Description:	Key communication, research and analysis skills for Biotechnologists. This includes written and oral presentation of research, experimental design and techniques, and modern language activities in either French or German.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Present biotechnology information and concepts in written and oral form
LO2	Summarise concepts in a variety of areas of biotechnology for a range of audiences
LO3	Search for scientific knowledge on biotechnology topics and applications
LO4	Correctly acknowledge information sources through formatted citations
LO5	Undertake core biotechnology-related laboratory techniques
LO6	Appreciate and design basic experimental investigation strategies
LO7	Express core biotechnology vocabulary and concepts in French or German

BG204: Biotechnology Skills with French/German II (Semester:3 Core)

Module Details

Title Short:	Biotechnology Skills with French/German II APPROVED
Module Code:	BG204
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	ANDREW FLAUS
Module Discipline:	BI - Biochemistry
Module Description:	This biotechnology module explores the broad spectrum of applications of Biotechnology including; microbial, animal, plant, aquatic, forensic, bioinformatics, environmental & medical biotechnology. In addition, the entrepreneurial, ethical and legal aspects of Biotechnology will be considered. Learning is facilitated through researching these topics in preparation for student's own presentations, and by participating in presentations of colleagues. 20% of this module comprises a French/German language component focusing on Biotechnology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain modern biotechnological achievements and applications using specific examples
LO2	Research specific topics using a variety of source materials
LO3	Produce written and oral biotechnology reports and presentations
LO4	Participate in scientific discussions with peers and academics on the subject of Biotechnology
LO5	Use oral French/German to discuss, express opinions, persuade and refute
LO6	Demonstrate a good knowledge of specialised French/German for Biotechnology in a precise range of lexical areas
LO7	Make detailed oral presentations and deliver reports in French/German
LO8	Discuss a range of biotech-related issues in French/German including career choices, bioethics, and research institutions.

BG304: Biotechnology Skills for Placements (Semester:6 Optional)

Module Details

Title Short:	Biotechnology Skills for Placements APPROVED
Language of Instruction:	English

Module Code:	BG304

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	STEPHEN REA

Module Discipline:	BI - Biochemistry

Module Description:	Interactive and practical tasks allowing students to develop a real appreciation and experience of practical skills in biotechnology. The activities will include contemporary research methods and their application to biotechnology analysis, and using language skills appropriate to a biotechnology environment.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Apply contemporary research methods with minimum supervision
LO2	Profile an area of contemporary biotechnology research interest
LO3	Perform analysis and write-up of mock experiment
LO4	Use oral French/German flexibly and spontaneously to communicate on Biotechnology topics

BG305: Biotechnology Skills with French/German III (Semester:6 Optional)

Module Details

Title Short:	Biotechnology Skills with French/German III APPROVED
Language of Instruction:	English

Module Code:	BG305

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	STEPHEN REA

Module Discipline:	BI - Biochemistry

Module Description:	Interactive and practical tasks allowing students to develop a real appreciation and experiences of practical skills in biotechnology. The activities will include contemporary research methods and their application to biotechnology analysis, reviewing a relevant topic, training experience in a biotechnology workplace environment, and using language skills appropriate to a biotechnology environment.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the principles underlying a range of contemporary research methods
LO2	Apply contemporary research methods with minimum supervision
LO3	Profile an area of contemporary biotechnology research interest
LO4	Adapt scientific knowledge to practical aspects of applied biotechnology
LO5	Complete a job interview in French/German
LO6	Make a detailed presentation in French/German on a biotechnology topic
LO7	Use oral French/German flexibly and spontaneously to talk about their work experience abroad, career prospects and expectations, and current developments in the biotech field.
LO8	Use the target language appropriately in a professional environment abroad

BG3101: Biotechnology Placement Experience (Semester:5 Optional)

Module Details

Title Short:	Biotechnology Placement Experience APPROVED
Language of Instruction:	English

Module Code:	BG3101

ECTS Credits:	25

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1 and Semester 2
Module Delivered in	1 programme(s)
Module Owner:	STEPHEN REA
Module Discipline:	BI - Biochemistry
Source:	This module is a replacement for BG303, biotechnology placement project
Module Level:	Honours
Module Description:	Independent work experience project in a research laboratory or industrial environment, comprising at least 12 weeks practical work to be described in a formal report.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Prepare suitable CV & letters of application
LO2	Demonstrate practical ability in designing experiments/ preparing work plan to address a biological question/industrial need
LO3	Use advanced technical skills in performing experiments/lab tasks
LO4	Display detailed theoretical knowledge and understanding of specialised topic of assigned project
LO5	Communicate research findings/experience in the form of a written mini-thesis
LO6	Communicate general topic of placement in the form of a mini-review
LO7	Acknowledge sources of information using appropriate formatted referencing

BI206: Gene Technologies and Molecular Medicine (Semester:4 Group not available to select online)

Module Details

Title Short:	Gene Technologies and Molecular Medicine APPROVED
Module Code:	BI206
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	7 programme(s)
Module Owner:	MICHAEL CARTY
Module Discipline:	BI - Biochemistry
Module Description:	This course provides a grounding in current concepts in molecular biology and recombinant DNA technology and their applications in biomedicine. It also incorporates technical training in biochemical approaches to enzymology and in recombinant DNA work.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Detail fundamental recombinant DNA techniques and their (potential) applications, particularly in biomedicine
LO2	Discuss the Human Genome Project
LO3	Describe in detail and carry out the polymerase chain reaction
LO4	Describe in detail and perform different chromatographic separation experiments
LO5	Perform and analyse biochemical experiments to calculate basic enzyme kinetics
LO6	Perform basic database searches and prepare scientific reports.

BI207: Metabolism and Cell Signalling
(Semester:4 Group not available to select online)

Module Details

Title Short:	Metabolism and Cell Signalling APPROVED

Module Code:	BI207

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	9 programme(s)

Module Owner:	MICHAEL CARTY

Module Discipline:	BI - Biochemistry

Module Description:	The course addresses the question of how cells obtain and manage energy. It outlines various pathways for the processing and use of energy in the cell and covers the integration of these pathways in metabolism. Problems in these fundamental processes contribute to human diseases, which are also covered in the course.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Outline how cells harvest energy to drive cellular reactions.
LO2	Summarise central concepts in cellular metabolism
LO3	Define anabolic and catabolic pathways including the key intermediates linking these pathways
LO4	Detail the biochemical pathways associated with glycolysis, glycogenolysis, gluconeogenesis, the citric acid cycle, oxidative phosphorylation, photosynthesis and the synthesis and degradation of fatty acids, amino acids and nucleotides.
LO5	Describe molecular mechanisms of cell signalling and control of key metabolic pathways
LO6	Discuss how dysfunction of these processes can be involved in disease.

BI208: Protein Structure and Function
(Semester:3 Group not available to select online)

Module Details

Title Short:	Protein Structure and Function APPROVED

Module Code:	BI208

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	MARIA TUOHY

Module Discipline:	BI - Biochemistry

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe fully the general molecular structure and function of proteins
LO2	Demonstrate the role of enzymes as nature's own biocatalysis at the molecular level from studies of kinetics and molecular structure
LO3	Develop an understanding of the main experimental approaches and concepts for biomolecule analysis
LO4	Manipulate biochemical reagents and perform biochemical assays
LO5	Perform core techniques for measuring properties and quantities of the four main classes of biomolecules, including proteins
LO6	Demonstrate an ability to present and interpret scientific results
LO7	Draw scientifically grounded conclusions from observations and explain these in writing
LO8	Explain the main units of biochemical measurements and perform the basic calculations used in biochemistry

BI309: Cell Biology
(Semester:5 Optional)

Module Details

Title Short:	Cell Biology APPROVED

Module Code:	BI309

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	PETER CREIGHTON

Module Discipline:	BI - Biochemistry

Module Description:	The course will provide students with a knowledge of the structure and function of typical eukaryotic cells, the biochemistry of cell communication, and insight into the cellular basis of the immune system. Practical classes will give students an understanding of laboratory safety, good laboratory practices, solutions and buffers, eukaryotic cells, and antibodies as biochemical reagents.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the structure and function of a typical eukaryotic cell.
LO2	Explain the basic concepts of cell communication.
LO3	Describe the cells of the human immune system
LO4	Prepare solutions and buffers for biochemical experiments.
LO5	Demonstrate an understanding of the principles of eukaryotic cell culture
LO6	Explain the key features of eukaryotic cells observed by microscopy.
LO7	Explain the principles of immunoassays.
LO8	Present and interpret scientific results in written format.

BI313: Cell Signalling

Module Details

Title Short:	Cell Signalling APPROVED
Module Code:	BI313
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	6 programme(s)
Module Owner:	PETER CREIGHTON
Module Discipline:	BI - Biochemistry
Module Description:	This course will provide students an understanding of the biochemical basis of cellular signal transduction pathways, including examples of neurotransmitters and the nervous system, loss of regulation and control of the cell cycle in cancer, and apoptosis. The practical course will introduce students to techniques used to study cell signaling.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the biochemical basis of key signal transduction pathways.
LO2	Describe the role of neurotransmitters in signal transduction in the nervous system.
LO3	Demonstrate how loss of regulation and control of the cell cycle leads to cancer.
LO4	Explain how cells undergo programmed cell death.
LO5	Explain the technique of sub-cellular fractionation.
LO6	Demonstrate the ability to carry out a glucose tolerance test.
LO7	Design and perform scientific experiments.
LO8	Draw scientifically grounded conclusions from observations and explain these in writing.

BI313: Cell Signalling

Module Content & Assessment

Indicative Content

Cell Signalling (CS)
This course will provide students an understanding of the biochemical basis of cellular signal transduction pathways, including examples of neurotransmitters and the nervous system, loss of regulation and control of the cell cycle in cancer, and apoptosis. The practical course will introduce students to techniques used to study cell signaling. The practical course will introduce students to the technique of sub-cellular fractionation, the glucose tolerance test with respect to insulin deficiency (diabetes), and students will carry out a mini-project in biochemistry.

Written Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Marks Out of*	*Pass Marks*	*Sitting*	*Assessment Period*	*Assessment Date*	*Duration*	*Mandatory*
Paper 1 - Written	N/A	1,2,3,4,5,6,7,8	60.00	0	0	First Sitting	Semester 2	n/a	2:00	True
Assessment is marked as bondable but has no matching assessments										
Paper 1 - Written	N/A	1,2,3,4,5,6,7,8	60.00	0	0	Second Sitting	Autumn	n/a	2:00	True
Assessment is marked as bondable but has no matching assessments										

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Marks Out of*	*Pass Marks*	*Sitting*	*Assessment Period*	*Assessment Date*	*Duration*	*Mandatory*
Continuous Assessment 1	N/A	1,2,3,4,5,6,7,8	30.00	0	0	First Sitting	Semester 2	n/a	0	False
Project 1	N/A	1,2,3,4,5,6,7,8	10.00	0	0	First Sitting	Semester 2	n/a	0	False
Continuous Assessment 1	There is no repeat sitting. CA results are carried forward from 1st sitting.	1,2,3,4,5,6,7,8	30.00	0	0	Second Sitting	Autumn	n/a	0	False
Project 1	There is no repeat sitting. CA results are carried forward from 1st sitting.	1,2,3,4,5,6,7,8	10.00	0	0	Second Sitting	Autumn	n/a	0	False

No Oral, Audio Visual or Practical Assessment

No Department-based Assessment

No Research

No Study Abroad

No Computer-based Assessment

The institute reserves the right to alter the nature and timings of assessment

NUI Galway
OÉ Gaillimh

BI313: Cell Signalling

Module Workload

Workload: Full Time					
Workload Type	*WorkLoad Description*	*Learning Outcomes*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	15 one hour lectures	1,2,3,4,5,6,7,8	15	Per Semester	1.25
Tutorial	2 two hour tutorials	1,2,3,4,5,6,7,8	4	Per Semester	0.33
Lab	4 three hour lab	1,2,3,4,5,6,7,8	12	Per Semester	1.00
Independent & Directed Learning (Non-contact)	No Description	1,2,3,4,5,6,7,8	42	Per Semester	3.50
				Total Hours	73.00
				Total Weekly Learner Workload	6.08
				Total Weekly Contact Hours	2.58

This module has no Part Time workload.

Module Resources

This module does not have any book resources
This module does not have any article/paper resources
This module does not have any other resources

Module Full Time Equivalent

Module Full Time Equivalent	
Discipline	*%*
Biochemistry	100

Module Delivered in

Course Stream Code	*Course Stream Title*
BO2	BO2 Bachelor of Science (Biomedical Science) Honours (Approved)
BS9	BS9 B.Sc. Degree (Undenominated) (Approved)
BY2	BY2 Bachelor of Science (Biotechnology) (Hons.) (Approved)
EM1	EM1 Erasmus (Approved)
OA1	OA1 Visiting Students (Approved)
SWB1	SWB1 Science Without Borders (Approved)

Module Instructors

Module Instructors	
Staff Member	*Staff Email*
MICHAEL CARTY	michael.carty@nuigalway.ie
PETER CREIGHTON	peter.creighton@nuigalway.ie
ADRIENNE GORMAN	adrienne.gorman@nuigalway.ie
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ASHLA WARD	ashla.ward@nuigalway.ie

BI317: Human Molecular Genetics (Semester:6 Optional)

Module Details

Title Short:	Human Molecular Genetics APPROVED
Module Code:	BI317
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	8 programme(s)
Module Owner:	BRIAN MCSTAY
Module Discipline:	BI - Biochemistry
Module Description:	This course will provide a framework for understanding human molecular genetics. Students will develop an understanding of the structure of human chromosomes, the human genome and human genetic variation. They will also learn about chromosomal and genetic alterations associated with disease states, and the techniques used to identify genetic disease associations. Finally, students will develop an appreciation for the future impact of human molecular genetics on human health.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the structure and explain the techniques for studying human chromosomes
LO2	Describe common human chromosomal abnormalities
LO3	Explain fundamental genetic concepts including, Mendelian inheritance, quantitative traits, linkage and linkage disequilibrium
LO4	Describe the organisation of the human genome
LO5	Describe human genetic variability and its consequences
LO6	Explain the techniques used to identify and map genes conferring susceptibility to disease
LO7	Describe genetic changes that result in, or are a consequence of, cancer
LO8	Describe the impact that moleular genetics will have an on human health

BI318: Human Nutrition
(Semester:5 Optional)

Module Details

Title Short:	Human Nutrition APPROVED
Module Code:	BI318
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	7 programme(s)
Module Owner:	GERALDINE NOLAN
Module Discipline:	BI - Biochemistry
Module Description:	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

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate knowledge of the basic nutrients in food
LO2	Describe the relationship between diet and both prevention and treatment of disease
LO3	Explain the special nutritional needs of different population subgroups
LO4	Explain the importance of nutrition in a clinical setting
LO5	Describe nutrition poilicy both in Ireland and Internationally

BI319: Molecular Biology (Semester:5 Optional)

Module Details

Title Short:	Molecular Biology APPROVED
Module Code:	BI319
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	8 programme(s)
Module Owner:	PETER CREIGHTON
Module Discipline:	BI - Biochemistry
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 eukrayotic gene expression, and viruses. Practical aspects of the course will give experience of key techniques used in molecular biology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the eukaryotic cell cycle and DNA replication.
LO2	Explain cellular genomes and their organisation.
LO3	Elucidate how genes expression is regulated.
LO4	Describe the nature and replication of viruses.
LO5	Perform key techniques in molecular biology including polymerase chain reaction, plasmid preparation, restriction enzyme digest and agarose gel electrophoresis.
LO6	Demonstrate an ability to present and interpret scientific results
LO7	Draw scientifically grounded conclusions from observations and explain these in writing
LO8	Describe the main units used and perform basic calculations in molecular biology.

BI321: Protein Biochemistry (Semester:6 Optional)

Module Details

Title Short:	Protein Biochemistry APPROVED
Module Code:	BI321
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	8 programme(s)
Module Owner:	PETER CREIGHTON
Module Discipline:	BI - Biochemistry
Module Description:	This course will provide students an understanding of the synthesis and turnover of proteins in the eukaryotic cell, the role of proteins as molecular tools with particular emphasis on enzymes, and the structure and function of key protein glycoconjugates including glycoproteins and proteoglycans. The practical course will include techniques used in the study of proteins and enzymes.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the life cycle of proteins in the cell.
LO2	Explain the role of proteins as molecular tools in cells.
LO3	Describe the structures and functions of glycoconjugates in cells.
LO4	Explain the role of enzymes at the molecular level from studies of kinetics and molecular structure.
LO5	Describe key steps in the purification of proteins.
LO6	Explain how proteins are assayed.
LO7	Perform basic enzyme assays including assays with inhibitors
LO8	Analyse data derived from experiments in enzyme kinetics.

BI325: Biochemistry Research Mini Project (Semester:6 Optional)

Module Details

Title Short:	Biochemistry Research Mini Project APPROVED

Module Code:	BI325

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	DEREK MORRIS

Module Discipline:	BI - Biochemistry

Module Description:	The module builds on the knowledge and skills the student has accumulated in the " Research Methods in Biomedical science" module and involves carrying out a research project in a laboratory in one of the Biomedical Science disciplines. Students will research, design and implement a research project. The results of the projects will be presented in the form of a poster presentation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Research a scientific topic
LO2	Design an experimental plan to implement a research project
LO3	work as part of a team in the overall research effort
LO4	Carry out the technical components of the research
LO5	write a report of the results
LO6	critically analyze data
LO7	design and deliver a poster of the research results
LO8	Defend the design of the experiment and the results obtained

BI429: Advanced Chromosome Biology (Semester:8 Optional)

Module Details

Title Short:	Advanced Chromosome Biology APPROVED
Module Code:	BI429
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	3 programme(s)
Module Owner:	NOEL F LOWNDES
Module Discipline:	BI - Biochemistry
Module Description:	This module will focus on advanced topics on the biology of the chromosome, including inherited patterns of gene expression, imprinting, epigenetic programming, the dynamic nature of nuclear structures, cell cycle control, genome instability, the DNA damage checkpoint and cancer.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate understanding of cellular dynamics, particularly protein dynamics in nuclear structures, mitotic spindle and kinetochore
LO2	Describe experimental strategies to study protein dynamics in cells
LO3	Demonstrate detailed understanding of genetic imprinting and epigenetic programming
LO4	Demonstrate detailed knowledge of DNA damage-activated cell cycle checkpoints, genome instability and cancer

BI445: Biomolecules
(Semester:7 Optional)

Module Details

Title Short:	Biomolecules APPROVED
Language of Instruction:	English

Module Code:	BI445

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	ADRIENNE GORMAN

Module Discipline:	BI - Biochemistry

Module Description:	The Biomolecules module will cover the structure and function of key biomolecules, focusing on proteins and glycoconjugates. You will learn how these biomolecules interact to regulate cellular events, and how defective biomolecules can lead to disease.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Give a detailed description of the structure and assembly of proteins
LO2	Explain how the molecular properties and structure of a protein determine its function
LO3	Describe how post-translational modification of proteins regulates their function
LO4	Describe the formation, structure and function of various glycoconjugates
LO5	Describe the functional interaction of Biomolecules in the context of cell signalling

BI446: Current Topics in Bioscience (Semester:7 Optional)

Module Details

Title Short:	Current Topics in Bioscience APPROVED
Module Code:	BI446
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1 and Semester 2
Module Delivered in	4 programme(s)
Module Owner:	CIARAN MORRISON
Module Discipline:	BI - Biochemistry
Module Description:	This module focusses on recent breakthroughs in the biosciences. Students will attend research seminars given within Biochemistry and submit short online Abstracts summarising the scientific question(s) addressed in the seminar, the experimental approaches used, the key findings, and the significance of the findings presented . Students will also conduct independent reading about recent advances in Biochemistry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Write an accurate and concise summary of a high-level research presentation
LO2	Demonstrate a general knowledge of current topics in Biochemistry
LO3	Demonstrate the ability to describe recent breakthroughs in Biochemistry
LO4	Synthesise information derived from independent research on topics of current interest in Biochemistry, and identify the key important points

BI447: Literature Review and Presentation (Semester:8 Optional)

Module Details

Title Short:	Literature Review and Presentation APPROVED
Language of Instruction:	English

Module Code:	BI447

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	HEINZ-PETER NASHEUER

Module Discipline:	BI - Biochemistry

Module Description:	This module provides an opportunity for students to research the scientific literature on a current area of Biochemistry research and to prepare a written review and give a presentation of the current state of knowledge on that topic. The review will be prepared by study of the relevant literature, including research articles published in international peer-reviewed scientific journals. This is a student-driven project carried out with guidance and direction of an academic member of staff.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Use research skills to search for relevant scientific information in the available published literature
LO2	Organise information and knowledge from the scientific literature into a coherent review of a topic
LO3	Write scientifically in a clear and concise manner
LO4	Demonstrate attention to detail regarding following instructions for written work
LO5	Demonstrate ability to appropriately use references and reference management software
LO6	Present findings in appropriate format

BI448: Modern Biotechnologies (Semester:7 Optional)

Module Details

Title Short:	Modern Biotechnologies APPROVED
Language of Instruction:	English

Module Code:	BI448

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	KEVIN SULLIVAN

Module Discipline:	BI - Biochemistry

Module Description:	New technologies underpin many advances in the biosciences. Among the topics covered in this module are: cloning, recombinant protein expression systems; modulation of protein expression using siRNA; bioinformatics in bioscience research; DNA sequencing technologies; mammalian cell culture systems in biomedical research, fluorescence microscopy; chromatography; electrophoresis and mass spectrometry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate good theoretical understanding of advanced technologies in bioscience, including protein systems, molecular biology, separation techniques, fluorescence microscopy, bioinformatics
LO2	Evaluate the advantages and disadvantages of different experimental methodologies
LO3	Demonstrate understanding of how to apply different experimental approaches in addressing specific biological questions
LO4	Explain how to choose appropriate methodology to use to address specific biological questions

BI449: Molecular and Cellular Biology
(Semester:8 Optional)

Module Details

Title Short:	Molecular and Cellular Biology APPROVED

Module Code:	BI449

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	AFSHIN SAMALI

Module Discipline:	BI - Biochemistry

Module Description:	The module will cover key topics in molecular and cellular biology, including chromosome organisation, DNA replication and cell division, inherited patterns of gene expression, cell cycle regulation, genome stability, DNA repair, mutagenesis, and apoptosis. The relationship between these processes and the development of cancer and other diseases will be discussed.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an understanding of the molecular organisation of chromosomes
LO2	Demonstrate detailed understanding of DNA replication in cell division, and of cell cycle regulation
LO3	Demonstrate detailed knowledge of genome stability and DNA repair pathways
LO4	Demonstrate detailed knowledge of molecular mechanisms of cell death, in particular apoptosis
LO5	Explain the relationship between these processes and the development of cancer and other diseases

BI451: Research Paper Analysis
(Semester:7 Optional)

Module Details

Title Short:	Research Paper Analysis APPROVED

Module Code:	BI451

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	CIARAN MORRISON

Module Discipline:	BI - Biochemistry

Module Description:	This course uses the detailed examination and critique of selected research papers in molecular biology and biochemistry to consider the means by which specific hypotheses can be addressed with current technologies. Students also learn to write précis of technical documents.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Accurately and rapidly summarise a technical manuscript
LO2	Discuss the use of recombinant DNA and molecular/cell biology experiments in addressing defined hypotheses
LO3	Define the experimental approaches and controls used in molecular/cell biology experiments
LO4	Critique experimental strategies used in recombinant DNA and molecular/cell biology experiments

BI452: Biochemistry Principles and Experimental Design (Semester:7 Optional)

Module Details

Title Short:	Biochemistry Principles and Experimental Design APPROVED
Language of Instruction:	English

Module Code:	BI452

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	4 programme(s)

Module Owner:	ANDREW FLAUS

Module Discipline:	BI - Biochemistry

Module Description:	Consolidation of general biochemistry knowledge, including fundamental principles and concepts in biochemistry as well as of scientific notation, biochemistry calculations and data presentation. Understanding of experimental design, planning and analysis/intrepretation of results.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define and discuss key elements of experimental design
LO2	Design and critique experimental strategies to address biochemical questions
LO3	Perform basic statistical analyses of experimental outputs
LO4	Describe ethical principles and good research conduct
LO5	Demonstrate knowledge of core biochemistry, molecular biology, cell biology and genetics principles
LO6	Accurately use biochemistry terminology and nomenclature
LO7	Perform biochemical calculations with accurate use of units

BI453: Biochemistry Research Project (Semester:7 Optional)

Module Details

Title Short:	Biochemistry Research Project APPROVED
Language of Instruction:	English

Module Code:	BI453

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	4 programme(s)

Module Owner:	HEINZ-PETER NASHEUER

Module Discipline:	BI - Biochemistry

Module Description:	This module provides an opportunity to conduct scientific research, with the supervision of an academic member of staff. These are student-driven projects carried out under the supervision of an academic member of staff and are usually conducted as part of a research team. The module consists of an eight week research project, plus two additional weeks for writing a project report in the form of a minor thesis.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate practical ability in designing experiments to address a biological question, with due regard for inclusion of adequate experimental controls
LO2	Use advanced technical skills in performing experiments
LO3	Communicate research findings in the form of a written mini-thesis
LO4	Display detailed theoretical knowledge and understanding of specialised topic of assigned research project
LO5	Communicate research findings in an oral seminar presentation

BM110: Introduction to Science Communication (Semester:1 Core)

Module Details

Title Short:	Introduction to Science Communication APPROVED
Module Code:	BM110
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	DEREK MORRIS
Module Discipline:	BI - Biochemistry
Module Data:	1 - 4 NON LAB
Module Description:	The module aims to introduce students to the tools necessary to develop oral, visual and written skills of science communication.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Utilise software package Microsoft Office(word, excel and Powerpoint) designed to support scientific research
LO2	Distinguish between peer reveiwed and non peer reviewed data and hence reliable and unreliable sources
LO3	Reference data correctly
LO4	Identify good techniques for oral presentation of research
LO5	Use Endnote to search PubMed, store and catalogue references
LO6	Read and Understand a scientific paper
LO7	Critically appraise scientific essays

BM111: Introduction to Biomedical Research (Semester:2 Core)

Module Details

Title Short:	Introduction to Biomedical Research APPROVED
Module Code:	BM111
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	AILISH HYNES
Module Discipline:	PM - Pharmacology
Module Description:	In this module students attend a series of seminars, given by members of academic staff, on current topics in Biomedical Research. Students are then assigned in groups of 4-6 to a supervisor (normally from the staff who gave the seminars). Students produce an individual essay and work as a team to provide an overview of the topic.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Contribute to seminars by asking questions
LO2	source scientific literature on a particular topic
LO3	evaluate the literature and select relevant information
LO4	synthesize the information to produce a scientific essay
LO5	correctly cite reference material both within the essay and in the bibliography
LO6	work in a team to produce an overview of the topic

BM112: Biomedical Debates (Semester:2 Core)

Module Details

Title Short:	Biomedical Debates APPROVED
Module Code:	BM112
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	DEREK MORRIS
Module Discipline:	BI - Biochemistry
Module Description:	To provide students with an opportunity to investigate topical issues, to evaluate scientific opinions in those issues and to develop and demonstrate skills in debating a biomedical science topic. To develop skills of communication and defence of scientific research

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Research a scientific topic objectively
LO2	Think critically about a scientific topic
LO3	Critically evaluate several biomedical science topics
LO4	Discuss and defend researched data
LO5	Develop teamwork skills
LO6	Participate in discussion
LO7	Communicate clearly and distinctly

BM406: Applications of Biomedical Science (Semester:7 Core)

Module Details

Title Short:	Applications of Biomedical Science APPROVED
Language of Instruction:	English

Module Code:	BM406

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	DEREK MORRIS

Module Discipline:	BI - Biochemistry

Module Description:	This module bridges the gap between biomedical science teaching and biomedical science research in NUI Galway and gives students an insight into current research activity within the university. Working in small groups, students focus on a particular area of current research in NUI Galway. They perform a review of the general research area, study a recent scientific manuscript on this subject in detail and meet the active researchers and Principal Investigators involved to gain an understanding of the opportunities and challenges for this field of research at present. Students get a unique insight into the local research environment in NUI Galway, as well as a perspective on the national and international research environment.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe a current area of Biomedical Science research at NUI Galway
LO2	Research and deliver a presentation to a class of their peers on a current area of Biomedical Science research at NUI Galway
LO3	Review a recent scientific manuscript from an NUI Galway research group working in this area
LO4	Meet the lead author of the scientific manuscript and afterwards deliver a Journal Club style presentation on the manuscript to a class of their peers
LO5	Meet the Principal Investigator in the NUI Galway research group and interview him/her on the topics of funding, strategy, collaborations, translation, ethics, innovation, impact and future prospects
LO6	Prepare a written report on the current area of Biomedical Science research at NUI Galway, to include background, current research and future opportunities and challenges

BM3101: Research Methods in Biomedical Science (Semester:5 Core)

Module Details

Title Short:	Research Methods in Biomedical Science APPROVED
Language of Instruction:	English

Module Code:	BM3101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	DEREK MORRIS

Module Discipline:	BI - Biochemistry

Module Description:	This module provides the students with an insight into experimental design of scientific research in the area of Biomedical Science. Areas of experimental design covered include defining hypotheses, understanding between-individual variation and replication, how and when to use different types of experimental designs, issues around taking measurements, and finally the importance of ethics in biomedical science. It teaches the student how to utilize computer software packages to graph data for reports and presentations. It incorporates mechanisms for delivering the skills set necessary to critically appraise data arising from scientific experimentation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the process of how observations lead to questions that lead to hypotheses that lead to predictions, which can be tested using data.
LO2	Differentiate between different types of experimental study designs and learn about what types of potential confounding factors may be important.
LO3	Evaluate different methods of data collection with a focus on making correct measurements, accounting for variation and the need for replication.
LO4	Critically evaluate scientific claims in the literature.
LO5	Use Graph Pad Prism to graph different types of data.
LO6	Discuss the importance of ethics in Biomedical Science research.

BO101: Biology
(Semester:1 Optional)

Module Details

Title Short:	Biology APPROVED
Language of Instruction:	English

Module Code:	BO101

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	14 programme(s)

Module Owner:	PETER CREIGHTON

Module Discipline:	MI - Microbiology

Module Description:	Biology is an integrative and interdisciplinary field that aims to investigate the dynamic and complex nature of living systems in terms of their molecular components and the interactions between organisms and their biotic and abiotic environment. This module will introduce students to fundamental concepts of biology. The course is intended to provide the necessary biological background to allow learners in general and specialised Science courses, Foundation Medicine and Biomedical Engineering to progress into more specialised topics in later years. First, the nature of biomolecules and the basis for cellular form and function are discussed. Then students are introduced to the structure, function, diversity and impact of plants, animals and microorganisms.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the structure and function of biomolecules
LO2	Describe the form and function of cells
LO3	Discuss organism diversity and evolutionary mechanisms
LO4	Relate basic principles of organismal interactions
LO5	Critically evaluate major human impacts on the environment
LO6	Understand the role of biological sciences in societal development

BO201: Molecular and Cellular Biology (Semester:3 Group not available to select online)

Module Details

Title Short:	Molecular and Cellular Biology APPROVED
Module Code:	BO201
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	11 programme(s)
Module Owner:	MARIA TUOHY
Module Discipline:	BI - Biochemistry
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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the main structural and organizational similarities and differences between Prokaryotic and Eukaryotic cells
LO2	Discuss the key features of different types of Eukaryotic cells, e.g. fungal, plant and animal cells
LO3	Identify the functions of the major subcellular structures and organelles
LO4	Describe the role of water and the importance of pH in living cells
LO5	Explain the basic chemical bonds and interactions that underpin the chemistry of biologically important reactions
LO6	Detail the general molecular structure and (bio)chemical features of the main biomolecules in living cells and explain their cellular functions
LO7	Compare and contrast genome structure and organization in prokaryotes and eukaryotes

BO202: Evolution and the Tree of Life
(Semester:3 Group not available to select online)

Module Details

Title Short:	Evolution and the Tree of Life APPROVED
Language of Instruction:	English

Module Code:	BO202

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	GRACE PATRICIA MCCORMACK

Module Discipline:	NAT_SCI - School of Natural Sciences

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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe natural selection and how it drives evolution
LO2	Explain what is meant by evolutionary constraint and evolutionary innovation giving examples.
LO3	Discuss the evidence for evolution including the fossil record, anatomical and molecular homologies, antibiotic resistance and pathogenicity.
LO4	Consider the origins of the biological components of life, and describe the genetic mechanisms through which different types of evolutionary novelties can arise, including how such mechanisms generate variation in organisms.
LO5	Define systematics and explain the different approaches to studying the evolutionary relationships amongst organisms.
LO6	Interpret and describe different types of phylogenetic trees.
LO7	Discuss how the first proaryotic and eukaryotic cells emerged
LO8	Outline and describe the major groups of microbes
LO9	Describe the basis of cellular and evolutionary diversity in eukaryotic organisms, using examples from the fungal kingdom
LO10	Discuss major events in the evolution of animals.
LO11	Outline and discuss the major groups of animals
LO12	Describe and understand the key evolutionary innovations that emerged in the plant lineage since it separated from other lineages.

BO2101: Scientific Writing Skills
(Semester:3 Group not available to select online)

Module Details

Title Short:	Scientific Writing Skills APPROVED
Module Code:	BO2101
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	MICHAEL CARTY
Module Discipline:	BI - Biochemistry
Module Description:	This module is focused on developing scientific writing skills.The module will introduce students to argumentative writing, critical thinking, and responsible engagement with secondary sources.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Read and summarise scientific texts identifying key points
LO2	Write an effective scientific report
LO3	Write a scientific essay
LO4	Review written scientific material effectively
LO5	Use secondary sources effectively and responsbily
LO6	Have an improved ability to think critically

BO3101: BO3101 Developmental Biology (Semester:5 Optional)

Module Details

Title Short:	BO3101 Developmental Biology APPROVED
Language of Instruction:	English

Module Code:	BO3101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	4 programme(s)

Module Owner:	URI FRANK

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Level:	Honours

Module Description:	The module will introduce the student to developmental biology. Basic principles of development will be discussed including cellular differentiation, early embryogenesis, pattern formation and morphogenesis, and normal and abnormal post-embryonic growth. The above topics will be dealt with in a number of model organisms that are commonly used in developmental biology to highlight comparative and evolutionary aspects.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe basic concepts of developmental biology
LO2	Explain the main stages of animal development
LO3	Describe different types of genetic pathways acting in development
LO4	Explain cellular signaling
LO5	Highlight differences in the development of different animals

BO4101: Advanced Topics in Developmental Biology (Semester:8 Optional)

Module Details

Title Short:	Advanced Topics in Developmental Biology APPROVED
Language of Instruction:	English

Module Code:	BO4101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	URI FRANK

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Level:	Honours

Module Description:	The module will deal with two advanced topics in developmental biology: stem cell biology and the development of the nervous system. Stem cell biology will cover areas of embryonic and adult stem cells, the molecular mechanisms that control their fate, and the potential use of these cells in regenerative medicine. Developmental neurobiology will cover neural induction, and the development of the central and peripheral nervous systems.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe mechanisms and general principles of neural development
LO2	Explain how central and peripheral nervous systems develop in vertebrates
LO3	Define different stem cells types
LO4	List genetic and epigenetic factors that affect stem cell decisions-making

BPS202: Fundamentals in Aquatic Plant Science (Semester:3 Group not available to select online)

Module Details

Title Short:	Fundamentals in Aquatic Plant Science APPROVED
Language of Instruction:	English

Module Code:	BPS202

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	DAGMAR BRIGITTE STENGEL

Module Discipline:	BT - Botany

Module Description:	This module will introduce key aspects of the biology of aquatic photosynthetic organisms including seaweeds, microalgae and 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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe and characterise environments (terrestrial, freshwater, marine) suitable for algal growth, with particular detail on growth requirements and controlling factors regarding seaweeds and phytoplankton
LO2	Provide an overview of different algal reproductive strategies and life cycles
LO3	Outline and appreciate the importance of different algal groups (including both microalgae and macroalgae) in ecology and their applications in biotechnology
LO4	Appreciate the diversity of different algal groups, their distinguishing biological features including morphological growth forms
LO5	Identify common representatives of native Irish algal groups
LO6	Describe and appreciate the different interactions between algae and their abiotic (physical, chemical) and biotic (living) environments

BPS203: Plant Diversity, Physiology & Adaptation (Semester:4 Group not available to select online)

Module Details

Title Short:	Plant Diversity, Physiology & Adaptation APPROVED
Language of Instruction:	English

Module Code:	BPS203

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	ZOE ADELAIDE POPPER

Module Discipline:	BT - Botany

Module Description:	Land plants evolved ~500 million years ago and have since diversified to inhabit every available niche. This module explores key adaptations and innovations which have allowed plants to adapt to specific environmental stresses including changes in life-cycle, biochemical and anatomical modifications of photosynthesis, water uptake and the evolution of roots and a vascular system, as well as the evolution of seeds and flowers. Plant diversity will be discussed providing an introduction to each of the major groups of land plants and their identifying features; this will be supported by examination of live and prepared materials.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe and understand the breadth of land plant diversity, and how it originated
LO2	Explain the functional biology of plant taxa, and their ecological significance
LO3	Compare the life-cycles and forms of reproduction found in extant land plants and explain their strengths and limitations;
LO4	Identify the distinguishing characteristics of major groups of bryophytes, ferns, gymnosperms and flowering plants
LO5	Discuss the major innovations and adaptations that have enabled plants to diversify and inhabit every available niche
LO6	Discuss Ireland's flora and biogeography

BPS401: Minor Research Project
(Semester:7 Optional)

Module Details

Title Short:	Minor Research Project APPROVED
Language of Instruction:	English

Module Code:	BPS401

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	DAGMAR BRIGITTE STENGEL

Module Discipline:	BT - Botany

Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand how to design and conduct scientific research in aspects of Botany and Plant Science ranging from ecology to biotechnology to a professional level
LO2	Have gained an understanding of the scientific method, including formulation of testable hypotheses and an appreciation of the importance of controls
LO3	Write a scientific review as an introductory chapter, using referencing software such as Endnote, and to a professional format
LO4	Be able to draft a materials and methods section of a thesis or scientific paper so that the experiments could be repeated by other researchers
LO5	Analyse and present scientific data in a critical and coherent manner, including through the use of statistics to test for significance of results obtained
LO6	Interpret and critically analyse and evaluate results obtained, including how results obtained relate to results published in the scientific literature
LO7	Effectively develop scientific research presentations and to deliver them to audiences and to deal with scientific questions posed

BPS402: Current Topics in Algal Research (Semester:7 Optional)

Module Details

Title Short:	Current Topics in Algal Research APPROVED
Language of Instruction:	English

Module Code:	BPS402

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	DAGMAR BRIGITTE STENGEL

Module Discipline:	BT - Botany

Module Description:	This module gives an insight into current issues and topics in algal research. Building on principles in algal biology, it provides an in-depth overview of applications of phycology; these range from using algae in environmental monitoring for pollution (bioindicators; ecotoxicology) to principles of the optimising algal biomass for use in the bioeconomy including algal biorefinery; integrated methods of algal cultivation and issues regarding invasive species. An update of current local, national and international research will be provided.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Provide an account of algal strategies to adapt/acclimate to environmental factors and key factors determining algal physiology and chemistry/composition
LO2	Be able to give an account of the methods and issues involved in algal cultivation for different applications, including ITMA
LO3	Discuss the issues associated with using algal biomass in the marine/blue bioeconomy
LO4	Evaluate algal biology as a tool in ecotoxicology and bioremediation
LO5	Have an appreciation of strategies of algal invasive species, and implications for aquatic systems and their management
LO6	Have an appreciation of current topics in algal research in Ireland and internationally

BPS405: Ecology and Conservation Issues (Semester:8 Optional)

Module Details

Title Short:	Ecology and Conservation Issues APPROVED
Language of Instruction:	English

Module Code:	BPS405

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	Dara Stanley

Module Discipline:	BT - Botany

Module Description:	Plants are fundamental in the functioning of our planet, and understanding how they interact with each other and their environment is vital. However, plant diversity is being threatened in numerous ways, resulting in the need for conservation. This module focuses on the conservation of plants, and covers key elements of conservation biology, threats to plant diversity and plant conservation. Students will also learn about relevant EU and Irish legislation, and implementation of conservation management techniques; knowledge essential for ecologists and conservationists working in a wide variety of sectors.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Identify threats to plant diversity
LO2	Evaluate key concepts in conservation biology, and how they apply to practical conservation
LO3	Understand policy and legislation, both Irish and International, that underpins conservation
LO4	Understand the principal state conservation designations and the relevant issues involved in their administration and management
LO5	Recognise some of Ireland's rare plant species and know the habitats they occur in
LO6	Discuss and evaluate conservation management techniques

BPS2101: Botanical Field Skills
(Semester:4 Group not available to select online)

Module Details

Title Short:	Botanical Field Skills APPROVED
Language of Instruction:	English

Module Code:	BPS2101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	DAGMAR BRIGITTE STENGEL

Module Discipline:	BT - Botany

Module Description:	Field skills in Botany and Plant Science are an essential part of understanding plants, their ecology and conservation, and their relationships with the environment. This module introduces students to practical field skills in Botany and Plant Science, through a field trip, associated lectures and coursework. Students will collect specimens for herbaria and use floral keys in the lab and field. They are also introduced to flora and range of habitats. Conservation and management issues are discussed in the field.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Identify common vascular plant species in the field
LO2	Recognise rare plant species, and the habitats in which they grow
LO3	Classify the species into the main vascular plant families using comparative techniques
LO4	Collect and preserve herbarium-quality plant specimens
LO5	Appreciate basic conservation and farming issues for flora and habitats
LO6	Produce concise reports and present data

BPS3101: Techniques in Field Ecology and Conservation (Semester:6 Optional)

Module Details

Title Short:	Techniques in Field Ecology and Conservation APPROVED
Module Code:	BPS3101
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	4 programme(s)
Module Owner:	DAGMAR BRIGITTE STENGEL
Module Discipline:	BT - Botany
Module Description:	Ireland has an interesting flora and diversity of habitats, many of which are of conservation concern. This module will investigate some aspects of the Irish flora and ecology of Irish plants, habitat classification, and conservation, through a field trip and associated coursework. The course focuses on key Irish habitats. Students learn vegetation & habitat description techniques, using the latest vegetation survey, classification and assessment methods for vascular plants. Conservation value assessment methods are taught for each habitat. Includes visits to Annex I habitats, a Nature Reserve and/or a National Park and meeting local practitioners, such as a ranger, field ecologist, etc.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Survey a range of habitats in the field using relevés and related techniques
LO2	Recognise and evaluate a range of habitats for their conservation interest
LO3	Have developed a basic understanding of the main functions of Nature Reserves and National Parks
LO4	Discuss the key habitats, and their ranges with special reference to EU Habitats Directive Annex I habitats
LO5	Describe key factors, include climate, geology, soils and farming, that affect the habitats of the region
LO6	Produce concise reports and present data

BPS3102: Plant Resources and Ecosystems (Semester:6 Optional)

Module Details

Title Short:	Plant Resources and Ecosystems APPROVED
Language of Instruction:	English

Module Code:	BPS3102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	DAGMAR BRIGITTE STENGEL

Module Discipline:	BT - Botany

Module Description:	As primary producers, plants (and algae) are essential components of all global ecosystems. Throughout the world, there is a wide range ecosystems, providing the habitats for plant life on earth and the associated ecosystem services they provide. In this module, we will provide and introduction to the different global biomes, and what drives their distribution. We will also focus on the main habitat types in Ireland, and discuss their status and ecology. This module explores the key features of global biomes in marine, aquatic and terrestrial systems, and the ecology of the plant communities (and resources) within these. Specifically it addresses key components of rocky shore ecology, distribution, mapping and sustainable utilisation of seaweed bioresources. It further covers important global ecosystems, and in particular the ecology of Irish natural habitats such as grassland, woodlands, bogs, hedgerows etc.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the main terrestrial habitat types in Ireland and discuss their current status
LO2	Understand global terrestrial biomes and ecosystems, and their distribution
LO3	Be familiar with features of seaweeds on rocky shore ecology and zonation patterns and factors driving temporal and spatial variability
LO4	Give an overview of the ecology of important local Irish and global seaweed habitats
LO5	Give an overview of important marine/coastal vascular plant communities (seagrasses, saltmarshes)
LO6	Appreciate the processes and methods involved in the assessment of algal bioresources for sustainable utilisation

BPS3103: Plant Function (Semester:5 Optional)

Module Details

Title Short:	Plant Function APPROVED
Language of Instruction:	English

Module Code:	BPS3103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	6 programme(s)

Module Owner:	ZOE ADELAIDE POPPER

Module Discipline:	BT - Botany

Module Level:	Pass

Module Description:	This module will explore the physiology and biochemistry of plants and algae. It will investigate: (1) plant and algal biochemistry and metabolism specifically focusing on carbon-fixation as well as the synthesis of primary and secondary metabolites, allelopathy and plant defence, and (2) plant and algal growth and development in which the role of hormones in fundamental processes including flowering, germination, expansive cell growth and the responses of plants to light and gravity will be explored. It will also investigate the role of aspects of plant function in conservation and its biotechnological applications.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Appreciate how plant and algal function is modified in response to the environment
LO2	Understand the role of secondary metabolites in plants and evaluate how they are used by humans
LO3	Describe the role of the five classical plant hormones (auxins, cytokinins, ethylene, abscisic acid, and gibberellins) in plant growth and development
LO4	Discuss how plant metabolic processes may be harnessed for conservation and biotechnology
LO5	Describe carbon acquisition by plants and algae

BPS3104: Plant Interactions (Semester:5 Optional)

Module Details

Title Short:	Plant Interactions APPROVED
Language of Instruction:	English

Module Code:	BPS3104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	7 programme(s)

Module Owner:	Dara Stanley

Module Discipline:	BT - Botany

Module Description:	This module will provide students with an important insight into the various types of interactions that occur between plants and other organisms in the natural world, and the biological, biotechnological, ecological and economic impacts of these interactions. Specifically, fundamental topics on interactions between algae and plants with other plants, plant pollinators and fungi will be covered, and the relevance of these interactions in the context of evolution, symbiosis, parasitism and disease will be explored.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe how plants adapt to and utilise organisms in their natural world for the purposes of nutrition, self-propagation, evolution, ecological advantage and survival
LO2	Describe how plants access the resources of other plants
LO3	Explain the evolution and different types of parasitic plants
LO4	Appreciate the economic and human cost of parasitism by plants
LO5	Understand how plants interact with pollinators, and how this has driven floral evolution
LO6	Describe the types of interactions that exist between plants and microorganisms
LO7	Describe positive and negative interactions of algae with other organisms, including fungi, bacteria and viruses, and the ecological and economic implications
LO8	Understand the different types of plant-fungal interactions and their impact on the biochemistry, physiology and survival of plants and fungi
LO9	Outline the molecular tools used in both positive and negative communication between plants and fungi

BPS3105: Plant Natural Products (Semester:6 Optional)

Module Details

Title Short:	Plant Natural Products APPROVED
Language of Instruction:	English

Module Code:	BPS3105

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	ZOE ADELAIDE POPPER

Module Discipline:	BT - Botany

Module Description:	This module investigates the use of plant-, algal-, and fungal- derived compounds for their uses including as medicines. The diversity of chemical compounds identified from plants/algae/fungi will be outlined and discussed in the context of their ecological roles as well as their taxonomic distribution and will highlight the importance of identification. The current sources of specific economically important products will be discussed with reference to sustainability and product quality and the role of biotechnology will be investigated. The methods used to identify products of potential pharmacological, and other uses, will be explored including the role of ethnobotany and traditional medicines as well as laboratory-based technologies. Product development will also be discussed.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Appreciate the diversity of plant-, algal-, and fungal-derived chemicals, including secondary metabolites and enzymes, and their range of activities including ecological, pharmaceutical and biotechnological
LO2	Discuss the taxonomic distribution of plant-, algal-, and fungal-derived compounds of economic and/or medicinal value and their role in planta
LO3	Explore potential, and actual, limitations in the production and quality of specific compounds and the role of biotechnology
LO4	Understand the methods used in product discovery including the role of ethnobotany, laboratory-based methods and bioinformatics-based approaches
LO5	Describe the steps involved in product development

BPS4101: Major Research Project
(Semester:7 Optional)

Module Details

Title Short:	Major Research Project APPROVED
Language of Instruction:	English

Module Code:	BPS4101

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	DAGMAR BRIGITTE STENGEL

Module Discipline:	BT - Botany

Module Description:	This module constitutes a Major Research Project which runs over Semester 1 and 2. A project is conducted under research supervision of Botany and Plant Science and associated staff. The topic will be assigned by BPS staff. Where necessary, a field work component may be undertaken over the summer, in agreement with the project supervisor and BPS staff. The project will include an extensive review of the literature review, experimental work (lab work, field work or both), data analysis, a mini-thesis and oral presentations.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand how to design and conduct scientific research in aspects of botany and plant science ranging from ecology to biotechnology to a professional level.
LO2	Have gained an understanding of the scientific method, including formulation of testable hypotheses and an appreciation of the importance of controls
LO3	Write a scientific review as an introductory chapter, using referencing software such as Endnote and to a professional format
LO4	Be able to draft a methods and materials section of a thesis or scientific paper so that the experiments could be repeated by other researchers
LO5	Analyse and present scientific data in a critical and coherent manner, including through the use of statistics to test for significance of results obtained.
LO6	Interpret and critically analyse and evaluate results obtained, including how results obtained relate to results published in the scientific literature
LO7	Effectively develop scientific research presentations and to deliver them to audiences and to deal with scientific questions posed.

BPS4102: Botany and Plant Science Research Skills (Semester:7 Optional)

Module Details

Title Short:	Botany and Plant Science Research Skills APPROVED
Language of Instruction:	English

Module Code:	BPS4102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	DAGMAR BRIGITTE STENGEL

Module Discipline:	BT - Botany

Module Description:	This module will equip students with essential research skills across the range of Botany and Plant Science, including different modes of scientific communication, scientific method including experimental design and research methods, and other career preparation skills.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Source and evaluate scientific information correctly - distinguish between scientific and non-scientific knowledge sources, and to be able to employ critical thinking based on scientific evidence (underpinned by correct scientific referencing).
LO2	Design, structure and present scientific information in different formats including oral (presentation) and written (essay, abstract) and visual (poster)
LO3	Gain career preparation skills (e.g. via Blackstone Launch Pad, Career Development Centre) including communication with the wider public (e.g. via CKI)
LO4	Exhibit an understanding of the scientific method: demonstrate the necessary skills required to develop and test research hypotheses including experimental design
LO5	Will have developed an understanding of current issues in botany and plant science

BPS4103: Plant Cell
(Semester:7 Optional)

Module Details

Title Short:	Plant Cell APPROVED
Language of Instruction:	English

Module Code:	BPS4103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	ZOE ADELAIDE POPPER
Module Discipline:	BT - Botany
Module Level:	Honours
Module Description:	This module investigates the plant cell focusing on specific features namely the presence of a large central vacuole, chloroplasts and the cell wall. The role of each of these features will be investigated in detail allowing an in-depth exploration of plant evolution, expansive cell growth, cell division, metabolism and development including fruit-ripening. Plant-specific features of mitochondrion function, plant genes and gene regulation will also be discussed.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the role of the plant cell wall in cell division, and plant growth and development including fruit ripening
LO2	Evaluate the potential biotechnological applications of plant cell walls including their modification in vivo and post-harvest
LO3	Explain how plant cells communicate to effect both a localised and a coordinated response of the whole plant to localised stimuli such as pathogen attack and how the complex barrier of the plant cell wall is penetrated by organisms especially fungi
LO4	Describe how plants capture, store and release energy with particular reference to the functions of chloroplasts
LO5	Discuss the origin and evolution of specific features of plant cells including chloroplasts, mitochondria, and specific cell wall components
LO6	Provide an overview of the diverse array of potent enzymes available in the fungal genome for plant cell wall degradation; understand the types of current and future biotechnological applications for which these enzymes can be used
LO7	Compare the differences between biotrophic and necrotrophic fungi in terms of their mode of attack on plant cells

BPS4104: Primary Productivity and Global Change (Semester:8 Optional)

Module Details

Title Short:	Primary Productivity and Global Change APPROVED
Language of Instruction:	English

Module Code:	BPS4104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	Dara Stanley

Module Discipline:	BT - Botany

Module Description:	This module will explore impacts of global change on terrestrial and marine plant (and algal) communities on a range of temporal and spatial scales. It will include a detailed overview of global change impacts on marine ecosystems and feedback mechanisms; such as ocean acidification, rising seawater temperatures, solar radiation, eutrophication, and the role of algae in global cycles. It will also investigate how global change has altered terrestrial plant communities in the past, and discuss current and future changes to plant communities (e.g. invasive species, climate change).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Characterise the key components of global change on marine and terrestrial primary producers
LO2	Be able to appreciate the individual and interactive impacts of global change components on different morphological and functional plant and algal groups
LO3	Evaluate the current literature on marine and terrestrial global change and appreciate current knowledge gaps
LO4	Provide an overview of the ecological and economic implications of global change on marine and terrestrial productivity

NUI Galway
OÉ Gaillimh

CH101: Chemistry
(Semester:1 Optional)

Module Details

Title Short:	Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH101

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	LUCA RONCONI

Module Discipline:	CH - Chemistry

Module Description:	This Module lays a broad foundation in chemistry for students who have an option of continuing to study chemistry in subsequent years. Some of these students will study chemistry to degree level and pursue careers as chemists. The Module assumes no prior knowledge of chemistry, although a significant minority of students will have a Level 5 (NFQ Level 5) qualification in chemistry. The aim is to provide the learner with the knowledge, skills and competences associated with molecular and physico-chemical approaches to the study of matter and of chemical change. The Module is designed to develop an understanding of how chemicals function in “real world” applications and how chemistry integrates with human, social and environmental issues. Students will also develop the knowledge, skills and competences appropriate for effective and safe work in a chemistry laboratory.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	predict chemical formulas of compounds using valence considerations and the knowledge of simple and complex cations and anions
LO2	perform mass- and mole-type calculations, to include isotopes, chemical equations and chemical analyses
LO3	use models of structure at the atomic/molecular level, including intermolecular forces, to explain the physical properties of matter and the properties of solutions
LO4	draw representations of the bonding and geometry of simple inorganic and organic molecules and ions, to include Lewis structures, resonance structures, formal charges, ionic character, and the use of Valence Shell Electron Pair Repulsion (VSEPR) theory
LO5	show how acid-base, redox and precipitation reactions in aqueous solutions are used for qualitative and quantitative analyses
LO6	solve basic quantitative problems involving chemical equilibrium and chemical kinetics, to include thermochemistry, entropy, Gibbs free energy, the direction of spontaneous change, and the effect of temperature on the rate of reactions
LO7	name inorganic and organic compounds according to IUPAC nomenclature
LO8	demonstrate familiarity with the chemistry of representative elements and their compounds, and with the structure and reactivity of the main organic functional groups
LO9	rationalize the properties of the elements and their compounds using basic quantum-mechanical models (including electron configuration, atomic spectra and periodic trends), and using the concepts of oxidation state and charge density
LO10	draw mechanisms for a range of simple organic reactions
LO11	relate the chemical properties of selected elements and compounds to their uses, human and social relevance, and environmental impact
LO12	analyze salts for the presence of common cations and anions, and simple organic substances for the presence of common functional groups
LO13	use appropriate laboratory techniques and equipment to synthesize, separate and purify chemical compounds
LO14	use titrimetry and physico-chemical techniques for quantitative analysis and to determine physico-chemical properties
LO15	implement safe work practices in a chemistry laboratory, to include awareness of common hazards and appropriate safety precautions
LO16	report to a scientifically acceptable standard on laboratory work

CH120: Chemistry: Molecular Science
(Semester:1 Core)

Module Details

Title Short:	Chemistry: Molecular Science APPROVED
Language of Instruction:	English

Module Code:	CH120

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	PATRICK O'LEARY

Module Discipline:	CH - Chemistry

Module Description:	This module provides a broad and targeted introduction to Chemistry for students who require a full two semester foundation course, who are pursuing medicine related courses and who will not be continuing with Chemistry in higher years. The module assumes no prior knowledge of Chemistry, though a significant proportion of those taking it (perhaps 50%) will have a level 5 qualification in Chemistry. The course addresses the particular needs of these students through the use of examples and applications related to biology and medicine.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Recognize the molecular basis of biological and medicine related processes and phenomena
LO2	Explain the macroscopic behaviour of matter in terms of molecular scale forces and effects
LO3	Recognize the link between chemical changes and environmentally important effects such as global warming and ozone layer depletion
LO4	Carry out calculations relating to the material balance in chemical processes
LO5	Recognize the factors that control the rates of chemical processes and of the importance of chemical and enzymic catalysis
LO6	Carry out basic thermodynamic calculations relating to enthalpy, entropy and free-energy in chemical and biochemical processes
LO7	Recognize how basic chemical principles control the behaviour of biological molecules
LO8	Recognize the importance of chemical principles in relation to medicine related issues: magnetic resonance imaging, mechanism of action of pharmaceuticals such as aspirin at a molecular level.
LO9	Recognize the chemical basis of many biomedical processes
LO10	Recognise the importance of carbon based molecules and their importance in terms of the petrochemical, chemical and pharmaceutical industries
LO11	Apply the scientific method in terms of problem solving.

CH130: Chemistry: The World of the Molecule (Semester:1 Optional)

Module Details

Title Short:	Chemistry: The World of the Molecule APPROVED
Language of Instruction:	English

Module Code:	CH130

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	PATRICK O'LEARY

Module Discipline:	CH - Chemistry

Module Description:	This module provides a broad and targeted introduction to Chemistry for students who require a full two semester foundation course, and who will be continuing with Chemistry in Year 2. The module assumes no prior knowledge of Chemistry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Recognize the molecular basis of biological and environment related processes and phenomena
LO2	Explain the macroscopic behaviour of matter in terms of molecular scale forces and effects
LO3	Recognize the link between chemical changes and environmentally important effects such as global warming and ozone layer depletion
LO4	Carry out calculations relating to the material balance in chemical processes
LO5	Recognize the factors that control the rates of chemical processes and of the importance of chemical and enzymic catalysis
LO6	Carry out basic thermodynamic calculations relating to enthalpy, entropy and free-energy in chemical and biochemical processes
LO7	Recognize how basic chemical principles control the behaviour of biological molecules
LO8	Recognize the importance of chemical principles in relation to medicine related issues: magnetic resonance imaging, mechanism of action of pharmaceuticals such as aspirin at a molecular level
LO9	Recognize the chemical basis of many biomedical processes
LO10	Recognise the importance of carbon based molecules and their importance in terms of the petrochemical, chemical and pharmaceutical industries.
LO11	Apply the scientific method in terms of problem solving.

CH202: Organic Chemistry (Semester:4 Group not available to select online)

Module Details

Title Short:	Organic Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH202

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	9 programme(s)

Module Owner:	PATRICK O'LEARY

Module Discipline:	CH - Chemistry

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

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss the reactions, reactivities & properties of organic functional groups as well as draw and describe structures & reaction schemes and apply naming conventions
LO2	Understand and apply chemical principles to describe and discuss the mechanisms of organic chemical reactions, including unseen reactions.
LO3	Discuss factors which effect selectivity most notably chemo, stereo and regioselectivity in organic reactions
LO4	Propose synthetic routes to organic compounds based on the reactions studied in this course, including previously unseen compounds.
LO5	Use standard laboratory techniques such as recrystallisation, distillation, reflux, separation techniques, glassware setup, heating and cooling methods in carrying out preparation of organic compounds in a safe manner.
LO6	Write a formal laboratory report detailing the experimental work carried out and including a clear and consise presentation and analysis of results
LO7	Use spectroscopic techniques (UV, IR and MS) for compound identification and to apply these to unknown compounds. Identify and explain simple reactions that occur in living systems based on organic reactions & mechanism

CH203: Physical Chemistry (Semester:3 Group not available to select online)

Module Details

Title Short:	Physical Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH203

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	HENRY CURRAN

Module Discipline:	CH - Chemistry

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

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss a range of models for predicting the behaviour of gases, and understand how and why real gas behaviour can deviate from such models
LO2	Understand how the laws of thermodynamics (0-3) can be used to describe the direction of spontaneous change for chemical processes, with emphasis on how enthalpy and entropy changes contribute to changes in Gibbs energy and understand and use calorimetry and bond energy data to estimate enthalpies of reactions
LO3	Describe how vibrational and electronic spectroscopic transitions arise and how to relate the amount of radiation absorbed during a transition to concentration
LO4	Derive rate laws and equations, and evaluate rate constants for simple chemical process, and understand how this relates to reaction mechanism
LO5	Describe the migration of ions, understand its importance in how electrolytes conduct electricity
LO6	Discuss the factors that affect the cell potential, understand how it relates to Gibbs energy changes and how electrical potential differences indicate capacity to generate electricity or how electricity can drive chemical change
LO7	Describe how the equilibrium constant is related to changes in Gibbs energy, and how it is affected by temperature, pressure and composition of gaseous species
LO8	Demonstrate competence and work safetly in practical aspects of physical chemistry which is related to the theory components of the course

CH204: Inorganic Chemistry (Semester:3 Group not available to select online)

Module Details

Title Short:	Inorganic Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH204

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	KAREN KELLY

Module Discipline:	CH - Chemistry

Module Description:	This course comprises lectures and practicals, and expands upon the fundamentals of inorganic chemistry covered in year 1. Topics include molecular structure & bonding, ionic and metal lattices, co-ordination chemistry and properties and reactions of the main group elements.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	apply VB and MO theories to describe bonding in diatomic molecules and to predict bond orders and magnetic properties of diatomic molecules.
LO2	apply valence-shell electron-pair repulsion theory to derive the geometry of molecules.
LO3	describe common types of packing in metal lattices (cubic and hexagonal close-packing, simple cubic, body-centred cubic) and the most important ionic lattices.
LO4	apply the Born-Haber cycle to calculate lattice energies, $\Delta fH°$, $\Delta aH°$, dissociation energies, ionization energies or electron affinities.
LO5	give valence shell electron configurations for coordination compounds of the transition metals and their ions
LO6	draw molecular structures for common ligands and the coordination compounds they form with the transition metals, to include isomers
LO7	use crystal field theory to explain the origin of colour and magnetism in transition metal compounds and to account for measured magnetic moments and maximal wavelengths of absorption & discuss the physical and chemical properties of selected main group elements.
LO8	Demonstrate competence in an inorganic chemistry laboratory and work safely in such an environment

CH205: Analytical & Environmental Chemistry (Semester:4 Group not available to select online)

Module Details

Title Short:	Analytical & Environmental Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH205

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	11 programme(s)

Module Owner:	ALAN RYDER

Module Discipline:	CH - Chemistry

Module Data:	1.7 - 2 LAB

Module Description:	This is an introductory course to environmental and analytical chemistry. Analytical chemistry is vital in Industry, Environmental Monitoring, and Healthcare. Students need to understand the fundamental principles behind the analytical techniques and get practical, hands-on experience of these methods. The course comprises of lectures and practicals on: Atmospheric & Water Chemistry, Analytical Chemistry, Electrochemistry, Applied Spectroscopy, Separation Science and Bioanalytical techniques. The specific practicals undertaken will vary from year to year.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	To explain the fundamental principles underlying analytical chemistry, sampling, and electrochemical sensors.
LO2	Explain the fundamentals of atmospheric chemistry and structure, chemistry of the polluted troposphere, and how to deal with waste.
LO3	Explain the fundamental issues influencing water chemistry, treatment, and quality.
LO4	Explain the fundamentals of Atomic Absorption, UV-visible, Mid-IR and Near-IR spectroscopies, and their application to the analysis of various materials.
LO5	Explain the fundamentals of chromatographic techniques and their application to the analysis of small molecules.
LO6	Explain the fundamental principles of protein purification and separation.
LO7	Demonstrate competence in analytical chemistry practicals related to the above learning outcomes (except for 2HF students)
LO8	Work safely, effectively, and to deadlines in a wet lab environment.

CH307: Inorganic Chemistry (Semester:6 Optional)

Module Details

Title Short:	Inorganic Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH307

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	8 programme(s)

Module Owner:	LUCA RONCONI

Module Discipline:	CH - Chemistry

Module Description:	This Module will provide insights into the specific roles of metals and ligands in the broad field of coordination chemistry. Specific areas to be discussed include the coordination and organometallic chemistry of transition metals, inorganic kinetics and principles of nuclear chemistry. The practicals related to the topics dealt with within the course are included in the laboratory-based Module CH334 - Experimental Chemistry II (see relevant module description).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	recognize the basic principles of radioactivity and nuclear chemistry, to include radioactive decays, the interaction of radiations with matter, nuclear reactions and common applications of radioisotopes
LO2	explain the bonding and structural features of transition metal coordination compounds based on the Crystal Field Theory (CFT) and the Molecular Orbitals (MOs) model
LO3	predict the spectroscopic properties of transition metal coordination compounds using theoretical models
LO4	describe the structure, bonding and reactivity of organometallic complexes of d-block elements
LO5	classify the types of organometallic complexes on the basis of the coordinated ligands
LO6	illustrate the catalytic activity of selected organometallic complexes and draw the associated mechanisms of reaction
LO7	explain the structure, bonding and reactivity of transition metals in the various oxidation states
LO8	discuss in detail the mechanisms of dissociative, associative, interchange, ligand substitution and electron transfer reactions of selected transition metals

CH311: Organic Chemistry (Semester:5 Optional)

Module Details

Title Short:	Organic Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH311

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	6 programme(s)

Module Owner:	FAWAZ ALDABBAGH

Module Discipline:	CH - Chemistry

Acknowledgment:	This is an update to CH311 where the continuous assessment component (formerly 10%) is now removed.

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	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.
LO2	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.
LO3	Understand the chemistry of peptide synthesis
LO4	Understand how organic structure and reactivity are related quantitatively & approaches to determining organic reaction mechanism
LO5	Use a retrosynthetic approach to design a multistep synthesis for a carbon based molecule
LO6	Apply basic stereochemical principles to the structure and reactions of carbon based molecules
LO7	Demonstrate knowledge of the structure and function of biomolecules
LO8	Demonstrate an understanding of protein structure in the context of the properties of amino acid residues, the peptide backbone and environmental factors

CH313: Physical Chemistry (Semester:6 Optional)

Module Details

Title Short:	Physical Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH313

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	HENRY CURRAN

Module Discipline:	CH - Chemistry

Module Description:	This course comprises lectures and tutorials, and expands upon the fundamentals of physical chemistry covered in years 1 and 2. Chemistry of molecular interactions, gas-solid interactions, thermodynamics of phase transitions, chemical kinetics, basic principles of electrode kinetics, spectroscopy and quantum chemistry are covered.The course emphasizes chemistry of interest to modern day chemists.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss the potential energy of interaction between closed-shell molecules, (i) charge/charge, (ii) charge/dipole, (iii) dipole/dipole, (iv) London (dispersion) interactions.
LO2	Explain the kinetics associated with reactors, understand the dependence of kinetics on thermodynamics of reactants and products and how the rate constant of a reaction varies with temperature.
LO3	Discuss thermodynamics of phase transitions of pure substances, understand from thermodynamics why homogeneous mixing of gases and ideal solutions occurs spontaneously and describe the phase diagrams of simple mixtures, focusing on temperature-composition diagrams, azeotropes and eutectics and their applications.
LO4	Understand the basic principles of electrode kinetics and be able to use the Butler-Volmer and Tafel equations to compute overvoltage values, transfer coefficients and the equilibrium exchange current density.
LO5	Understand the importance of gas-solid interactions and be able to use and manipulate the various isotherms that are used to describe these interactions. The importance of surface tension, surfactants and the Gibbs adsorption isotherm should also be known.
LO6	Understand how the molar mass of polymers influence their properties, in particular their mechanical and thermal properties and be able to describe methods used to measure this mass. The influence of crystallinity on polymer properties should also be understood.
LO7	Explain the selection rules governing and fundamental theory underpinning Rotational and Vibrational (NIR, MIR, & Raman) spectroscopies. Calculate anharmonicity constants, the energies and populations of spectroscopic energy levels.
LO8	Explain the evidence for quantum theory and the De Broglie Relationship. Explain the Schrodinger Wave Equation (SWE), nature of wavefunctions, Born Interpretation, uncertainty principle. Be able to solve SWE for several simple 1D, 2D, and 3D cases related to spectroscopy and materials science. Be able to use the solutions of the SWE to calculate energy levels in simple systems.

CS319: Scientific Computing (Semester:6 Optional)

Module Details

Title Short:	Scientific Computing APPROVED
Language of Instruction:	English

Module Code:	CS319

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	MA - Mathematics

Module Description:	This module introduces the fundamental principles of scientific computing, object oriented programming, and the development of mathematical software. Key ideas in object oriented programming, such as encapsulation, polymorphism and inheritance, and presented in the context of solving problems that arrise in mathematical and/or staistical modelling.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Write computers programmes in a high-level object-oriented language that implement key mathematical concepts such as functions, vectors and matrices.
LO2	Implement important algorithms of problem-solving in scientific computing, such as optimization and solution of linear equations.
LO3	Apply the techniques of object-oriented programming, such as of polymorphism and encalsulation.
LO4	Develop robust, reliable and tested code.

CH326: Analytical Chemistry & Molecular Structure (Semester:5 Optional)

Module Details

Title Short:	Analytical Chemistry & Molecular Structure APPROVED
Language of Instruction:	English

Module Code:	CH326

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	NIALL GERAGHTY

Module Discipline:	CH - Chemistry

Module Description:	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).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	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.
LO2	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.
LO3	Relate their knowledge of the theory and instrumentation of gas-liquid chromatography to the design of a variety of seprations.
LO4	Explain the theory of X-ray Fluorescence spectroscopy and the origin of the spectral lines.
LO5	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.
LO6	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.
LO7	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.
LO8	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.

CH332: Drug Design & Drug Discovery
(Semester:5 Optional)

Module Details

Title Short:	Drug Design & Drug Discovery APPROVED

Module Code:	CH332

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	DAVID CHEUNG

Module Discipline:	CH - Chemistry

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Relate concepts in molecular mechanics to thermodynamic properties of ligand-protein interactions (enthalpy, entropy, the role of solvent)
LO2	Understand classical mechanical force fields and molecular dynamics simulations
LO3	Be competent in accessing and retreiving data from structure databases, and in using computational software to analyze and vizualize molecular complexes
LO4	Define the issues associated with computational conformational sampling, automated docking, and binding energy calculations
LO5	Understand the historical and current importance of natural products as drugs and drug leads and identify the most important natural sources for drug discovery
LO6	Describe the advantages, challenges as well as concepts and methods used in natural product drug discovery
LO7	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)
LO8	Understand biosynthetic and drug activation reactions involving DNA, RNA, ATP, cAMP, S-adenosyl methionine and NQO1.

CH333: Experimental Chemistry I
(Semester:5 Optional)

Module Details

Title Short:	Experimental Chemistry I APPROVED

Module Code:	CH333

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	4 programme(s)

Module Owner:	FAWAZ ALDABBAGH

Module Discipline:	CH - Chemistry

Module Description:	This laboratory based module compliments third year organic chemistry and analytical and structure chemistry courses. Students taking this module must also take these corresponding two theory based courses.This course will involve carrying out organic preparations and chemical analysis using an array of techniques.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate competence in safely setting up organic and organometallic reactions, carrying out work up and standard purification techniques, such as distillation, chromatography and recrystallization.
LO2	Demostrate competence in mole and yield calculations.
LO3	Demostrate competence in organic compound characterization (e.g. IR, UV, MS and NMR spectroscopy) and chromatographic (e.g. HPLC and GC) techniques.
LO4	Demostrate competence in report writing, interpretation of laboratory results, and relate experimental data with theoretical and mechanistic aspects covered in associated lecture modules.
LO5	Carry out procedures in solving crystal structures, and other solid state techniques such as SEM, EDX.
LO6	Investigate the structure and properties of a molecule using molecular modelling
LO7	Search, and obtain information from chemistry databases

CH334: Experimental Chemistry II (Semester:6 Optional)

Module Details

Title Short:	Experimental Chemistry II APPROVED
Language of Instruction:	English

Module Code:	CH334

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	LUCA RONCONI

Module Discipline:	CH - Chemistry

Module Description:	This laboratory-based Module complements the 3rd Year Inorganic Chemistry (CH307) and Physical Chemistry (CH313) lecture-based Modules (which students must also take). This course will involve the carrying out of experiments in areas such as inorganic syntheses, analysis and spectroscopic studies of coordination compounds, chemical kinetics, viscosity, temperature dependence of equilibrium, miscible liquids, rotational-vibrational spectra and electrochemistry. Attendance to laboratory sessions is mandatory.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	set up and carry out a range of inorganic syntheses (e.g. coordination compounds, polyoxometallates)
LO2	relate laboratory results to the properties (e.g. oxidation states, structures) and reaction mechanisms of compounds of the transition metals (e.g. coordination compounds, polyoxometallates) covered in the associated inorganic chemistry lectures
LO3	demonstrate competence in the spectroscopic characterization (e.g. IR, UV-Vis, NMR spectroscopy) of coordination compounds
LO4	demonstrate competence in stoichiometric calculations
LO5	set up and perform tests to verify fundamental physical chemistry theories in the laboratory
LO6	relate experimental results to the physico-chemical principles dealt with in the associated physical chemistry lectures
LO7	recognize the scientific method of planning, developing, conducting and reporting experiments to a scientifically acceptable standard
LO8	apply important synthetic and analytical techniques relevant to the professional practice of chemistry
LO9	implement safe work practices in a chemistry laboratory, to include awareness of common hazards and appropriate safety precautions

CH449: Selective Synthesis and Organometallic Chemistry (Semester:7 Optional)

Module Details

Title Short:	Selective Synthesis and Organometallic Chemistry APPROVED
Module Code:	CH449
ECTS Credits:	5
NFQ Level:	N/A
EQF Level:	
EHEA Level:	
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	PAUL MURPHY
Module Discipline:	CH - Chemistry
Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe a variety of reactions that are commonly used in target oriented synthesis, including selective synthesis and demonstrate ability to plan synthesis.
LO2	Demonstrate competence and knowledge in basic organic chemistry related to selective synthesis
LO3	Describe, explain and implement established rules and theories in determining various of properties of organometallic compounds as well as a variety of mechanisms involving organometallic compounds.
LO4	Describe the preparation of selected organometallic reagents and and how to modulate their reactivity and design routes to target compounds based on these reagents

CH2101: Medicinal Chemistry

(Semester:3 Group not available to select online)

Module Details

Title Short:	Medicinal Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH2101

ECTS Credits:	5

NFQ Level:	6	**EQF Level:**	5	**EHEA Level:**	Short Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	KAREN KELLY

Module Discipline:	CH - Chemistry

Module Description:	In this module the students will obtain an introduction into basic concepts of medicinal chemistry. There will be a theory and practical component. The theory component will deal with an introduction into biomolecule structure, with a focus on protein structure. Students will learn how drug molecules can interact with proteins, and the key interactions involved. Through a small number of case studies they will gain knowledge on how some drugs were discovered (e.g. penicillin, paracetamol, artemesinin, ivermectin etc.), In the practical component basic synthetic, analytical and computational techniques used in medicinal chemistry will be introduced

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Gain knowledge of the structure of building blocks of biomolecules that are receptors for drugs. A focus will be on amino acids and proteins, and the chemistry influencing the three dimensional structure of proteins
LO2	Understand and apply chemical principles to describe and discuss how drug molecules interact with their biomolecular receptors such as proteins. This covers the interactions involved in protein-ligand complex formation.
LO3	Gain knowledge and understanding of how drug interaction with a target are measured. In this regard how the potency and selectivity of drugs for their target receptor or enzyme is measured and how structure activity relationships are established will be covered.
LO4	Gain an appreciation for how physicochemical properties of compounds are important in medicinal chemistry. These include solubility, lipophilicity, stability, ADMET etc.
LO5	Use synthetic and analytical techniques in the laboratory to prepare & evaluate drug molecules. Use computational techniques to gain appreciation for protein structure, and the chemical nature of drug-receptor complexes, as well as calculation of physicochemical properties of compounds.
LO6	Write a formal laboratory report detailing laboratory work carried out and including a clear and consise presentation and analysis of results
LO7	Demonstrate knowledge and understanding of selected drugs were identified and developed and their mechanism of action (e.g. penicillins, paracetamol, ivermectin, artemesinin)

CH3101: Computers and Chemical Research (Semester:6 Optional)

Module Details

Title Short:	Computers and Chemical Research APPROVED
Language of Instruction:	English

Module Code:	CH3101

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	NIALL GERAGHTY

Module Discipline:	CH - Chemistry

Module Description:	The module consists of units designed to develop research & reporting skills important for professional chemists. These include sourcing knowledge from literature, critically analysing data, preparing reports, communicating research outcomes. Units in scientific writing, presentations and use of various computer packages are included. Assignments will also require the students to demonstrate broadening their knowledge and enhancing their understanding of (Biopharmaceutical) Chemistry

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	produce scientific written reports and that includes communication of chemical information such as structures, tables of data, other figures such as molecular graphics to present chemical information
LO2	produce spreadsheets and graphs using Excel for inclusion in reports and for analysing data
LO3	source information from the primary scientific literature using various resources such as online library, search engines, databases (e.g. SciFinder, Reaxys) and other related technology
LO4	prepare a Chemistry or Biopharmaceutical Chemistry presentation, and use it to communicate knowledge to a group
LO5	use various sources of chemical knowledge, to independently research a topic and write a critical essay or report
LO6	carry out basic molecular modelling
LO7	demonstrate increased knowledge and understanding within chemistry or biopharmaceutical chemistry

CH3103: Validation in the Pharmaceutical and Medical Devices Industry (Semester:6 Optional)

Module Details

Title Short:	Validation in the Pharmaceutical and Medical Devices Industry APPROVED
Language of Instruction:	English

Module Code:	CH3103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	8 programme(s)

Module Owner:	CONSTANTINA PAPATRIANTAFYLLOPOULOU

Module Discipline:	CH - Chemistry

Acknowledgment:	This is also to be attached to the new MSc. in Chemistry (new instance to be created). This will be a core module for 3 BPC students and an elective module for 3BS students. BPC = Biopharmaceutical Chemistry. This is an update to CH339 and replaces it.

Module Description:	This module covers pertinent topics concerning validatory requirements within the biopharma-, pharma, medical device and chemical industries and also Chemistry important in Industry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain in detail and apply the concept of Validation and the Validation Masterplan (VMP) and their roles in the pharmaceutical industry.
LO2	Discuss the concept of Good Manufacturing Practice (GMP) and Good Laboratory Practice (GLP) in relation to the pharmaceutical and chemical industries, highlighting the necessity for manufacturers, institutes and governing bodies to exercise and uphold these frameworks
LO3	Explain all pertinent aspects of Cleaning Validation, Qualification (which includes Design, Installation, Process and Performance Qualification).
LO4	Describe many aspects of Medical Devices and the practical aspects of Quality Control, Good Manufacturing Practices and Drug Development in relation to the Medical Device Industry
LO5	Carry out a short research investigation & present the outcome

CH4101: Research - Independent Investigation (Semester:7 Optional)

Module Details

Title Short:	Research - Independent Investigation APPROVED
Language of Instruction:	English

Module Code:	CH4101

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	2 programme(s)

Module Owner:	PAUL MURPHY

Module Discipline:	CH - Chemistry

Acknowledgment:	This module replaces CH451 and CH447

Module Description:	This is an open ended investigation which requires the student to manage their own learning working on a defined research problem under the guidance of an academic supervisor. The student will consolidate & extend their knowledge and understanding of chemistry or biopharmaceutical chemistry through the research project activity assigned in this module. Biopharmaceutical Chemistry students will normally have completed this module at the end of Semester 1. Chemistry students will normally carry out the work in Semester 1 & 2 and complete the assessment during Semester 2.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Establish the state of the art in an assigned research topic
LO2	Demonstrate competence in specialised technical skills associated with the research project
LO3	Critically analyse data obtained from library and/or laboratory work or other data provided
LO4	Demonstrate competence in relevant research skills acquired during the course of the project
LO5	Demonstrate a greater a comptence and knowledge within Chemistry or Biopharmaceutical Chemistry as a result of the independent investigative project
LO6	Use facts obtained to challenge current teaching and/or myths/hyperbole in Chemistry and/or to provide new insights and/or advance a topic in Chemistry or Biopharmaceutical Chemistry
LO7	Demonstrate competence in reporting & presenting the outcomes of their work

CH4102: Synthesis, Organometallic & Analytical Chemistry (Semester:7 Optional)

Module Details

Title Short:	Synthesis, Organometallic & Analytical Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH4102

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	PAUL MURPHY

Module Discipline:	CH - Chemistry

Acknowledgment:	This module replaces CH448 and CH449

Module Description:	This module deals with a selection of generally selective reactions and their application in synthesis of target compounds. The structure and properties of organometallic compounds and their application in synthesis is included. The module will include applications of fluorescence microscopy, NMR, mass spectrometry and other spectroscopies and methods in analysis of a range of different molecule types, including structure determination.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe a variety of reactions that are commonly used in target oriented synthesis, including selective synthesis.
LO2	Design reasonable synthetic routes to target compounds based on selective reactions
LO3	Describe, explain and implement established rules and theories in determining various of properties of organometallic compounds as well as a variety of mechanisms involving organometallic compounds.
LO4	Describe the preparation of selected organometallic reagents and and how to modulate their reactivity and design routes to target compounds based on these reagents
LO5	Correlate the signals in various types of NMR spectra with a given structure, and deduce the structure of an unknown organic molecule given its NMR spectra and other standard data
LO6	Use spectroscopic techniques to derive the structures of inorganic compounds and to understand the properties of metals and their various compounds
LO7	Explain the basic optical concepts, components used in the construction of optical fluorescence microscopes.
LO8	Use the knowledge and competencies gained to solve unseen problems

CH4103: Physical & Biophysical Chemistry (Semester:7 Optional)

Module Details

Title Short:	Physical & Biophysical Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH4103

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	HENRY CURRAN

Module Discipline:	CH - Chemistry

Acknowledgment:	This module replaces CH429 and CH432

Module Description:	This module deals with selected topics in physical chemistry: chemical kinetics, fluorescence spectroscopy, statistical thermodynamics, soft matter, chemical biophysics, mass transfer and drug delivery.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain basic concepts of kinetics and to apply fundemental chemical kinetics to first and second order reactions in flow reactors, jet-stirred reactors and in shock tubes
LO2	Fluorescence spectroscopy: be able to explain the proces of photon absorption, the different possible fates of excited states, lifetimes, fluorescence and phosphorescence. Be able to explain the concepts of quenching, FRET, TRES, and anisotropy. Be able to discuss fluorophores, types, and applications.
LO3	Calculate the thermodynamic properties of molecules and radicals using statistical methods based on rotational, translational, vibrational and electronic partition functions.
LO4	Describe the properties of soft matter systems and how these are related to molecular structure and organisation.
LO5	Describe the mechanisms of mass transfer and current state of the art for advanced drug delivery.
LO6	Provide quantitative analysis of cellular systems.
LO7	Complete course problems in physical chemistry.
LO8	Complete unseen problems in physical chemistry.

CH4104: Organic & Bioorganic Chemistry (Semester:7 Optional)

Module Details

Title Short:	Organic & Bioorganic Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH4104

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	FAWAZ ALDABBAGH

Module Discipline:	CH - Chemistry

Acknowledgment:	This module replaces module CH439 and CH438

Module Description:	The module deals with advanced topics in organic chemistry and structure elucidation techniques (such as 2-D NMR). This includes chemistry of reactive intermediates, supramolecular organic chemistry & advanced organic reactions and their mechanisms. Included are topics from bioorganic chemistry including protein chemistry and natural product chemistry. Students will develop problem solving skills during the course of the module.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Write reaction schemes, and mechanisms using single and double-headed arrows for various reactions discussed in the lectures. Such reactions can be those involved in preparation of materials, organic molecules, biomolecules or in biosynthesis
LO2	Demonstrate an knowledge of the main features of techniques (NMR spectroscopy and X-ray crystallography) that are used to characterize biomolecular structure and interactions and explain the concept of binding affinity and relate it to the structure and function of proteins
LO3	Describe in detail (including molecular structure diagrams) the types of non-covalent interactions that occur in protein-ligand interfaces. These interactions include hydrogen bonds, salt bridges, cation-pi bonds, and the hydrophobic effect.
LO4	Write reaction schemes and describe mechanisms for cationic, anionic, Ziegler-Natta and step-growth polymerizations accounting for monomer selection, molecular weight growth, and describe a living polymerization process.
LO5	To relate conformational analysis with reactivity in defined classes of molecules
LO6	Write mechanisms for radical cyclizations mediated by Bu3SnH or silane replacements, accounting for Baldwin's rules, Thorpe-Ingold effect, and Beckwith Transition states
LO7	To discuss radical, electrocyclic, cycloaddition and sigmatropic reactions in terms of frontier orbital interactions, including drawing the molecular orbitals of alkenes and polyenes, discussing their symmetry properties and indentifying the relevant LUMO and HOMO orbitals

CH4105: Inorganic & Bioinorganic Chemistry (Semester:7 Optional)

Module Details

Title Short:	Inorganic & Bioinorganic Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH4105

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	ANDREA ERXLEBEN

Module Discipline:	CH - Chemistry

Acknowledgment:	This module is replacing CH445 and CH446

Module Description:	This course comprises lectures and tutorials, and expands upon the fundamentals of inorganic chemistry covered in years 1, 2 and 3. Topics include medicinal inorganic chemistry, metalloenzymes, catalysis, f-block chemistry, solid state and supramolecular chemistry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe the relevance of various metals (Pt, Ru, Ga, V, Ti, Mo, Au, Li, Bi, Mn, Gd, Tc) and their complexes in medicine
LO2	discuss the chemistry of antitumour active platinum compounds with regard to synthesis of cis- and transplatin, coordination chemistry of Pt, trans-effect, mechanism and kinetics of ligand substitution, solution behaviour of cisplatin, reaction of cisplatin with DNA, nucleobases and amino acids, structure-activity relationships for Pt drugs, Pt NMR
LO3	discuss the coordination chemistry of Ru-, Ga-, Ti-, V-, and Au complexes and relate their properties to their biological and medicinal properties.
LO4	describe the generation and selection criteria of therapeutic and diagnostic radionuclides, the synthesis of radiopharmaceuticals and the function of radiosensitizers.
LO5	Describe the application of combinatorial chemistry in metal-based drug design
LO6	Present and analyse evidence that supports mechanisms of action for metallo-enzymes including support for proposed intermediates and to represent the mode of action using catalytic cycles
LO7	relate the properties of metals and their coordination compounds to the roles they play in biological systems and show how these chemical properties can be modulated to fit a variety of biological environments
LO8	demonstrate an in-depth knowledge of the following aspects of solid state chemistry; commercial and laboratory-scale synthesis of solid state materials, atomic structure of many important materials used in everyday life; non-stoichiometric materials, ionic and electronic conductors, Type I and Type II superconductor materials;. perovskite, zeolite and spinel classes of materials
LO9	demonstrate an in-depth knowledge of the following aspects of f-block chemistry; general properties of lanthanoids and actinoids, f orbitals, lanthanoid contraction, oxidation states, coordination numbers and geometries; electronic spectra and luminescence; NMR shift reagents; formation and structures of halides, hydroxides and oxides; organometallic compounds
LO10	describe the concept of supramolecular self-assembly and self-recognition and the driving forces for the formation of supramolecular structures.
LO11	apply the “molecular library approach” to predict the formation of 2D polygons and 3D polyhedra from ditopic and tritopic building blocks and to describe synthetic strategies for the construction of molecular grids, helicates, catenanes, catenates, rotaxanes
LO12	discuss and explain anion and cation recognition by molecular receptors
LO13	work both individually and in small groups to form and express opinions on scientific issues from learned articles on bioinorganic chemistry.
LO14	complete course problems in inorganic chemistry

CH4107: Analytical & Biophysical Chemistry (Semester:8 Core)

Module Details

Title Short:	Analytical & Biophysical Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH4107

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	ALAN RYDER

Module Discipline:	CH - Chemistry

Acknowledgment:	This module is taken by year 4 Biopharmaceutical Chemistry students as a core module in Semester 2. It can potentially be taken by occasional students or Science without Border students who have sufficient background in Chemistry from previous studies. This module will replace CH448 & CH432.

Module Description:	The module will include applications The Analytical chemistry element will cover applications such as: fluorescence microscopy, NMR, mass spectrometry and other spectroscopies and methods in analysis of a range of different molecule types, including structure determination. The Biophysical chemistry element will cover topics such as soft matter, chemical biophysics, mass transfer and drug delivery.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the properties of soft matter systems and how these are related to molecular structure and organisation.
LO2	Provide quantitative analysis of cellular systems.
LO3	Describe the mechanisms of mass transfer and current state of the art for advanced drug delivery.
LO4	Correlate the signals in various types of NMR spectra with a given structure, and deduce the structure of an unknown organic molecule given its NMR spectra and other standard data
LO5	Use spectroscopic techniques to derive the structures of inorganic compounds and to describe the properties of metals and their various compounds
LO6	Explain the basic optical concepts, components used in the construction of optical fluorescence microscopes.
LO7	Use the knowledge and competencies gained to solve course problems
LO8	Use the knowledge and competencies gained to solve unseen problems

CH4108: Bioorganic & Bioinorganic Chemistry (Semester:8 Core)

Module Details

Title Short:	Bioorganic & Bioinorganic Chemistry APPROVED
Language of Instruction:	English

Module Code:	CH4108

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	ANDREA ERXLEBEN

Module Discipline:	CH - Chemistry

Acknowledgment:	This new module will replace CH438 and CH446

Module Description:	This module deals with the chemistry & chemical reactivity of biomolecules and natural products. This will include protein chemistry & biosupramolecular chemistry & the biosynthesis of selected natural products. The course covers medicinal inorganic chemistry and structures and reaction mechanisms of selected metalloenzymes.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	discuss the coordination chemistry of bioactive metal complexes and relate their properties to their biological and medicinal properties.
LO2	present and analyse evidence that supports mechanisms of action for metallo-enzymes including support for proposed intermediates and to represent the mode of action using catalytic cycles.
LO3	relate the properties of metals to the roles they play in biological systems and show how these chemical properties can be modulated to fit a variety of biological environments
LO4	complete problems in bioinorganic chemistry
LO5	Describe the structure, properties and some basic reactions of well known carbohydrates
LO6	Demonstrate an knowledge of the main features of two structural biology techniques (NMR spectroscopy and X-ray crystallography) that are used to characterize protein interactions.
LO7	Explain the concept of binding affinity and relate it to the structure and function of proteins as well as describe in detail (including molecular structure diagrams) the types of non-covalent interactions that occur in protein-ligand interfaces. These interactions include hydrogen bonds, salt bridges, cation-pi bonds, and the hydrophobic effect.
LO8	Demonstrate an knowledge of the biosynthesis of terpenes and terpenoids, and relate biological reactions to chemical laboratory examples as well as explaining how conformation influences chemical behaviour in such systems.

CH4110: Biopharmaceutical Chemistry Dissertation (Semester:7 Optional)

Module Details

Title Short:	Biopharmaceutical Chemistry Dissertation APPROVED
Language of Instruction:	English

Module Code:	CH4110

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	PAUL MURPHY

Module Discipline:	CH - Chemistry

Acknowledgment:	This is a dissertation to be prepared by biopharmaceutical chemistry students who are also taking the work placement module. This module should not be taken by students who are taking the on campus project module.

Module Description:	This is an open ended investigation which requires the student to manage their own learning working on a defined topic in Biopharmaceutical Chemistry under the guidance of an academic supervisor. The student will consolidate & extend their knowledge and understanding of biopharmaceutical chemistry through this module. Biopharmaceutical Chemistry students will normally have completed this module at the end of Semester 1

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate ability to establish the state of the art in an assigned topic
LO2	Organise the outcomes of the research into a coherent thesis format
LO3	Demonstrate competence in relevant research skills
LO4	Demonstrate a greater a competence and knowledge within Biopharmaceutical Chemistry as a result of the dissertation work
LO5	Provide a critical analysis of the data with a view to advancing a topic in Biopharmaceutical Chemistry
LO6	Demonstrate competence in reporting & presenting the outcomes of their work

CH4111: Work Placement (Semester:7 Optional)

Module Details

Title Short:	Work Placement APPROVED
Language of Instruction:	English

Module Code:	CH4111

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	FAWAZ ALDABBAGH

Module Discipline:	CH - Chemistry

Acknowledgment:	This is an update to the work placement module for Biopharmaceutical Chemistry students

Module Description:	This module gives students work experience in an organization. It will enable them to make a link between the subject knowledge gained from their course and the workplace. They will enhance their work readiness through action learning. The assessment will be based on a site visit, a written report, a report from the employer and an oral presentation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	show an appreciation for the laboratory or organization where they carried out their placement, its management structure and the environment in which it operates its daily business
LO2	have increased knowledge regarding their own employability and demonstrate insight into their transferrable skills
LO3	identify career choices in light of their work placement
LO4	demonstrate an appreciation of health & safety in the workplace
LO5	Link the work placement to their programme of study
LO6	Demonstrate effective People Skills such as negotiation, team working, leadership, interpersonal and communication skills.
LO7	Demonstrate effective Self Reliance Skills such as initiative, networking, willingness to learn, reliability, punctuality and prioritising tasks.
LO8	Demonstrate the required Technical and General Skills of the given work place.

CH4113: Organic Chemistry (Semester:7 Optional)

Module Details

Title Short:	Organic Chemistry APPROVED
Module Code:	CH4113
ECTS Credits:	5
NFQ Level:	N/A
EQF Level:	
EHEA Level:	
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	FAWAZ ALDABBAGH
Module Discipline:	CH - Chemistry
Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Write reaction schemes, and mechanism using single and double headed arrows for various reactions discussed in the lectures. such reactions can be those involved in preparation of materials, organic molecules, biomolecules or in biosynthesis.
LO2	Demonstrate a working knowledge of the main analytical techniques used in structure elucidation of organic compounds and natural products e.g. NMR spectroscopy
LO3	Write reaction schemes and describe mechanisms for cationic, anionic and polymerizations accounting for monomer selection, molecular weight growth, and describe a living polymerization process.
LO4	Write mechanisms for radical cyclizations mediated by Bu3SnH or silane replacements, accounting for Baldwin's rules. Thorpe-Ingold effect, and Beckwith Transition states.
LO5	To discuss radical, electrocyclic, cycloaddition and sigmatropic reactions in terms of frontier orbital interactions, including drawing the molecular orbitals of alkenes and polyenes, discussing their symmetry properties and identifying the relevant LUMO and HOMO orbitals.

CH4109: Biopharmaceutical Chemistry & Industrial Biochemistry (Semester:8 Core)

Module Details

Title Short:	Biopharmaceutical Chemistry & Industrial Biochemistry APPROVED
Language of Instruction:	English

Module Code:	CH4109

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	PETER BERNARD CROWLEY

Module Discipline:	CH - Chemistry

Acknowledgment:	This new module will replace CH441 and CH442

Module Description:	This course focuses on the fundamental chemistr of biopharmaceuticals such as glycoproteins and antibodies and other natural products. Emphasis is placed on how these components are important in the biopharmaceutical industry. The module presents an overview of (a) animal cell culture and (b) pharmaceutical biotechnology in the context of underlining science and industrial/medical applications including regulatory routes for pharmaceuticals.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an knowledge of protein-based therapeutics, including their disease-relevance and molecular basis of function. In particular, they should be able to related antibody structure to antigen binding affinity.
LO2	Describe the structure & properties of glycoconjugates and relate this to biopharmaceutical structure. Describe how they may be analysed and discuss why this is important.
LO3	Illustrate the importance of natural products produced naturally for the development of novel lead compounds for small molecule drug development, with examples of scaffolds in current use.
LO4	Describe the concepts and processes underpinning the development and production of products of pharmaceutical biotechnology
LO5	Independently identify and evaluate pertinent information from scientific and additional literature sources
LO6	Critique suggested product patenting approaches, developmental or production schemes with a view to assessing their industrial suitability
LO7	Devise product patenting, development or production schemes appropriate for purpose

CP102: Chemistry/Physics (Semester:1 Core)

Module Details

Title Short:	Chemistry/Physics APPROVED
Language of Instruction:	English

Module Code:	CP102

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	4 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This module lays a broad foundation in chemistry and physics for students who need an introductory level knowledge of the physical sciences for the demonimated courses in Marine Science and Health and Safety Systems. Some of the students may have level 4/5 knowledge of either or both subjects but no prior knowledge is assumed in the course design. The level of mathematics required for the physics component is simple algebra and trigonometry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	General Chemistry: Students will understand and be able to apply concepts of matter, atomic theory and the periodic table to predict chemical behaviour of compounds; Students will be able to apply the basic reactivities of simple compounds to produce balanced equations for reactions; Students will be able to convert between basic units and use these to do reaction based calculations; and Students will understand and be able to calculate the effect of physical forces on Solids Liquids and gases
LO2	Specific Physics Detail: Understand some basic physical principles related to topics such as motion, forces, energy, heat, waves, electricity, light, atoms and radiation; Identify basic physical principles governing the behaviour of simple systems; Describe physical processes using simple equations and solve numerical problems; Make measurements in the physics laboratory; and Record and analyse experimental data.

CS102: Computer Science (Semester:1 Optional)

Module Details

Title Short:	Computer Science APPROVED

Module Code:	CS102

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	AM - Applied Mathematics

Module Description:	This module lays a broad foundation in Computer Science for students in the College of Science. It complements the physical, life and mathematical sciences by providing the core principles of computing need for a degree in science, with an emphasis on programming. It is also the gateway to a degree in Computer Science.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	identify the primary components of computers and networks.
LO2	describe the architecture of a computer, and the computer representation of numbers
LO3	explain the basics of logic circuits and microprocessor operation
LO4	solve problems algorithmically, and describe these algorithms in pseudo-code.
LO5	implement algorithms of various complexity in Python, and use Python's arithmetic and logical operators
LO6	use decision structures (if-elif-else) and loop structures (while, for) in Python
LO7	demonstrate understanding of the concepts of scope of a variable and of a function, write and use their own functions in Python, with parameters and return values
LO8	write Python programs that use lists and nested lists, and demonstrate an understanding of slices and other operations on lists.
LO9	demonstrate an understand the principles of object oriented programming (OOP), and write python programs that use OOP to solve problems.

CS103: Computer Science (Semester:1 Core)

Module Details

Title Short:	Computer Science APPROVED
Module Code:	CS103
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	EMIL SKOLDBERG
Module Discipline:	MA - Mathematics
Module Description:	Head of School of Mathematics, Statistics and Applied Mathematics

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	solve problems algorithmically, and describe these algorithms in pseudo-code.
LO2	implement algorithms of various complexity in Python, and use Python's arithmetic and logical operators
LO3	use decision structures (if-elif-else) and loop structures (while, for) in Python
LO4	demonstrate understanding of the concepts of scope of a variable and of a function, write and use their own functions in Python, with parameters and return values

CS204: Computer Science (Semester:3 Core)

Module Details

Title Short:	Computer Science APPROVED
Language of Instruction:	English

Module Code:	CS204

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	MA - Mathematics

Module Description:	This module is concerned with the construction, design and amalysis of algorithms. Complexity theory is covered in detail, along with algorithm design techniques.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	calculate the computational complexity of simple algorithms
LO2	construct algorithms for a number of sorting problems
LO3	given a number of solutions to a problem, determine which is computationally more efficient
LO4	analyze the Euclidean algorithm and explain the Halting Problem

CS209: Algorithms And Scientific Computing (Semester:3 Group not available to select online)

Module Details

Title Short:	Algorithms And Scientific Computing APPROVED
Language of Instruction:	English

Module Code:	CS209

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	7 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	MA - Mathematics

Module Description:	This course covers algorithm design, analysis and implementation. The programming language used is PYTHON.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	calculate the computational complexity of simple algorithms;
LO2	construct algorithms and corresponding code) for a number of sorting problems;
LO3	given a number of solutions to a problem, determine which is computationally more efficient;
LO4	write programs using both iteration and recursion;
LO5	apply the technique of Dynamic Programming to solving particular problems.

CS211: Programming and Operating Systems (Semester:3 Group not available to select online)

Module Details

Title Short:	Programming and Operating Systems APPROVED
Module Code:	CS211
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	7 programme(s)
Module Owner:	EMIL SKOLDBERG
Module Discipline:	MA - Mathematics
Module Description:	This course introduces operating systems, the most fundatmental piece of software running on any computer.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Name and describe the main tasks of an operating system;
LO2	Explain the concept and purpose of a process in an operating system;
LO3	Represent the life cycle of a process in a diagrammatical fashion;
LO4	Describe and compare various scheduling strategies;
LO5	Explain and implement a queue data structure;
LO6	Apply a semaphore as a tool in concurrent programming;
LO7	Explain the necessary conditions for deadlock;
LO8	Describe and apply an algorithmic strategy for deadlock detection.

CS319: Scientific Computing (Semester:8 Optional)

Module Details

Title Short:	Scientific Computing APPROVED
Language of Instruction:	English

Module Code:	CS319

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	MA - Mathematics

Module Description:	This module introduces the fundamental principles of scientific computing, object oriented programming, and the development of mathematical software. Key ideas in object oriented programming, such as encapsulation, polymorphism and inheritance, and presented in the context of solving problems that arrise in mathematical and/or staistical modelling.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Write computers programmes in a high-level object-oriented language that implement key mathematical concepts such as functions, vectors and matrices.
LO2	Implement important algorithms of problem-solving in scientific computing, such as optimization and solution of linear equations.
LO3	Apply the techniques of object-oriented programming, such as of polymorphism and encalsulation.
LO4	Develop robust, reliable and tested code.

CS402: Cryptography
(Semester:8 Optional)

Module Details

Title Short:	Cryptography APPROVED
Language of Instruction:	English

Module Code:	CS402

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	10 programme(s)

Module Owner:	ALEXANDER RAHM

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	This course develops basic concepts in private and public key cryptosystems, explores some of the associated algorithmic number theory, and introduces more advanced topics such as the use of elliptic curves in cryptography.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Encrypt and decrypt simple Diffie-Hellmann and ElGamal cryptosystems.
LO2	Understand the weaknesses of discrete-logarithm-problem based cryptosystems like RSA and Diffie-Hellmann key exchange.
LO3	Break an ElGamal encryption key by a pre-image attack.
LO4	Define elliptic curves, calculate the group of points of an elliptic curve.
LO5	Explain the use of elliptic curves in public key cryptography.
LO6	Encrypt and decrypt using an elliptic curve cryptosystem.

CS424: Object Oriented Programming/Internet Programming (Semester:7 Optional)

Module Details

Title Short:	Object Oriented Programming/Internet Programming APPROVED
Module Code:	CS424
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	GOTZ PFEIFFER
Module Discipline:	MA - Mathematics
Module Description:	This course introduces computer science students to object orient programming techniques and to software architecture used for internet programming.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the term web application
LO2	List and describe the four basic CRUD functions of persistent storage
LO3	Explain the Model-View-Controller software architecture
LO4	Implement parts of a dynamic web site in an object oriented programming language
LO5	Describe the relationship between wep page and its internal representation as document object model
LO6	Use standard types of database connections to implement relationships between models
LO7	Explain the concept of asynchronous requests and their effects;
LO8	Describe the relationship between standard CRUD actions and HTTP methods in a RESTful web application.

CS428: Advanced Operating Systems
(Semester:8 Optional)

Module Details

Title Short:	Advanced Operating Systems APPROVED

Module Code:	CS428

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	EMIL SKOLDBERG

Module Discipline:	MA - Mathematics

Module Description:	This course introduces the basics of parallel computing. Topics covered include parallel computing platforms and networks; parallel algorithm design and parallel programming in both homogeneous and heterogeneous systems.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Reason about different logical and physical organisation of parallel platforms;
LO2	Apply decomposition techniques to parallelise serial algorithms;
LO3	Implement fundamental algorithms in MPI;
LO4	Calculate speedup, and derive Amdahl's law;
LO5	Describe and use parallel algorithms for dense matrix multiplication;
LO6	Describe and use parallel algorithms for sorting;
LO7	Implement matrix algorithms with CUDA.

CS3304: Logic
(Semester:5 Optional)

Module Details

Title Short:	Logic APPROVED
Language of Instruction:	English

Module Code:	CS3304

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	19 programme(s)

Module Owner:	COLLETTE MCLOUGHLIN

Module Discipline:	MA - Mathematics

Module Description:	This module introduces the fundamental concepts of propositional and predicate logic. Topics covered include the precise mathematical formulation of logical statements; the analysis of such statements to establish equivalence and consistency; and an introduction to mathematical techniques to check the validity of arguments in propositional and predicate logic.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Represent mathematical statements in propositional and predicate logic;
LO2	Establish if given compound propositions are equivalent;
LO3	Derive the disjunctive and conjunctive normal forms of a proposition;
LO4	Apply semantic and syntactic techniques to check logical consequence;
LO5	Parse and analyse statements formulated in predicate logic;
LO6	Demonstrate knowledge of mathematical and logical reasoning.

CS4101: Computer Science Project
(Semester:7 Optional)

Module Details

Title Short:	Computer Science Project APPROVED

Module Code:	CS4101

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	NIALL MADDEN

Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics

Module Description:	In this module, the student works on a Computer Science project under the supervision of an academic at the School of Mathematics, Statistics and Applied Mathematics. The student is required to produce a mid-term project report, a final project report, and to deliver an oral presentation on the project to members of the School.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	conduct a literature search on a topic in Computer Science
LO2	work under supervision and individually on a computational subject;
LO3	organise their results into a written document;
LO4	develop running computer program(s) demonstrating key algorithms and/or concepts investigated;
LO5	summarise their report into a visual presentation;
LO6	deliver a clear presentation of their results;
LO7	answer questions about their report.

CS4423: Networks
(Semester:8 Optional)

Module Details

Title Short:	Networks APPROVED
Module Code:	CS4423
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	13 programme(s)
Module Owner:	COLLETTE MCLOUGHLIN
Module Discipline:	MA - Mathematics
Module Description:	An Introduction to Network Science.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe a network in graph theoretic terms;
LO2	Apply graph traversal techniques to networks with additional attributes;
LO3	Provide a formal definition of a game;
LO4	Identify equilibrium strategies in a given game;
LO5	Reason about specific markets when represented as networks;
LO6	Reason about document networks such as the web.

CT336: Graphics And Image Processing
(Semester:7 Optional)

Module Details

Title Short:	Graphics And Image Processing APPROVED
Language of Instruction:	English

Module Code:	CT336

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	17 programme(s)

Module Owner:	SAM REDFERN

Module Discipline:	CT - Information Technology

Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss the evolution of computer graphics software and hardware systems.
LO2	Specify complex 3D models using 3D coordinate systems, translations and transformations.
LO3	Explain the trade-offs inherent in real-time graphics rendering, and be able to evauluate the techniques that are used to simultaneously maximise both rendering performance and graphical realism.
LO4	Discuss the appropriateness of the various standard digital image processing techniques to different problems.
LO5	Develop customised digital image processing solutions for novel applications; justify the use of the specific image processing techniques chosen within these solutions.

CT414: Distributed Systems & Co Operative Computing (Semester:8 Optional)

Module Details

Title Short:	Distributed Systems & Co Operative Computing APPROVED
Language of Instruction:	English

Module Code:	CT414

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	9 programme(s)

Module Owner:	DESMOND CHAMBERS

Module Discipline:	CT - Information Technology

Module Description:	This module builds on existing knowledge and aims to equip the student with an appreciation of Distributed Systems both from high-level and from low-level perspectives. The complexity and ubiquity of distributed systems is explored and a foundation is laid for independent exploration and assessment of the area.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe in detail the concepts and technology behind distributed systems
LO2	Analyse the available technologies and choose appropriate solutions for specific situations
LO3	Analyse and design distributed systems using a range of current technologies
LO4	Demonstrate knowledge and understanding of distributed systems technologies, standards and trends
LO5	Describe technologies and services that support cloud computing
LO6	Demonstrate knowledge and understanding of web services standards
LO7	Assess security in a distributed context

CT422: Modern Information Management (Semester:7 Optional)

Module Details

Title Short:	Modern Information Management APPROVED
Language of Instruction:	English

Module Code:	CT422

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	12 programme(s)

Module Owner:	COLM O'RIORDAN

Module Discipline:	CT - Information Technology

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	The course introduces some of the main theories and techniques in the domain of information retrieval.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the main models used information retrieval.
LO2	Explain the factors involved in designing and analysing weighting schemes
LO3	Be able to chose suitable data structures and algorithms for builing IR systems
LO4	Be able to explain the main ideas and approaches used web search, collaborative filtering, multimedia IR

CT475: Machine Learning & Data Mining
(Semester:7 Optional)

Module Details

Title Short:	Machine Learning & Data Mining APPROVED
Language of Instruction:	English

Module Code:	CT475

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	16 programme(s)

Module Owner:	MICHAEL MADDEN

Module Discipline:	CT - Information Technology

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	Definitions of Machine Learning, Data Mining and the relationship between them; the CRISP Data Mining process model; major tasks including classification, regression, clustering, association learning, feature selection, and reinforcement learning; algorithms for these tasks that may include decision tree learning, instance-based learning, probabilistic learning, support vector machines, linear and logistic regression, and Q-learning; open-source software tools for data mining; practical applications such as sensor data analysis, healthcare data analysis, and text mining to identify spam email; ethical issues and emerging trends in data mining and machine learning.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define Machine Learning and Data Mining and discuss their relationship
LO2	Explain what major categories of Machine Learning tasks entail
LO3	Demonstrate how to apply the Data Mining process to practical problems
LO4	Explain and apply algorithms for decision tree learning, instance-based learning, linear and logistic regression, probabilistic learning, support vector machines, and reinforcement learning
LO5	Given a dataset and data mining task to be addressed, select, apply and evaluate appropriate algorithms, and interpret the results
LO6	Discuss ethical issues and emerging trends in data mining and machine learning.

CT511: Databases
(Semester:5 Optional)

Module Details

Title Short:	Databases APPROVED
Language of Instruction:	English

Module Code:	CT511

ECTS Credits:	5

NFQ Level:	9	**EQF Level:**	7	**EHEA Level:**	Second Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1
Module Delivered in	23 programme(s)
Module Owner:	AIDEEN O'DOHERTY
Module Discipline:	CT - Information Technology
Module Level:	Continuous Calculator (M.Sc.) (PG Dip)
Module Data:	1 - 4 NON LAB
Module Description:	This module will provide the student with the information and technical know-how to establish, manage and optimally use databases. This will be essential information for those interested in Clinical Research administration.

Learning Outcomes
No learning outcomes provided

CT865: Human Computer Interaction (Semester:7 Optional)

Module Details

Title Short:	Human Computer Interaction APPROVED
Module Code:	CT865
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	4 programme(s)
Module Owner:	KAREN YOUNG
Module Discipline:	CT - Information Technology
Module Description:	Postgraduate Introduction to HCI

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Elaborate the importance of design in professional and social contexts and the critical role of users in the systems design process
LO2	Distinguish between human cognition and emotion and assess their role in effective interaction system design
LO3	Identify the roles of human agents and those of digital agents in any interaction
LO4	Develop the knowledge and skills necessary to analyse, design and evaluate good quality interactive systems
LO5	Competently differentiate between various Interaction Design processes or approaches
LO6	Analyse technological developments and innovations in social, educational and leisure computing and their implications for user experience and interaction design

CT2101: Object Oriented Programming I (Semester:3 Group not available to select online)

Module Details

Title Short:	Object Oriented Programming I APPROVED
Language of Instruction:	English

Module Code:	CT2101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	14 programme(s)

Module Owner:	SÉAMUS HILL

Module Discipline:	CT - Information Technology

Module Level:	Honours

Module Description:	Introduction to Object Oriented Programming using the Java programming language.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understanding of the basic principles of the object oriented development process and apply this understanding to the analysis and design of solutions for small scale problems.

CT2102: Object Oriented Programming II (Semester:4 Group not available to select online)

Module Details

Title Short:	Object Oriented Programming II APPROVED
Language of Instruction:	English

Module Code:	CT2102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	13 programme(s)

Module Owner:	SÉAMUS HILL

Module Discipline:	CT - Information Technology

Module Level:	Honours

Module Description:	Understanding of the more advanced principles of the object oriented development process and apply this understanding to the analysis and design of solutions for small scale problems.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Competence in the use of the Java programming language in the development of small sized application programs that demonstrate professionally acceptable coding and performance standards.

CT2108: Networks and Data Communications 1 (Semester:6 Optional)

Module Details

Title Short:	Networks and Data Communications 1 APPROVED
Language of Instruction:	English

Module Code:	CT2108

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	DESMOND CHAMBERS

Module Discipline:	CT - Information Technology

Module Description:	This module provides students with theoretical and practical knowledge in the area of computer networks and data communications. It provides the student with a good introduction to communication networks including design principles, existing technologies and future technologies.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the layered network architecture design and implementation
LO2	Understand the theoretical aspects behind data transmission and communication
LO3	Understand bandwidth limitations in relation to Modulation Complexity and Signal to Noise Ratio
LO4	Understand existing networking technologies and protocols
LO5	Analyze, design and implement communication protocols at various network layers

CT3535: Object Oriented Programming III (Semester:5 Optional)

Module Details

Title Short:	Object Oriented Programming III APPROVED
Language of Instruction:	English

Module Code:	CT3535

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	SÉAMUS HILL

Module Discipline:	CT - Information Technology

Module Level:	Honours

Module Description:	Develop and design computer programmes using the more advanced features of Object Oriented Programming.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate a knowledge of basic algorithms and data structures, in particular the application of recursive algorithms, simple searching and sorting algorithms.
LO2	Develop code that involves File I/O and Serialisation
LO3	Develop code to implement simple Network applications
LO4	Incorporate Multithreading in your applications

EC135: Principles of Microeconomics (Semester:1 Core)

Module Details

Title Short:	Principles of Microeconomics APPROVED
Language of Instruction:	English

Module Code:	EC135

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	20 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Description:	The objective of this module is to introduce the basic concepts and principles of microeconomic theory. This is followed by applications of the theory, using real world examples and case studies.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the discipline as a social science and its scientific method of inquiry
LO2	Recognise, appreciate and use the core principles of economics
LO3	Develop an understanding of markets and the market economy
LO4	Demonstrate the application of key concepts in microeconomics
LO5	Explain and analyse various microeconomic issues and problems
LO6	Develop an understanding of and an appreciation for formal models & techniques/tools used

EC136: Principles of Macroeconomics (Semester:2 Core)

Module Details

Title Short:	Principles of Macroeconomics APPROVED
Language of Instruction:	English

Module Code:	EC136

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	20 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Description:	The objective of this module is to introduce students to the principles of macroeconomics. Topics include: Introduction, Unemployment, Inflation, Business Cycles, Trade and Environment.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Identify the key theoretical ideas underpinning macroeconomic analysis
LO2	Relate these theoretical concepts to macroeconomic variables
LO3	Derive the central results of a range of macroeconomic models
LO4	Apply macro models to a variety of contemporary policy issues
LO5	Identify and explore key areas of controversy in macroeconomics

EC247: Introduction to Financial Economics (Semester:4 Core)

Module Details

Title Short:	Introduction to Financial Economics APPROVED
Language of Instruction:	English

Module Code:	EC247

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	27 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Description:	This is quite a practical module for those interested in doing further modules in financial economics and those interested in other disciplines (notably accounting) who wish to develop a useful transferable skill, namely the most important professional tool in financial services (Excel). You will find that the computations will not only enable you to get answers to important financial economics problems, but will deepen your understanding of the concepts involved. Topics covered include: Introduction to Financial Markets and Excel Functions; Key Concepts: time Value of Money & NPV; Risk & Portfolio Statistics; Valuing Shares and Bonds; Introduction to Financial Options.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the key principles of financial economics
LO2	Use a spreadsheet to solve problems in financial economics
LO3	Access and use financial data to real-world issues
LO4	Apply basic statistical techniques to financial economics
LO5	Describe the properties of the key financial assets
LO6	Build your own spreadsheet models for future courses in finance

EC268: Intermediate Macroeconomics (Semester:4 Core)

Module Details

Title Short:	Intermediate Macroeconomics APPROVED
Language of Instruction:	English

Module Code:	EC268

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	17 programme(s)

Module Owner:	PÁDRAIC DE BÚRCA

Module Discipline:	EC - Economics

Module Description:	This is an intermediate level course, both in drawing on your previous exposure to macroeconomics, and acting as prelude to further study in third year. An overall theme is that macroeconomic theory is useful in helping us to understand real-world events, and in particular, to understand the role of macroeconomic policy. Several economic models will be studied, within a framework which analyses both long-run economic performance and short-run fluctuations. The models will be used to help explain various economic policy issues, both domestically (Ireland) and in an international (EU/eurozone) setting.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Recognise the linkages between the behaviour of key economic variables (output, inflation, unemployment) over the long-run
LO2	Analyse the economic relationships between countries, and how exchange rates affect trade
LO3	Analyse how incomes tend to grow over the long-run
LO4	Use economic models to explain how and why economies experience short-run fluctuations away from long-run trends
LO5	Show how policymakers can respond to short-run fluctuations in the economy
LO6	Develop an understanding of different macro schools of thought
LO7	Work (source, gather, interpret, use) with macro data
LO8	Comprehend the macroeconomy (and macro policy) of Ireland and the Eurozone

EC269: Intermediate Microeconomics (Semester:3 Core)

Module Details

Title Short:	Intermediate Microeconomics APPROVED
Language of Instruction:	English

Module Code:	EC269

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	18 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Description:	This course is primarily focused on neo-classical choice theory, where the decision-making agents are consumers and firms. This approach assumes that all social outcomes are the result of rational self-regarding individual actions. The implication of this perspective for government policy is also addressed. We will also look at a competing paradigm, loosely defined as Critical Institutionalist/Evolutionary. Institutional theories assume that human motivation may be less narrowly egoistic (and materialistic), that preferences evolve, that social norms influence behaviour and that in the face of uncertainty, rationality can mean many types of conduct. The reason for introducing another paradigm is precisely because we question the notion that there is one correct way to interpret economic and social phenomena. This is important given that economics is a policy oriented discipline. It is also of normative consequence since government policies that facilitate or restrain markets, as well as policies regarding property rights determine individual and collective welfare. Evaluation in this normative sense requires students to address the issues of individual and societal welfare.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	understand the scope and limitations of, primarily, the neo-classical approach to explaining economic phenomena (since it is the dominant school of thought to which most time will be devoted) but also the alternative paradigm presented.
LO2	facilitate students to think critically about economics and the popular presentation of economic facts and economic policies.

EC369: Money And Banking (Semester:5 Core)

Module Details

Title Short:	Money And Banking APPROVED
Language of Instruction:	English

Module Code:	EC369

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	38 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Description:	This course explores the theoretical and applied foundations of money and banking with a focus on international issues. The introductory part of the course motivates why the study of money and banking may be worthwhile, and provides an overview of international financial systems. Next, details of financial markets are discussed, in particular the behavior of interest rates and their determinants, as well as the classical theory of rational expectations and the efficient markets hypothesis as they pertain to stock markets. The third section of the course focuses on aspects of financial crises, financial institutions, and the theory and practice of central banking. This includes the study of the stages of financial crises, alternative international central banking systems, as well as the strategy and conduct of central bank intervention. The final fourth part of the course discusses international finance and monetary policy theory including the foreign exchange market, aggregate demand and supply analysis, the theory of monetary policy, and the role of expectations and credibility with respect to central banks.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the theoretical and applied foundations of money and banking with a focus on international issues.
LO2	Discuss issues in relation to financial markets, behaviour of interest rates and their determinants, the classical theory of rational expectations and the efficient markets hypothesis as they pertain to stock markets
LO3	Understand and discuss aspects of financial crises, final institutions, the theory and practice of central banking.
LO4	Understand the stages of financial crises, alternative international central banking systems, strategy and conduct of central bank intervention.
LO5	Discuss international finance and monetary policy, foreign exchange market, aggregate demand and supply analysis, monetary policy, expectations and credibility with respect to central banks.

EC410: Economics Of Financial Markets Seminar I (Semester:8 Core)

Module Details

Title Short:	Economics Of Financial Markets Seminar I APPROVED
Language of Instruction:	English

Module Code:	EC410

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	IMELDA HOWLEY

Module Discipline:	EC - Economics

Module Description:	This course is an introduction to modern derivatives and risk management. We begin by exploring the basic features of futures, swaps and options with an emphasis on economic intuition and understanding, although important quantitative techniques are developed. We use the insights developed in these topics to examine some well-known examples of derivatives mishaps and recent applications of derivatives, including credit derivatives and weather derivatives.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Evaluate the concepts and market mechanics of different types of financial derivatives
LO2	Explain how financial derivatives are valued using no-arbitrage pricing and risk-neutral valuation
LO3	Implement risk management strategies using derivatives
LO4	Apply trading and hedging strategies using futures and options.
LO5	Use Excel spreadsheets for options trading strategies and pricing

EC411: Economics Of Financial Markets Seminar II (Semester:7 Core)

Module Details

Title Short:	Economics Of Financial Markets Seminar II APPROVED
Language of Instruction:	English

Module Code:	EC411

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	IMELDA HOWLEY

Module Discipline:	EC - Economics

Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	The objective of this course is to analyze the economic theoretic underpinnings of the modern finance theory
LO2	The course will equip students in both theoretical understanding and applied policy analysis of some of the models of modern finance theory using historical and current financial data.

EC420: International Monetary Economics (Semester:8 Core)

Module Details

Title Short:	International Monetary Economics APPROVED
Language of Instruction:	English

Module Code:	EC420

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Level:	Honours

Module Description:	The aim of this course is to increase students' understanding of how the international financial system operates, which an emphasis on the role of banks and central banks in the financial system. A key focus of the course will be the response of central bank to the financial crisis and the effect of these policies on asset markets. We will also consider recent moves to build a banking union in Europe.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	to increase their understanding of what banks do and how they work.
LO2	to increase their familiarity with causes of banking crises and policy responses.
LO3	understand the role of money and central banks in the financial system.
LO4	Understand the role of central banks and control of interest rates
LO5	to increase their understanding of a Gold standard as a monetary system

EC1108: Skills for Economics I (Semester:1 Core)

Module Details

Title Short:	Skills for Economics I APPROVED
Language of Instruction:	English

Module Code:	EC1108

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	16 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Level:	Honours

Module Description:	This module introduces students to a range of core applied skills in economics, principally focused on the accessing, management, analysis, and visualisation of economic data (including online data) and on document preparation, report writing, citation of sources, and presentation skills for economics.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Access online economic data from a range of sources
LO2	Manage economic data in a structured way
LO3	Create meaningful charts and tables to present a range of economic data
LO4	Integrate data, text, and graphical elements in report formats.

EC3101: Microeconomics and Public Policy (Semester:5 Core)

Module Details

Title Short:	Microeconomics and Public Policy APPROVED
Language of Instruction:	English

Module Code:	EC3101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	30 programme(s)

Module Owner:	IMELDA HOWLEY

Module Discipline:	EC - Economics

Module Level:	Honours

Module Description:	The module provides students with an introduction to topics in advanced microeconomic theory, with applications to public policy where relevant. Topics covered include game theory, oligopoly and regulation, collective decision making and criteria for social choice, general equilibrium and the welfare theorems, uncertainty and information, contracting and externalities. We will consider the appropriate economic role for the State that emerges from an analysis of these topics.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Apply game theory to situations of strategic interaction
LO2	Understand the general equilibrium model of a pure exchange economy and apply the first and second welfare theorems.
LO3	Use social choice theory to analyse different voting rules.
LO4	Understand the problems asymmetric information can cause in markets, and explain how these problems can be overcome.
LO5	Apply economic theory to consider when government intervention in the economy is appropriate.

EC3102: Macroeconomics and Public Policy (Semester:6 Core)

Module Details

Title Short:	Macroeconomics and Public Policy APPROVED
Language of Instruction:	English

Module Code:	EC3102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	30 programme(s)

Module Owner:	CLAIRE NOONE-KELLY

Module Discipline:	EC - Economics

Module Level:	Honours

Module Description:	Macroeconomics is concerned with the major economic issues such as unemployment, inflation, and the interrelation between income distribution and economic growth. Several theoretical models have been developed in the literature to study the fundamental causes of these issues. Many of these models serve as analytical frameworks in which applied economic policy analysis is conducted. Examples include the Keynesian structural macroeconometric models in the 1970s and the New Keynesian DSGE models in the current period. This module considers dominant economic policy regimes since the post-world war II period and examines the macroeconomic theoretic principles and the analytical framework that underpins these policy regimes.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate the ability to locate the macroeconomic theoretic basis of economic policy regimes
LO2	Critically engage with theoretical models and their policy prescriptions.
LO3	Analyse economic problems in the broader historical context

EOS213: Introduction to Ocean Science (Semester:3 Group not available to select online)

Module Details

Title Short:	Introduction to Ocean Science APPROVED
Language of Instruction:	English
Module Code:	EOS213
ECTS Credits:	10
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	5 programme(s)
Module Owner:	RACHEL CAVE
Module Discipline:	EOS - Earth & Ocean Sciences
Acknowledgment:	Compulsory for 2EH, 2MR. Open to 2BS if taking another 10 ECTS of EOS modules. Max of 120 students.
Module Level:	Common
Module Description:	An introduction to ocean properties and processes

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the processes that exchange energy and water within the Earth system
LO2	Describe the main sources, sinks and pathways of material (sediment, nutrients, gases, trace elements) in the oceans
LO3	Explain how the temperature, salinity and density structure in the ocean arises and be able to distinguish different water masses on a temperature-salinity diagram
LO4	Explain how waves and tides are generated in the oceans and how these in turn generate currents
LO5	Recognise the difference between Eulerian and Lagrangian co-ordinate systems and measurement techniques and be able to represent them graphically
LO6	Describe the process of hydrothermal circulation of seawater through the seabed and resulting transformations in the chemistry of seawater
LO7	Describe the biogeochemical cycling of oxygen, carbon dioxide and nutrients in the oceans
LO8	Discuss the formation and global distribution of biogenic sediments on the seafloor
LO9	Carry out simple calculations of volume transport and fluxes of material to and within the oceans
LO10	Grasp the breadth of instrumentation used in oceanography and understand how a subset of these work and how they are used in oceanographic research

EOS222: Ancient Earth Environments (Semester:4 Group not available to select online)

Module Details

Title Short:	Ancient Earth Environments APPROVED
Language of Instruction:	English

Module Code:	EOS222

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	SHANE TYRRELL

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 2EH1; 2BS1, 2MR1, 2EV1, 1SWB1 Core for: 2EH1 Optional for: 2BS1, 2MR1, 2EV1, 1SWB1 Pre-requisites: EOS104 Co-requisites: EOS225 Timing and scheduling: 2 lectures per week for 12 weeks in SEM2 Number Limits (resource based): 90

Module Description:	This course will investigate the generation and behaviour of sediment on the earth's surface and how sedimentary rocks record information about changing environment over geological timescales. Students will learn about processes such as weathering, erosion and sediment transport and how to differentiate and classify sedimentary rocks. Different sedimentary environments, and associated sedimentary structures, will be investigated with reference to the geological history of Ireland.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the principles of stratigraphy
LO2	Discriminate and classify sedimentary rock types on the basis of grain size, texture and composition
LO3	Compare the transport of sand grains by wind and water
LO4	Describe how simple sedimentary structures form
LO5	Contrast shallow and deep marine sedimentation
LO6	Describe terrestrial depositional enviroments
LO7	Identify the key framework components in clastic sedimentary rocks
LO8	Discuss Irish geological history in terms of environmental change

EOS225: Optical Microscopy of Minerals and Rocks (Semester:4 Group not available to select online)

Module Details

Title Short:	Optical Microscopy of Minerals and Rocks APPROVED
Language of Instruction:	English

Module Code:	EOS225

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	SADHBH BAXTER

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 2EH1; 2BS1, 2MR1, 2EV1 Core for: 2EH1 Optional for: 2BS1, 2MR1, 2EV1 Pre-requisites: EOS104 Co-requisites: EOS222. Timing and scheduling: 1 x 1 hour lecture per week for 12 weeks in SEM2 accompanied by 12 x 2 hour lab per week for 12 weeks in SEM2. Number Limits (resource based): 70

Module Data:	1 - 4 NON LAB

Module Description:	This module explains how minerals and rocks can be identified using the transmitted polarising light microscope. The optical classification of crystals is used to explore the optical properties that aid in the identification of the rock forming minerals in thin section e.g. refractive index, relief, pleochroism, interference colours and extinction. This is followed by introductory petrographic studies of typical mineral assemblages and textures in igneous, metamorphic and sedimentary rocks. The petrographic studies utilise both in-house sessions with microscopes and rock thin sections, and the Virtual Microscope online learning environment. Students carry out the work on the Virtual Microscope outside of a timetabled class.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate competency with the petrologic microscope
LO2	Recognise, record, and identify the optical properties of minerals: relief, pleochroism, interference colours and extinction
LO3	Recognise, record, identify, and interpret typical textures in thin sections of igneous, metamorphic and sedimentary rocks
LO4	Deliver a cogent thin section description of common igneous, metamorphic and sedimentary rocks.
LO5	Describe how polarised light interacts with the crystal structure of rock forming minerals
LO6	Tabulate the optical properties of the main rock forming minerals
LO7	Map the minerals observed in thin section to those observed in equivalent hand samples.

EOS303: Ocean Dynamics
(Semester:6 Optional)

Module Details

Title Short:	Ocean Dynamics APPROVED
Language of Instruction:	English

Module Code:	EOS303

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	MARTIN WHITE

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 3EH2, 3MR3, 3BS9 Core for: 3MR Optional: 3EH, 3MR, 3BS Co req: Pre requisites: EOS229, EOS230 Timing: 6 week module, Sem 2, weeks 1-6 Limit: 70 (resource capacity)

Module Description:	This module introduces the basics of dynamical oceanography and the study of forces that control ocean processes and the resulting interaction with large scale bio-geochemical cycling. Students will learn how to assess what forces and interactions are important for a particular scenario relating to an ocean feature/process

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain how the forces that drive ocean circulation arise and interact.
LO2	Compare the importance of each force for a particular situation under consideration
LO3	Describe the processes underlying the wind and density driven circulation
LO4	Recognise the major differences between coastal and deep ocean dynamics
LO5	Describe the relationship between the ocean dynamics and biogeochemical processes
LO6	Interpret data collected from a case studies and explain results found

EOS304: Aquatic Geochemistry (Semester:6 Optional)

Module Details

Title Short:	Aquatic Geochemistry APPROVED
Language of Instruction:	English

Module Code:	EOS304

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	8 programme(s)

Module Owner:	PETER CROOT

Module Discipline:	EOS - Earth & Ocean Sciences

Module Description:	This course introduces students to the quantitative treatment of chemical processes in aquatic systems. It includes a brief review of chemical thermodynamics and photochemistry as it applies to natural waters. Specific topics covered include acid-base chemistry, precipitation-dissolution, coordination, and redox reactions. Emphasis is on equilibrium calculations as a tool for understanding the variables that govern the chemical composition of aquatic systems and the fate of pollutants.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	construct and balance chemical equations for reactions in aquatic systems
LO2	use thermodynamic data to calculate the solubility of minerals and construct stability diagrams
LO3	use geochemical analyses of rocks and waters to determine and quantify weathering reactions
LO4	describe the most important factors that control weathering rates
LO5	know the main chemical elements and compounds of river water and sea water and explain why
LO6	know the main chemical elements and compounds of river water and sea water and explain why
LO7	describe the behaviour of light in aquatic systems

EOS305: Introduction to Applied Field Hydrology (Semester:5 Optional)

Module Details

Title Short:	Introduction to Applied Field Hydrology APPROVED
Language of Instruction:	English

Module Code:	EOS305

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	TIERNAN HENRY

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 3EH2, 3BS9, 3EV2, SWB, 1OS1, 1OA1 Core for: 3EH2 Optional for: 3BS9, 3EV2, SWB, 1OS1, 1OA1 Timing: Six week module, Semester 1, Weeks 1-6

Module Description:	Hydrology is the term that broadly describes the study of water on, in and above the Earth's surface. This introductory course is designed to introduce the students to the theories and concepts underpinning the discipline and to allow them to learn how to measure, estimate and calculate river and groundwater flows in the field and in the lab.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Have an appreciation of the nature of the relationships that exist between water the land
LO2	Prepare and produce water balances at local and regional scales
LO3	Use the tools acquired in the class to break down complex water management issues into negotiable sub-units
LO4	Compare and differentiate between methods for measuring, estimating and calculating hydrological data sets
LO5	Assess past hydrological events and future (predicted) events and contextualise these in terms of the frequency with which they are likely to occur, and the risks associated with their occurence
LO6	Incorporate field data, published data and interpreted data to make reasonable inferences about water and the land
LO7	Frame research questions about water resource management and water resource allocation

EOS323: Sediments and the Sedimentary Record (Semester:5 Optional)

Module Details

Title Short:	Sediments and the Sedimentary Record APPROVED
Language of Instruction:	English

Module Code:	EOS323

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	SHANE TYRRELL

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 3EH2, 3BS9, 3MR3, 1SWB1 Core for: n/a Optional for: 3EH2, 3BS9, 3MR3, 1SWB1 Pre-requisites: EOS222 Co-requisites: EOS324 Timing and scheduling: 3 lectures and 1 2 hour practical per week, weeks 1-6, SEM1 Number Limits (resource based): 70

Module Description:	This course will take a detailed look at the characteristics of clastic, chemical, biogenic and volcaniclastic sediments and sedimentary rocks. Students will investigate how the sediments and rocks originate, learn about the range of depositional environments in which they accumulate and/or form, and examine their potential importance as an economic resource.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Interpret a broad range of sedimentary structures in rocks
LO2	Construct sedimentary logs
LO3	Measure, analyse and interpret palaeocurrent data
LO4	Describe the principles behind basic fluid mechanics
LO5	Assess the petrography of a range of sedimentary rock types
LO6	Interpret simple geochemical analyses of sedimentary rocks
LO7	Describe the processes that sediment undergoes during lithification (diagenesis)
LO8	Reconstruct ancient depositional environments from observations made in the field

EOS402: Global Change
(Semester:7 Optional)

Module Details

Title Short:	Global Change APPROVED

Module Code:	EOS402

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	PETER CROOT

Module Discipline:	EOS - Earth & Ocean Sciences

Module Description:	This course introduces students to multi-disciplinary studies of the physical forcings and earth/ocean system responses that induce and drive environmental change on different temporal and spatial scales. Emphasis here is placed on understanding and communicating the basic science behind both natural climate cycling (e.g. Milankovitch/ENSO) and more recent anthropogenic forcings (e.g. fossil fuel burning and agricultural practices).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Critically discuss the basic science behind the natural processes that impact global climate
LO2	Recognize and interprete geological and chemical indicators of present and past global change in the environment (atmosphere, water, sediment/mineral).
LO3	Evaluate and appraise how human activities can be drivers of global change
LO4	Explain the role of the IPCC and how it works
LO5	Develop knowledge of current climate change adaptation strategies
LO6	Compile scientific information from multiple sources and prepare a briefing document for a general audience.
LO7	Present scientific perspectives on global change to both a specific scientific audience and to the general public

EOS403: Final Year Project (Semester:7 Optional)

Module Details

Title Short:	Final Year Project APPROVED
Language of Instruction:	English

Module Code:	EOS403

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	JOHN MURRAY

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 4EH2, 4BS9. Core for 4EH2 and ?4BS9 (undenominated students specialising in EOS). Pre-requisites: EOS300 (Fieldtrip module). Timing: Student project data collection happens in the summer months between third and fourth year of study. Weekly 3-hour practical/tutorials are organised in Semester 1 of 4th year to assist with project presentation and write-up. Project reports are submitted before the Christmas break, at the very end of Semester 1. Number Limits (resource based): 50.

Module Description:	This module will provide students with the advanced field and computational skills that are required for Earth and Ocean Sciences graduates seeking employment in either research or industry. The underlying core philosophy is to have students (1) Collect a wide variety original data in the field, in a range of environments. (2) Process & analyse this data (i.e. to solve problems) and (3) Produce an original (dissertation) report. In addition, students are required to carefully plan and organise the logistical side of their project (i.e. engage in project management) and to produce deliverables (presentations, drafts and a final report) according to deadline.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Collect and record scientific data (both qualitative and quantitative) in the field.
LO2	Prepare and plan the logistical side of a period of fieldwork, including identifying potential health and safety issues.
LO3	Present and explain the findings of their research to an audience.
LO4	Compile and synthesize the data collected in the field, into a written report.
LO5	Discuss and assess previously published work relevant to their project topic.
LO6	Produce a report, poster and oral presentation according to set guidelines and deadlines.
LO7	Appraise and critique the data produced during the course of the project.

EOS407: History of Life
(Semester:8 Optional)

Module Details

Title Short:	History of Life APPROVED
Language of Instruction:	English

Module Code:	EOS407

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	JOHN MURRAY

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 4EH2; 4BS9, 4MR1, 4EV1, 1SWB1 Optional for: 4EH2; 4BS9, 4MR1, 4EV1, 1SWB. Pre-requisites: EOS3103 [Palaeontology & Evolution]. Co-requisites: None Timing: six week module (4 lectures and one practical per week), running in weeks 1-6, Semester 2. Number Limits (resource based): 30

Module Description:	This course will explore, in detail, the major events in the story of the evolution of life on earth, as relayed to us through the fossil record. Topics to be covered will include the origin of life, appearance of eukaryotes and development of metazoans (multicellular organisms) in the Precambrian; the Cambrian Explosion and Ordovician Biodiversification Events; the conquest of land (terrestrialisation); mass extinctions and the rise of mammals in the Palaeogene and Neogene. The ethos of this course will be quite holistic in approach (i.e. using a wide range of geological, palaeontological as well as biological data sources); however, the narrative will be from a palaeontological perspective.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss and appraise the various theories relating to the origin of life on earth.
LO2	Recount (in chronological order) and describe the significant events in the history of life.
LO3	Discuss and appraise the effects the earth has had on influencing the evolution of the biosphere (and vice versa).
LO4	Critically assess the currently accepted hypotheses and models, which attempt to explain the significant events in the evolutionary history of life.
LO5	Compile scientific information, from a number of sources, and use this to prepare a script and storyboard for a documentary film.
LO6	Employ the script and storyboard developed in LO5 to produce a short documentary-style film, which will communicate or explain an evolutionary idea or concept to a wider audience.

EOS409: Biophysical Interactions in the Ocean (Semester:8 Optional)

Module Details

Title Short:	Biophysical Interactions in the Ocean APPROVED
Language of Instruction:	English

Module Code:	EOS409

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	MARTIN WHITE

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 4EH2, 4MR2, 4BS9 Optional for: 4EH, 4MR, 4BS Pre-requisites:EOS303 Timing: 6week module , Sem 2, weeks 7-12

Module Description:	This module looks at ocean dynamics and processes and the resulting interaction with large scale bio-geochemical cycling. The coupling between physical processes and the biosphere (habitats, sediment dynamics) is highlighted. The course is centred around critical review of publications on relevant topics.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Examine the relationships between physical and biogeochemical processes that cycle Carbon through the ocean
LO2	Differentiate various bio-physical interaction processes for certain case studies
LO3	Research results for a particular case study from peer reviewed literature
LO4	To critically review peer reviewed publications, and to write concise summaries and abstracts of scientific papers

EOS418: Applied Field Hydrogeology (Semester:7 Optional)

Module Details

Title Short:	Applied Field Hydrogeology APPROVED
Language of Instruction:	English

Module Code:	EOS418

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	TIERNAN HENRY

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 4EH2, 4BS9, 4EV2, 1OS1, 1OA1, SWB Core: N/A Optional: 4EH2, 4BS9, 4EV2, 1OS1, 1OA1, SWB Pre-requisites: EOS305 Timing: Six week module, Semester Two, weeks 7-12

Module Description:	Groundwater is one of our key water resources, yet it also one that is stressed by natural processes and human activities. Managing groundwater is a mix of science, regulation and politics. This course focuses on understanding groundwater in its geological setting and explores the ways in which groundwater affects and is affected by the medium in and through which it flows.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Analyse and explain pumping test data outputs
LO2	Interpret qualitative and quantitative groundwater data outputs in the context of geology and hydrogeology
LO3	Assess and examine groundwater chemistry data sets to generate hydrochemical facies
LO4	Contrast and distinguish between conflicting genetic models of mineral deposition
LO5	Critically examine hydraulic fracturing as a means of resource extraction in a groundwater context
LO6	Frame research questions about groundwater resource management and allocation
LO7	Undertake critical evaluation and review of reports and research papers

EOS422: Sedimentary Basins

(Semester:7 Optional)

Module Details

Title Short:	Sedimentary Basins APPROVED
Language of Instruction:	English

Module Code:	EOS422

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	SHANE TYRRELL

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 4EH, 4BS, 1SWB1 Pre-requisites: EOS323 Instances: 4EH2, 4BS2 Core for: n/a Optional for: 4EH2, 4BS2 Pre-requisites: EOS323 Co-requisites: n/a Timing and scheduling: 4 lectures per week, weeks 7-12, SEM1 Number Limits (resource based): 40

Module Description:	Sedimentary basins comprise a long time-scale record of environmental change on the earth's surface and are also hugely economically important. Almost all commercial hydrocarbons are contained within sedimentary basins – they also comprise groundwater aquifers and potential sites for sequestered carbon dioxide. This module will investigate the origin, evolution and architecture of sedimentary basins, and examine in detail the variety of techniques which are used in basin analysis.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the origin and evolution of sedimentary basins
LO2	Outline the fundamental elements of basin analysis
LO3	Investigate the factors that control sediment dispersal into basins
LO4	Assess hydrocarbon prospectivity in sedimentary basins offshore Ireland
LO5	Plan independent research on a topic related to sedimentary basins
LO6	Communicate the results of individual research to an audience of peers
LO7	Describe the geophysical techniques used to characterise sedimentary basins in the subsurface
LO8	Describe the elements of petroleum plays and the petroleum system concept

EOS2101: Introduction to Fieldskills (Semester:4 Core)

Module Details

Title Short:	Introduction to Fieldskills APPROVED
Language of Instruction:	English

Module Code:	EOS2101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	SHANE TYRRELL

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: Core for 2EH Pre-requisites: EOS104 Co-requisites: EOS222, EOS225, EOS229, EOS230 1 one hour lecture slot per week for weeks 7-12 Semester 2. 5 day field trip at end of semester 2 Instances: 2EH1 Core for: 2EH1 Optional for: n/a Pre-requisites: EOS104 Co-requisites: EOS222, EOS225, EOS229, EOS230 Timing and scheduling: 1 one hour lecture per week for weeks 7-12 Semester 2. 5 day field trip at end of semester 2 Number Limits (resource based): 45

Module Description:	This is a field-based course, and will dominantly be taught during a five day residential field trip to Northern Ireland. Its aim to to introduce students to basic concepts in the earth sciences, e.g. field relationships, stratigraphy, records of environmental change and volcanic activity. It also aims to teach the basics skills required to collect and interpret data in the field, e.g. navigation and geological mapping. It is available to denominated Earth and Ocean Sciences students only.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Recognise a range of volcanic rocks in the field
LO2	Identify and explain the origin of sedimentary structures
LO3	Record the spatial distribution of rocks and produce a geological map
LO4	Measure the orientation of dipping layers
LO5	Navigate ordinance survey maps
LO6	Interpret ancient depositional environments from the sedimentary record
LO7	Recognise and interpret different field relationships and contacts
LO8	Relate observations made in the field to Irish geological history

EOS3101: Geological Structures and Maps (Semester:5 Optional)

Module Details

Title Short:	Geological Structures and Maps APPROVED
Language of Instruction:	English

Module Code:	EOS3101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	DAVID MCNAMARA

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 3EH2, 3BS9. Core for: 3EH2 Optional for: 3BS9. Pre-requisites: N/A Co-requisites: EOS3104. Timing and scheduling: 1 hour lecture per week (weeks 1-12) for 12 weeks in SEM1 accompanied by 12 x 3 hour lab per week (weeks 1-12) for 12 weeks in SEM1. Number Limits (resource based): 70

Module Description:	Structrual geology, the study of deformation in our planet's crust, is a core subject in the earth sciences. This module aims to cover the fundamentals of structural geology from both a descriptive and mechanistic perspective and will examine these processes at micro – (e.g. individual crystals) to macro-scales (global tectonics). Topics will include stress, strain, folding, faulting and plate tectonics. The course will be underpinned by practical work where the students will be introduced to methods and approaches used in interpreting geological maps, relationships and structures in 3-D.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discriminate and classify geological structures and describe how they are formed.
LO2	Investigate large-scale earth structure and plate tectonics.
LO3	Investigate and contrast stress and strain in rocks.
LO4	Use 2D map data to create 3D interpretations of subsurface geology.
LO5	Interpret geological relationship, structures and histories based on mapped data.

EOS3102: Environmental and Marine Geophysical Remote Sensing (Semester:6 Optional)

Module Details

Title Short:	Environmental and Marine Geophysical Remote Sensing APPROVED
Module Code:	EOS3102
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	4 programme(s)
Module Owner:	EVE DALY
Module Discipline:	EOS - Earth & Ocean Sciences
Acknowledgment:	Instance: 3BS,3EV, 3EH, 4EV,1EM,1OA,1OS,1SWB Core: NA Optional for:3BS,3EV, 3EH, 4EV,1EM,1OA,1OS,1SWB Pre-Requisites EOS104 Co-requisite: None Timing and schedule: 3 lectures a week, and 1 3 hour practical per week, weeks 7-12, semester 2. Number limits (resource based) 50.
Source:	This is a replacement module for EOS320, for academic year 2016_2017. The idea is to blend content from EOS320 and EOS19 with view of removing EOS419 in 2017_2018.
Module Description:	This module will introduce students to a series of geophysical remote sensing techniques for exploring the near-surface in both terrestrial and Marine environments. The results will be used to explain key chemical, geological, hydrogeological and physical processes beneath the surface and how these can aid the monitoring of geo-hazards and management of near-surface resources. Specifically the course will introduce students to an array of Geophysical methods.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the theory and field operation of a range of applied geophysical methods
LO2	Distinguish between each method and when they should be used
LO3	Interpret data from the above datasets in a geological context.
LO4	Design a geophysical survey to investigate a certain problem, given site history and regional geology.

EOS3103: Palaeontology and Evolution
(Semester:5 Optional)

Module Details

Title Short:	Palaeontology and Evolution APPROVED
Language of Instruction:	English

Module Code:	EOS3103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	JOHN MURRAY

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 3EH2, 3BS9, 3MR1, 3EV1, 1SWB1 Core for: 3EH2 Optional for: 3BS9, 3MR1, 3EV1, 1SWB1. Pre-requisites: EOS222 Co-requisites: EOS323 Timing: six week module (4 lectures and one 2-hour practical per week), running in weeks 7-12, Semester 1. Number Limits (resource based): 100.

Module Description:	This module will introduce students to palaeontology (the study of fossils). All of the major animal groups, who have left their mark in the fossil record, will be examined. Emphasis will be placed firmly on understanding form and function in organisms and how it has related to their habitat over time. The course will finish with the topic of human evolution. Students will be trained to think both logically and critically; they will be shown how to develop arguments and answer questions based on the data available to them (or indeed collected by them in class). The background theme of the entire course will be to provide students with an appreciation for the story of evolution of life on Earth over the past c.541 million years.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Label and describe the basic body plans of a wide range of invertebrate and vertebrate groups.
LO2	Explain some of the physical principles governing the body construction of organisms.
LO3	Recognise the link between form and function in organisms and to then apply that insight to understanding how various creatures interact with their physical living environments (both at present and also in the past).
LO4	Describe and appraise the history of life on planet earth.
LO5	Collect, record and appraise scientific data.
LO6	Apply biological data/information not just qualitatively, but also quantitatively.

EOS3104: Fieldskills Training

(Semester:6 Optional)

Module Details

Title Short:	Fieldskills Training APPROVED
Language of Instruction:	English

Module Code:	EOS3104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	JOHN MURRAY

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 3EH2; 3BS9. Core for: 3EH2 and any 3BS9 student intending to progress to final year EOS. Pre-requisites: EOS222, EOS225, EOS229 & EOS230. Co-requisites: EOS3101 and an additional 30 credits of EOS courses in third year. This would bring students up to a total of 40 ects of EOS-related subjects in third year - which would qualify them to enter final year EOS. Timing: 4 weekly 2-hour practical workshops will happen towards the end of Semester 2, the main part of the course is delivered as a 6-day residential field-trip which happens after Semester 2 finishes (usually before/around Easter). Number Limits (resource based): 50. This is an absolute upper limit - as prescribed by the max capacity of a coach (for transportation) and health and safety concerns on the outcrop.

Module Level:	Honours

Module Description:	This module is largely field-based and will provide students with the basic field skills that are required for Earth and Ocean Sciences (both in research and industry). The approach to the fieldskills element of the course will be strongly 'hands on' with students gaining valuable experience in geological, hydrogeological and oceanographic methods of data collection. They will gain experience in dealing with a wide range of rock types and structures in the field and will learn how to subsequently digitise maps and logged sections (created in the field) for presentation purposes. This course is specifically designed to train and prepare Earth and Ocean Science students for their dissertation work in the final year.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Collect and record scientific data (qualitative and quantitative) in the field, and subsequently appraise it.
LO2	Identify and describe a wide range of rock and sediment types at outcrop level.
LO3	Interpret palaeoenvironments of different geological units using sedimentology and palaeontology (body and trace fossils).
LO4	Apply standard methods for hydrogeological investigations.
LO5	Determine the influence of tides and tidal patterns on coastal morphology.
LO6	Appraise the degree to which the underlying geology of any given area influences landscape development and evolution.
LO7	Construct a geological/geomorphological map for a given study area.
LO8	Compile a digitised (computer) version of the map produced in LO7 for presentation purposes.

EOS3105: The Crystalline Crust
(Semester:5 Optional)

Module Details

Title Short:	The Crystalline Crust APPROVED
Language of Instruction:	English

Module Code:	EOS3105

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	SADHBH BAXTER

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 3EH2, 3BS9 Core for: 3EH2 Optional for: 3BS9 Pre-requisites: EOS225 Timing: 12 week module, running in Semester 1

Module Description:	This module looks at the crystalline (igneous & metamorphic) rocks of the Earth's crust. The mineralogy, tectonic setting, and origin of these rocks will be examined. The practical component of the course will build on the skills learned in EOS225 in the study of rocks and minerals in thin section.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe & identify (in hand specimen & thin section) the main igneous & metamorphic rocks
LO2	Interpret (in hand specimen & thin section) textural & mineralogical features of the main igneous & metamorphic rocks
LO3	Classify global igneous & metamorphic processes & products and their links with plate tectonics
LO4	Describe how the chemistry of an igneous rock determines its mineralogy
LO5	Describe how the chemistry of the protolith & the agents of metamorphism determine the mineralogy of the resultant metamorphic rock

EOS4101: Earth Observation and Remote Sensing (Semester:8 Optional)

Module Details

Title Short:	Earth Observation and Remote Sensing APPROVED
Language of Instruction:	English

Module Code:	EOS4101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	EVE DALY

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Course Instance. 4BS, 4EV,4EH,4MR Pre-Requisits EOS104 and/or Ph101. 4 lectures a week and one 2 hour practical a week. Number limits 50 (resources based)

Source:	This module is a replacement for EOS419

Module Level:	Honours

Module Description:	This module will introduce students to an array of Remote sensing techniques used in Earth Observations. It will include Satellite, Airborne (plane and drone) and Marine based technologies. Students will be introduced to the theory of electromagnetic radiation, remote sensing systems, Multispectral scanners, Radar instruments, Photogrammetry. Image processing and image interpretation will also be covered. The data provided from these methods can be used to help understand the physical, chemical, and biological processes acting on the earth's surface. Applications include environmental monitoring climate change. Specifically geological mapping, marine and terrestrial habitat mapping, agriculture, coastal erosion, flood mapping, land use mapping and archaeology will be covered.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	To explain the concept of electromagnetic energy (EM) including the principles of remote sensing (sources of radiation, EM energy interaction with the atmosphere, EM energy interaction with terrestrial targets, spectral properties of terrestrial targets)
LO2	Appreciate the variety of sensors (Multispectral, Lidar, Radar) and their properties (ie spatial, spectral, radiometric, temporal resolution)
LO3	Grasp the principle of image acquisition from a variety of platforms. Satellite, Airborne and Drone
LO4	Process and integration of remotely sensed images into a GIS
LO5	Relate remote sensing technologies to successful applications of Earth observation and monitoring ((geology, atmospheric sciences, climatology, water resources, oceanography, agriculture, forestry)

EOS4102: EOS Minor final year project (Semester:7 Optional)

Module Details

Title Short:	EOS Minor final year project APPROVED
Language of Instruction:	English

Module Code:	EOS4102

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	2 programme(s)

Module Owner:	RACHEL CAVE

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Available for 4EH only

Module Level:	Honours

Module Description:	This is a computer/lab-based module which aims to give students a selection of transferable skills, learned while completing a minor project based on existing EOS data.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Set up a spreadsheet and populate a database
LO2	Produce a GIS map for a given region and populate it with sampling locations
LO3	Process and analyse a range of EOS datasets/samples
LO4	Carry out statistical and trend analysis on datasets
LO5	Produce a detailed correctly formatted report on their dataset and the results of their analysis
LO6	Create and present a talk on their results using presentation software

EOS4103: Advanced Fieldskiils (Semester:8 Optional)

Module Details

Title Short:	Advanced Fieldskiils APPROVED
Language of Instruction:	English

Module Code:	EOS4103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	2 programme(s)
Module Owner:	RACHEL CAVE
Module Discipline:	EOS - Earth & Ocean Sciences
Acknowledgment:	Instances: 4EH, 4BS (if taking EOS final year project).Co-reqs: EOS403 full project module or EOS 4th year minor project module plus other 4th year EOS modules
Module Level:	Honours
Module Description:	This module comprises advanced field-based studies where students will choose to carry out either land-based or marine-based field investigations. Students will learn advanced techniques and skills in geology, hydrogeology, geophysics or oceanography depending on their choice, and this module is designed to build on the skills learned during their 4th year project work.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Independently collect and record scientific data in the field
LO2	Appraise scientific data collected in the field and present to others
LO3	Recognise in the field and explain a range of linked oceanographic and geological processes
LO4	Produce a detailed well-ilustrated report based on field observations
LO5	Design and plan a field survey

EOS4104: Geomechanics and Resources (Semester:8 Optional)

Module Details

Title Short:	Geomechanics and Resources APPROVED
Language of Instruction:	English

Module Code:	EOS4104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	DAVID MCNAMARA

Module Discipline:	EOS - Earth & Ocean Sciences

Acknowledgment:	Instances: 4EH2, 4BS2. Optional for: 4EH2, 4BS9. Pre-requisites: EOS3101. Co-requisites: N/A. Timing and scheduling: 2 x 1 hour lectures per week (weeks 7-12) for 6 weeks in SEM2 accompanied by 1 x 2 hour labs per week (weeks 7-12) for 6 weeks in SEM2. Number Limits (resource based): 70

Module Description:	This course will allow students to discover the applications of structural geology to the resource industry. Students will work with standard techniques and learn underpinning structural geology theory that applies to the exploration and utilisation of geological resources such as petroleum, geothermal, groundwater, and mining and quarrying.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss the nature of geological structures as they relate to crustal stress fields.
LO2	Explain the physics of brittle deformation and its role in crustal fluid flow.
LO3	Work with standard methods for determining the in-situ stress field in the Earth's crust.
LO4	Explain the role of vein formation in the destruction and creation of natural resources.
LO5	Apply knowledge of an areas structure and stress to economic questions around resource development.

EV203: Ecological Survey Techniques
(Semester:3 Core)

Module Details

Title Short:	Ecological Survey Techniques APPROVED
Module Code:	EV203
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	MICHAEL JOSEPH GORMALLY
Module Discipline:	MI - Microbiology
Module Description:	This course introduces students to a variety of fieldwork techniques used for ecological surveys. In conjunction with lectures where the methodologies are described, data from field exercises are analysed and discussed in class to encourage students to critically appraise methodologies / data and to think in a logical and scientific fashion.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Apply appropriate ecological survey methodologies to a range of habitats
LO2	Analyze ecological data
LO3	Interpret ecological data
LO4	Assess the limitations of ecological survey methodologies

EV304: Field Course with Environmental Skills (Semester:5 Core)

Module Details

Title Short:	Field Course with Environmental Skills APPROVED
Module Code:	EV304
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	2 programme(s)
Module Owner:	MICHAEL JOSEPH GORMALLY
Module Discipline:	MI - Microbiology
Module Description:	This course introduces students to the managers of a range of habitats with the purpose of generating discussion regarding best practices for nature conservation. In addition, knowledge gained during computer skills classes is used to describe habitat condition and management options.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Compare a range of habitat management practices in the context of sites visited
LO2	Describe habitat condition and possible management noptions using selected computer packages
LO3	Recognise that habitats of the same type may require different management strategies

EV305: Habitat Management Planning
(Semester:6 Core)

Module Details

Title Short:	Habitat Management Planning APPROVED

Module Code:	EV305

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	MICHAEL JOSEPH GORMALLY

Module Discipline:	MI - Microbiology

Module Description:	This course introduces students to the practical management of habitats for nature conservation. Students learn how to survey and evaluate habitats in the field culminating in the production of a habitat management plan for a specific site.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Survey sites for the purposes of producing a habitat management plan
LO2	Recognise the conservation value of habitats
LO3	Explain the complexities inherent in making conservation management decisions
LO4	Prepare a habitat management plan

EV306: Legislation for Environmental Scientists (Semester:5 Core)

Module Details

Title Short:	Legislation for Environmental Scientists APPROVED
Module Code:	EV306
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	MICHAEL JOSEPH GORMALLY
Module Discipline:	MI - Microbiology
Module Description:	This module exposes students to the considerable amount of environmental legislation that exists in Ireland and to challenge the students to think about how the legislation is implemented and how it could be used in their future careers.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Consider both national and European legislation in the context of its impact on environmental quality
LO2	Deconstruct legislation with reference to the purpose of the legislation, the powers within the legislation, the offences and penalties contained in the legislation construct
LO3	Consider, using real life scenarios, the legislation that could be used in such scenarios for the betterment of the environment.

EV307: Nature Conservation & Habitat Management (Semester:5 Core)

Module Details

Title Short:	Nature Conservation & Habitat Management APPROVED
Module Code:	EV307
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	2 programme(s)
Module Owner:	MICHAEL JOSEPH GORMALLY
Module Discipline:	MI - Microbiology
Module Description:	This course introduces students to the identification and management of a variety of habitats for nature conservation including grasslands, woodlands, fens, bogs and boundary habitats on agricultural land.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Distinguish major habitat types in Ireland
LO2	Describe current conservation mangement practices for the major habitats in Ireland
LO3	Contrast the advantages and disadvantages of different habitat management regimes

EV405: Environmental Impact Assessment (Semester:8 Core)

Module Details

Title Short:	Environmental Impact Assessment APPROVED
Module Code:	EV405
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	MICHAEL JOSEPH GORMALLY
Module Discipline:	MI - Microbiology
Module Description:	This course introduces students to Environmental Impact Assessment with regard to the priciples of environmental assessment theory in the context of EU and Irish legislation. Using case studies in conjunction with field visits, students appraise the quality of Environmental Impact Statements through the use of role play exercises to encourage critical and objective thinking.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the role Environmental Impact Assessment plays in environmental protection
LO2	Consider the limitations of the Environmental Impacts Assessment process
LO3	Assess the quality of Environmental Impact Statements

EV406: Environmental Science Seminars (Semester:8 Core)

Module Details

Title Short:	Environmental Science Seminars APPROVED
Module Code:	EV406
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	MICHAEL JOSEPH GORMALLY
Module Discipline:	MI - Microbiology
Module Description:	Students are exposed to a wide range of current environmental topics presented by experts who work in the environmental field

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Summarize the main environmental problems in Ireland today
LO2	Consider various solutions to current environmental problems

EV420: Project
(Semester:7 Core)

Module Details

Title Short:	Project APPROVED

Module Code:	EV420

ECTS Credits:	25

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	MICHAEL JOSEPH GORMALLY

Module Discipline:	MI - Microbiology

Module Description:	Students undertake a major research project involving experimental design, data collection & analysis and discussion of results in the context of the existing literature in an appropriate field of research relating to environmental science.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Interpret existing scientific literature in the context of the project
LO2	Apply appropriate methodologies to experimental design
LO3	Analyze and present data using a range of analytical techniques
LO4	Assess the limitations of the project with reference future work
LO5	Present the project as a written document (thesis) and orally to academic staff

FR137: French for Biotechnology I (Semester:1 Optional)

Module Details

Title Short:	French for Biotechnology I APPROVED

Module Code:	FR137

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	SUZANNE GILSENAN

Module Discipline:	FR - French

Module Description:	This module is designed for 1st Year Biotechnology students and aims to introduce them to scientific French and particularly to French for Biotechnology. It also seeks to improve their understanding of the fundamental structures of French.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	demonstrate a good knowledge of basic scientific terminology in French
LO2	demonstrate knowledge of simple terminology relating to a specific range of Biotechnology topics in French such as stem cells, DNA, medical biotechnology etc.
LO3	understand and correctly use the principal grammatical structures in French.
LO4	read and comprehend authentic documents in French relating to a specific range of topics in Science and Biotechnology

FR216: French for Biotechnology II (Semester:3 Optional)

Module Details

Title Short:	French for Biotechnology II APPROVED
Module Code:	FR216
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1 and Semester 2
Module Delivered in	1 programme(s)
Module Owner:	SUZANNE GILSENAN
Module Discipline:	FR - French
Module Description:	This module is designed for 2nd Year Biotechnology students who have already completed the French for Biotechnology I module. It aims to further develop students' oral and written communication skills within a Biotechnology context.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	demonstrate a good knowledge of specialised French for Biotechnology in a precise range of lexical areas
LO2	read, comprehend and interpret authentic documents in French relating to a specific number of topics in Biotechnology
LO3	manipulate known grammatical structures in French and use for advanced structures
LO4	describe graphs/ statistical tables and diagrams in French
LO5	use written French to express opinions, to discuss, to argue etc.
LO6	produce clear and grammatically accurate French

FR252: French
(Semester:4 Group not available to select online)

Module Details

Title Short:	French APPROVED

Module Code:	FR252

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	ORNAITH RODGERS

Module Discipline:	FR - French

Module Description:	This module is designed for 2nd Year Science students who have already completed French to Leaving Certificate level (or equivalent). The programme aims to consolidate students' existing language skills and further develop their proficiency in French.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	demonstrate a good knowledge of basic scientific terminology in French particularly relating to topics such as the environment, biodiveresity, health, nutrition, technology etc.
LO2	describe their academic studies, the field of Science they specialise in, and their activities in the lab in French.
LO3	understand and correctly use the principal fundamental grammatical structures in French.
LO4	read, comprehend and interpret authentic documents in French relating to a specific range of topics in Science.
LO5	speak with ease about themselves, student life and their studdies in French and also take part in discussions in French about a specific range of scientific topics.

FR364: French for Biotechnology III (Semester:5 Optional)

Module Details

Title Short:	French for Biotechnology III APPROVED
Module Code:	FR364
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	SUZANNE GILSENAN
Module Discipline:	FR - French
Module Description:	This module is designed for 3rd Year Biotechnology students who have already completed the French for Biotechnology I and II modules. The programme aims to further develop with a Biotechnology context students' oral and written communication skills. In particular it aims to provide students with the professional language skills they would need if working in a French-speaking environment in the Biotechnology sector.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate a good knowledge of specialised French for Biotechnology in a variety of lexical areas
LO2	Read, comprehend and interpret authentic documents in French relating to a wide range of topics in Biotechnology
LO3	Use advanced grammatical structures in French
LO4	Prepare professional documents in French such as CVs, reports, emails etc.
LO5	Produce clear, structured and grammatically accurate written and spoken French

FR365: Advanced French for Science
(Semester:5 Optional)

Module Details

Title Short:	Advanced French for Science APPROVED

Module Code:	FR365

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	5 programme(s)

Module Owner:	ORNAITH RODGERS

Module Discipline:	FR - French

Module Description:	This module is designed for 3rd year Science students who have already completed the Applied French for Science (FR252) module or equivalent. The programme aims to further develop students' oral and written communication skills within a scientific context.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	demonstrate a good knowledge of specialised French for Science in a precise range of lexical areas
LO2	read, comprehend and interpret authentic documents in French relating to a specific range of topics in Science
LO3	manipulate known grammatical structures in French and use more advanced grammatical tenses and structures
LO4	use oral and written French to discuss, argue, express opinions, persuade, convince and refute
LO5	make a detailed oral presentation in French
LO6	prepare professional documents in French

GR150: German for Biotechnology I (Semester:1 Optional)

Module Details

Title Short:	German for Biotechnology I APPROVED
Language of Instruction:	English

Module Code:	GR150

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	CHRISTA BRENNAN-LOFFLER

Module Discipline:	GR - German

Module Description:	The module is designed for second year Biotechnology students who have successfully completed the German for Biotechnology 1 module.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe various aspects of student life in German
LO2	discuss different science subjects in German
LO3	read and understand short articles on biotechnology and related topics in German
LO4	cope with everyday situations in a German-speaking environment
LO5	apply for jobs, practicals or courses in the German-speaking areas

GR224: Beginner's German for Science (Semester:3 Group not available to select online)

Module Details

Title Short:	Beginner's German for Science APPROVED
Language of Instruction:	English

Module Code:	GR224

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	12 programme(s)

Module Owner:	GERALDINE SMYTH

Module Discipline:	GR - German

Module Description:	The module is designed for 2nd or 3rd year science students without any previous knowledge of German. In this course, students will complete German Levels A1 and A2 as specified in the European Framework for Languages. They will be introduced to the basic scientific terms necessary for students of the natural sciences and will acquire all 4 language skills specified for this level.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	understand and use the basic grammatical structures for Levels A1 and A2 in German
LO2	communicate in general on aspects of their student life in spoken and written form
LO3	describe basic aspects of their science subjects and their lab activities in German
LO4	read and comprehend short texts in German on general as well as science topics
LO5	give a mini presentation in German on a general science-related topic (e.g. a German scientist, a scientific achievement etc. of their choice)
LO6	appreciate the importance of developing their knowledge of German for a possible practical experience abroad, for future work and research, etc.

GR241: German for Biotechnology II (Semester:3 Optional)

Module Details

Title Short:	German for Biotechnology II APPROVED
Module Code:	GR241
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1 and Semester 2
Module Delivered in	1 programme(s)
Module Owner:	GERALDINE SMYTH
Module Discipline:	GR - German
Module Description:	German for Biotechnology students with Leaving Certificate German.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe aspects of student life in detail in German
LO2	discuss various science subjects in German
LO3	use intermediate grammatical structures in German
LO4	report on laboratory practicals and science projects in German

GR252: German (Semester:3 Group not available to select online)

Module Details

Title Short:	German APPROVED
Language of Instruction:	English

Module Code:	GR252

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	8 programme(s)

Module Owner:	CHRISTA BRENNAN-LOFFLER

Module Discipline:	GR - German

Module Description:	This module is designed for 2nd and 3rd year science students with Honours Leaving Certificate German (C3) or who passed GR224 with Grade A. In this course students will complete German Level A2 as specified in the European Framework for Langauges. They will be introduced to a general science terminology which is necessary for students of science. They will acquire all 4 language skills- reading, writing, aural and oral - specified for this level.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an understanding of basic scientific terms in German from the different fields in Science -chemistry, biochemistry, genetics, mircrobiology, pharmacology, marine science, physics etc.
LO2	Demonstrate an understanding of the grammatical structures necessary for Level A2 in German
LO3	Communicate on general aspects of student life in spoken and written German
LO4	Describe various aspects of their science subjects, lab activities, research, etc. in German
LO5	Read and comprehend authentic articles in German on various science topics.
LO6	Give a short presentation in German on a science topic - a German scientist of their choice

GR353: German
(Semester:3 Group not available to select online)

Module Details

Title Short:	German APPROVED
Language of Instruction:	English

Module Code:	GR353

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	8 programme(s)

Module Owner:	CHRISTA BRENNAN-LOFFLER

Module Discipline:	GR - German

Module Description:	This course is designed for 2nd year and 3rd year Science students who have either passed GR252 as prerequisite or show an equivalent level of German. Students will complete German Level B1 as specified in the European Framework for Languages. They will further expand and consolidate their science terminology which is necessary for science students. They will acquire all 4 language skills specified for this level.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate a good knowledge of general as well as specific scientific terms in German e.g. from the fields of genetics, chemistry/biochemistry, microbiology, bioethics, physics, etc.
LO2	Demonstrate an understanding of the grammatical structures necessary for Level B1+B2 in German
LO3	Communicate well in German on more specific aspects of student life in spoken and written form
LO4	Describe various aspects of their science subjects, their lab. activities etc. in German
LO5	read and comprehend articles on topics like stem cell research, tissue engineering, genetic engineering and gene therapy, medical and pharmacological research, telomeres and cell death, virus research and epidemics, cancer research and therapies, bioethics, etc.
LO6	Do a presentation in German e.g. on research centres, new developments in science etc.
LO7	expand his/her proficiency in applied German for career purposes, for research abroad or work experience abroad

GR358: German for Biotechnology III (Semester:5 Optional)

Module Details

Title Short:	German for Biotechnology III APPROVED
Module Code:	GR358
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	CHRISTA BRENNAN-LOFFLER
Module Discipline:	GR - German
Module Description:	The module is designed for 3rd year Biotechnology students who have successfully completed the German for Biotechnology I and II modules. The aim of the module is to consolidate and further develop all existing language skills in a Biotechnology context and provide students with the professional language skills needed for working in a German-speaking environment in the field of Biotechnology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate a good knowledge of German for Biotechnology in a variety of lexical areas
LO2	Read, comprehend and interpret authentic documents in German relating to a wide range of topics in the field of Biotechnology
LO3	Use advanced grammatical structures in German
LO4	Prepare/furnish professional documents in German such as CVs, applications, reports, emails, summaries, etc.
LO5	Produce clear, structured and grammatically correct written and spoken German

HP304: Research Methods for Occupational Health & Safety (Semester:5 Core)

Module Details

Title Short:	Research Methods for Occupational Health & Safety APPROVED
Language of Instruction:	English

Module Code:	HP304

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	LISA PURSELL

Module Discipline:	HP - Health Promotion

Module Level:	Honours

Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Have an understanding of the research process
LO2	Appreciate the strengths and weaknesses of different methodological processes including epidemiological study design
LO3	Have an understanding of basic data analysis techniques for quantitative data
LO4	Understand the uses of information derived from different methodological processes
LO5	Be able to develop a specific research question and select appropriate research methods
LO6	Be able to conduct a literature search and critically review research articles and be able to read and understand research articles that use qualitative and quantitative approaches
LO7	Be able to employ statistical software (SPSS) to execute basic descriptive and analytical statistical techniques
LO8	Be able to prepare a basic research protocol

HP440: Health & the Work Environment
(Semester:8 Core)

Module Details

Title Short:	Health & the Work Environment APPROVED
Language of Instruction:	English

Module Code:	HP440

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	VICTORIA HOGAN

Module Discipline:	HP - Health Promotion

Module Level:	Common

Module Description:	The course aims to provide students with information in relation to the principles and practice of occupational health and occupational health psychology. The application to the working environment is also explored.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Design and implement appropriate occupational health management techniques to reduce risk to tolerable levels within the organisation.
LO2	Analyse relevant legislative requirements that influence occupational and enviromental health practice
LO3	Synthesize knowledge of health psychology for occupational and environmental health management
LO4	Apply the principles of workplace health promotion
LO5	Compare and contrast the health and safety risks associated with different groups in the workplace setting, in particular; aging workers, young workers, female workers, migrant workers and shiftworkers.
LO6	Design and implement effective risk communication methods
LO7	Design and implement effective training programmes

HP1200: Occupational Health and Wellbeing (Semester:5 Core)

Module Details

Title Short:	Occupational Health and Wellbeing APPROVED
Language of Instruction:	English

Module Code:	HP1200

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	VICTORIA HOGAN

Module Discipline:	HP - Health Promotion

Module Description:	This course aims to provide students with information in relation to the principles and practice of occupational and environmental health and how they can be applied in a working environment.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the role of occupational and environmental health in protecting the health and safety of workers and the community.
LO2	Select and evaluate available and current sources of occupational health and environmental health information to utilise in practice.
LO3	Assess and manage health issues arising from exposure to physical, chemical, psychological and ergonomic hazards within the workplace.
LO4	Analyse relevant legislative requirements that influence occupational and enviromental health practice.
LO5	Design and implement appropriate occupational health management techniques to reduce risk to tolerable levels within the organisation.

HP1300: Professional Experience Programme (Semester:7 Core)

Module Details

Title Short:	Professional Experience Programme APPROVED
Language of Instruction:	English

Module Code:	HP1300

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	VICTORIA HOGAN

Module Discipline:	HP - Health Promotion

Module Description:	Students participate in an industrial/work placement over the summer following third year summer exams until December of final year. The students also undertake Seminars in Professional Studies eg Quality Auditing.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the importance of Health and Safety Management policies governing the implementation of Health and Safety law and promotion of a positive safety culture within the organisation
LO2	Communicate Health and Safety at all levels within an organisation and the society at large
LO3	Design and develop systems for the recognition, evaluation, control and management of workplace risk
LO4	Understand the application of active and reactive monitoring systems
LO5	Appreciate the objectives of the Health and Safety Audit and Review Process
LO6	Development of Personal and Professional Skills; Personal management skills, information skills, problem solving skills, decision makeing skills, opportunity awareness skills, action planning and implementation skills
LO7	Ability to plan and carry out relevant internal quality management, safety and environmental systems audits

IE323: Information Systems Ergonomics
(Semester:8 Core)

Module Details

Title Short:	Information Systems Ergonomics APPROVED
Language of Instruction:	English

Module Code:	IE323

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	10 programme(s)

Module Owner:	ENDA FRANCIS FALLON

Module Discipline:	ME - Mechanical Engineering

Module Level:	Common

Module Description:	Introduction to Systems, Task Analysis, Vision, Information Processing, Short Term Memory, Working Memory, Long Term Memory. Selective, Divided, Focused, and Sustained Attention. Static Information, Dynamic information. Visual Capabilities.Displaying Information. Typography, Arrangements of Components. Compatibility Relationships. Situation Awareness, Allocation of Functions, Selected Topics in Human Factors, Systems and Artefact Evaluation

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the role of the human in machine systems
LO2	Understand the way in which information is processed by humans
LO3	Assess and specify aspects of visual and auditory displays to improve human information processing in specified tasks
LO4	Design and develop the configuration and layout of displays and controls at work stations
LO5	Analyse and represent tasks for inclusion in the design process
LO6	Evaluate selected human machine systems and synthesize specifications for improved versions of them

IE446: Project Management (Semester:5 Core)

Module Details

Title Short:	Project Management APPROVED
Language of Instruction:	English

Module Code:	IE446

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	28 programme(s)

Module Owner:	KATHRYN CORMICAN

Module Discipline:	ME - Mechanical Engineering

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	Project management is a means to an end and not an end in itself. The purpose of project management is to foresee or predict as many of the potential pitfalls and problems as soon as possible and to plan, organise and control activities so that the project is successfully completed in spite of any difficulties and risks. This process starts before any resources are committed, and must continue until all the work is completed. The primary aim of this course is to improve the effectiveness of people engaged in project management. It focuses on the essential concepts and practical skills required for managing projects in dynamic environments. This course aims to provide learners with a solid understanding of the fundamentals of project management and to equip them with simple yet powerful tools that will empower them to meet their full potential in the area of project management thus enabling them to implement successful projects on time, within budget and to the highest possible standard.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the critical influencing factors for successful project management and execution.
LO2	Understand the key reasons for failure and to comprehend the impact and implications of project failure on the individual, team and organisation.
LO3	Specify an effective project plan, which is consistent with the business plan of the company
LO4	Demonstrate the ultimate success of the plan through successful project implementation
LO5	Be capable of using appropriate tools to schedule a project and associated activities and tasks
LO6	Be capable of using tools to analyse the health of a project portfolio and to select relevant projects that align with the overall portfolio.
LO7	Understand the concept of cross functional team working
LO8	Gain a solid grounding in transferable skills such as problem specification, team working, and the ability to synthesise and apply acquired knowledge to the solution of problems

IE453: Health & Safety Project
(Semester:8 Core)

Module Details

Title Short:	Health & Safety Project APPROVED

Module Code:	IE453

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2014-15 (01-09-14 – 31-08-15)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	ENDA FRANCIS FALLON

Module Discipline:	EP - Physics

Module Description:	The project involves some original work conducted by the student. Projects may be completed within the areas of Occupational Health, Ergonomics, Industrial Hygiene, Safety & Risk Management and Legal Studies The students must demonstrate their ability to use the theoretical knowledge from lecture materials in practical situations. The knowledge requirements can include: Science and Technology, 2. The legal System, 3. H&S Management, 4. Risk Management 5. Safety,6.Occupational Hygiene and Health

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	The learning outcomes are again dependent on the area of specialisation and scope of the project. Students having completed the IE405 project will achieve a range of competencies from the IOSH Core Competence Learning Objectives. Policy and Culture, Communication and Competence, Risk Assessment and Management, Monitoring, Audit and Review

LN2210: Scileanna Gaeilge don Eolaíocht 1 (Semester:3 Group not available to select online)

Module Details

Title Short:	Scileanna Gaeilge don Eolaíocht 1 APPROVED
Language of Instruction:	Irish

Module Code:	LN2210

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	EOIN Ó DROIGHNEÁIN

Module Discipline:	ACADAMH - Acadamh na hOllscolaíochta Gaeilge

Module Description:	Sa mhodúl seo, cuirfear oiliúint ar na mic léinn i dtaca le hullmhú téacsanna eolaíochta sa Ghaeilge. Tabharfar eolas dóibh i dtaca leis na príomhfhoinsí teanga a mbaintear leas astu san obair sin agus déanfar cleachtadh sa rang ar na foinsí sin a scagadh agus a úsáid i gceart. Tabharfar léargas ar théarmaíocht na heolaíochta agus ar an gcaoi a gceaptar téarmaí eolaíochta. Tabharfar faoi ábhar eolaíochta a aistriú ó Bhéarla go Gaeilge agus beidh cleachtaí ranga ann le léargas a thabhairt do na mic léinn ar cheird an aistriúcháin. Beidh na ranganna ar siúl i ríomhlann chun taithí phraiticiúil a thabhairt do na mic léinn ar an obair.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Ach an modúl seo a bheith curtha díobh go sásúil ag na mic léinn, beidh ar a gcumas: 1. Úsáid éifeachtach a bhaint as na foinsí teanga atá ar fáil don té a bhíonn ag plé le heolaíocht as Gaeilge. 2. Scagadh a dhéanamh ar théarmaíocht na heolaíochta agus ar chumadh na téarmaíochta sin. 3. Scagadh a dhéanamh ar straitéisí aistriúcháin a bhaineann le hábhar scoile. 4. Téacsanna gearra eolaíochta i mBéarla le haghaidh scoileanna a aistriú go Gaeilge.

LN2211: Scileanna Gaeilge don Eolaíocht 2 (Semester:4 Group not available to select online)

Module Details

Title Short:	Scileanna Gaeilge don Eolaíocht 2 APPROVED
Language of Instruction:	Irish

Module Code:	LN2211

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	EOIN Ó DROIGHNEÁIN

Module Discipline:	ACADAMH - Acadamh na hOllscolaíochta Gaeilge

Module Description:	Sa mhodúl seo, cuirfear oiliúint bhreise ar na mic léinn i dtaca le hullmhú téacsanna eolaíochta sa Ghaeilge. Déanfar staidéar ar théacsanna eolaíochta atá foilsithe sa Ghaeilge. Tabharfar léargas ar théarmaíocht na heolaíochta agus ar an gcaoi a gceaptar téarmaí eolaíochta. Cuirfear bunoiliúint ar na mic léinn i mbogearra aistriúcháin ríomhchuidithe agus bainfidh siad úsáid as an mbogearra sin chun gearrthionscadal eolaíochta a ullmhú i nGaeilge. Tabharfar an deis dóibh láithreoireacht a dhéanamh ar thoradh a gcuid oibre. Beidh na ranganna ar siúl i ríomhlann chun taithí phraiticiúil a thabhairt do na mic léinn ar an obair.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Ach an modúl seo a bheith curtha díobh go sásúil ag na mic léinn, beidh ar a gcumas: 1. Úsáid éifeachtach a bhaint as na háiseanna teanga atá ar fáil don té a bhíonn ag plé le heolaíocht i nGaeilge. 2. Straitéisí aistriúcháin a bhaineann le hábhar scoile eolaíochta i nGaeilge a chur i bhfeidhm. 3. Úsáid a bhaint as na gnéithe is tábhachtaí de bhogearra aistriúcháin ríomhchuidithe. 4. Tionscadal a chur i gcrích ina n-ullmhóidh siad téacs eolaíochta c. 1500 focal as Gaeilge le haghaidh scoileanna dara leibhéal. 5. Láithreoireacht ar a gcuid oibre tionscadail a chur i láthair.

LW3114: Introduction to Law (Semester:1 Core)

Module Details

Title Short:	Introduction to Law APPROVED
Language of Instruction:	English

Module Code:	LW3114

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	4 programme(s)

Module Owner:	CARMEL FLYNN

Module Discipline:	LAW - Law

Module Description:	This module describes how legal regulation occurs in the Irish legal system from the perspective of occupational health and safety and the environment. It focuses on the sources of law and their interpretation, (including EU law, the Irish Constitution, legislation and judge-made law) and the regulatory actors (including courts, legal professionals and statutory bodies).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	• explain how Ireland became a common law country
LO2	• name, describe and explain the sources of Irish law
LO3	• explain the role of solicitors, barristers, judges and relevant regulatory bodies
LO4	• explain the jurisdiction, composition and role of the courts in enforcing the law (criminal and civil)
LO5	• think critically in relation to the introduction and operation of legal provisions

LW3117: Environmental, Health and Safety Law (Semester:5 Core)

Module Details

Title Short:	Environmental, Health and Safety Law APPROVED
Language of Instruction:	English

Module Code:	LW3117

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	DEIRDRE CALLANAN

Module Discipline:	LAW - Law

Module Description:	This module aims to examine the major pieces of legislation governing environmental, health and safety stds in the workplace and the International background to the provisions. To enhance the skills required to read and understand Acts, Regulations and the roles of the enforcement agencies responsibility for processing environmental, health and safety claims. Cases will be discussed and new developments will be examined

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	To identify, locate and evaluate available and current sources of health and safety and environmental law systems to utilize in practice
LO2	To examine, analyse, discuss and critique key health and safety legal environmental cases
LO3	To explain, and discuss critical factors that influence the practice of health and safety law and environmental law within organisations
LO4	To understand the enforcement agencies responsibility for processing health and safety and environmental claims
LO5	To understand and interpret relevant legislative requirements that influence work practice
LO6	To understand the importance of tracking injuries and ill health within the workplace and to comprehend the relevant legislative requirements
LO7	To identify core legislative elements of environmental health and safety management programmes

MA161: Mathematical Studies
(Semester:1 Optional)

Module Details

Title Short:	Mathematical Studies APPROVED
Language of Instruction:	English

Module Code:	MA161

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	7 programme(s)

Module Owner:	NIALL MADDEN

Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics

Module Description:	Mathematical Studies MA161 is an introduction to university mathematics aimed at students studying the physical and life sciences. The majority of MA161 students will have studied ordinary level mathematics at Leaving Certificate, though some will have studied the subject at higher level. Although students are unable to proceed from this module to a Mathematics BSc, the module does lead on to a range of second and third year Mathematical Studies modules relevant to the physical and life sciences. (By taking a total of 60 ECTS of appropriate Mathematical Studies modules during their undergraduate studies, students can satisfy the Teaching Council's subject requirements for mathematics teachers while majoring in another Science subject.)

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	You will be able to perform algebraic operations with 2x2 matrices, and translate some geometric problems into the language of 2x2 matrices. You will be able to identify some commonly occurring linear scientific phenomena.
LO2	You will be able to calculate the eigenvalues and eigenvectors of a 2x2 matrix and use these calculations to solve some recurrence problems occurring in science.
LO3	You will be able to solve a system of n equations in n unknowns (for low values of n) and, in particular, decide when such a system has no solution, a unique solution or infinitely many solutions.
LO4	You will be able to: sketch the graph of a number of basic functions; calculate the limit of a function at a point or at infinity; decide whether a given function has an inverse and, if it does, calculate it; use the Intermediate Value Theorem to find roots of equations. You will be able to apply the material learned to a variety of problems coming from physics and earth sciences.
LO5	You will be able to: use the definition of derivative to compute the derivative of simple functions; apply different techniques of differentiation to calculate derivatives; apply the Mean Value Theorem to finding roots of equations; find maxima/minima/inflection points, and use these to sketch graphs of functions; apply differentiation techniques to solve optimisation problems.
LO6	You will be able to perform calculations with logarithms and the exponential function. You will be able to use anti-derivatives to solve some basic problems in biology, chemistry and physics.
LO7	You will be able to perform basic arithmetic operations with complex numbers, and factorize polynomial as a product of linear factors.
LO8	You will be able to quantify the likelihood of some simple events, and calculate the expected value of some simple random variables.
LO9	You will be able to describe data using the notions of median, mode, percentile, mean, standard deviation; you will be able to make inferences based on the estimated mean and standard deviation of a population.
LO10	You will be able to explain the connection between differential and integral calculus using the Fundamental Theorem of Calculus, and you will be able to apply this connection to some practical scientific problems.

MA170: Introduction to Programming for Biologists (Semester:1 Core)

Module Details

Title Short:	Introduction to Programming for Biologists APPROVED
Language of Instruction:	English

Module Code:	MA170

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	10 programme(s)

Module Owner:	CATHAL SEOIGHE

Module Discipline:	MA - Mathematics

Module Description:	This module provides biology students with foundation programming skills in Perl and enables them to perform core bioinformatics tasks. It will also introduce them to the scope for further learning and more advanced applications, and allow them to appreciate that computer-based tools are fundamental to modern biology and medicine.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Access, interpret and apply programming education resources
LO2	Assess the usefulness of programming to perform fundamental tasks in molecular biology
LO3	Create different types of programming code to compare molecular biology data.
LO4	Create and structure a computer program that alters molecular biology data.
LO5	Identify and co-opt other coding solutions to perform specific tasks

MA180: Mathematics (Honours) (Semester:1 Optional)

Module Details

Title Short:	Mathematics (Honours) APPROVED

Module Code:	MA180

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	9 programme(s)

Module Owner:	JOHN MICHAEL BURNS

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	Mathematics MA180 is an introduction to university mathematics aimed at students studying the mathematical and physical sciences. Students should have achieved at least an OA2 or HC3 level in their Leaving Certificate. Around 66% of students will have studied higher level mathematics at Leaving Certificate. The module is a prerequisite for the Mathematics BSc and is a popular option for a wide range of degree programmes in the mathematical and physical sciences.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	You will be able to find the general solution of a number of basic separable differential equations, solve basic problems from chemistry and biology.
LO2	You will be able to test the validity of propositional arguments; design simple logic circuits; express statements in the language of set theory.
LO3	You will be able to express a permutation as a product of transpositions and thus determine its sign; you will be able to factorize certain polynomials as products of irreducible polynomials.
LO4	You will be able to determine the determinant and eigenvectors of an nxn matrix for small values of n. You will be able to describe the role of eigenvectors in Google's page rank algorithm.
LO5	You will be able to distinguish between finite, countably infinite and uncountable sets of real numbers. You will be able to explain the meanings of the terms supremum and infinum, and analyze boundedness properties of given sets. You will be able to explain the concept of convergence and determine whether a given sequence of real numbers is convergent.

MA199: Statistics & Probability & Maths Of Finance (Semester:1 Core)

Module Details

Title Short:	Statistics & Probability & Maths Of Finance APPROVED
Language of Instruction:	English

Module Code:	MA199

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	CATHAL SEOIGHE

Module Discipline:	MA - Mathematics

Module Description:	Paper I is intended as a first course in probability taken by students studying a degree in which mathematics is to be the main subject throughout that degree as it provides a good foundation to higher level probability and statistics courses. This material is a prerequisites for second year modules MA235/MA236 probability and statistical inference. PAPER II Paper II material is intended as a first course in statistics for students studying a degree in which mathematics is to be the main subject throughout that degree as it provides a good foundation to higher level probability and statistics modules. The material in paper I is a prerequisite for this material. This material is a prerequisite for second year modules: MA235/MA236, probability and statistical inference. PAPER III Simple interest and simple discount, bank discount and negotiable instruments, compound interest and discount, equivalent dates and rates, exponential and logarithm functions, annuities (all types), perpetuity, capitalization, depreciation, loans (amortization and sinking funds).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	PAPER 1 demonstrate the concepts of systematic and random variation, and that probability is concerned with the construction of mathematical models for random phenomena that are subject to stable relative frequencies; comprehend that probability and (inferential) statistics are opposite scientific processes, and be able to give examples where the former is used to justify statistical inferences made in the real world
LO2	demonstrate the role of probability both as a discipline in its own right with applications to e.g. financial decision-making, gambling, communications systems, and as the tool used in justifying statistical inferences (i.e. in justifying statements made about entire populations based on information available in samples taken from the populations)
LO3	demonstrate the frequentist and classical approaches to probability, be able to calculate probabilities for compound events, understand the ideas of mutually exclusive events and of independent events, and be able to perform calculations involving Bayes' formula
LO4	demonstrate the motivation for the introduction of the concept of random variable, and the idea that a given population can be viewed as synonymous with the distribution of an suitably-defined random variable
LO5	model basic discrete random variables and perform calculations based on hypergometric, multivariate hypergeometric, binomial, geometric, negative binomial and Poisson distributions
LO6	demonstrate the importance of the first two moments of discrete and continuous random variables as summary measures of a distribution, and be able to compute the mean and variance of certain discrete variables
LO7	demonstrate the idea underlying the density of a continuous random variable and be able to perform probability calculations for normally distributed variables
LO8	demonstrate the importance and properties of sampling distributions, especially that of the sample mean; be able to calculate probabilities about the mean of a random sample when sampling from a normal distribution
LO9	state the central Limit Theorem and apply it to compute probabilities relating to sums and means of values of both quantitative and Bernoulli variables
LO10	PAPER II • identify sources of variation in observational and experimental data, identify ideas involved in some basic survey and experimental designs, and be aware of sensitivity of analyses to various assumptions
LO11	Paper III Simple interest and simple discount
LO12	Bank discount and negotiable instruments
LO13	Compound interest and discount, equivalent dates and rates
LO14	Exponential and logarithm functions
LO15	Annuities (all types), perpetuity, capitalization, depreciation
LO16	Loans (amortization and sinking funds).

MA203: Linear Algebra (Semester:4 Group not available to select online)

Module Details

Title Short:	Linear Algebra APPROVED
Module Code:	MA203
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	21 programme(s)
Module Owner:	SEJONG PARK
Module Discipline:	MA - Mathematics
Module Level:	Pass
Module Description:	An introduction to the theory and application of linear algebra.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Draw diagrams that illustrate the basic operations of vector algebra in two and three dimensions;
LO2	Recognise the equations of lines and planes in two and three dimensions;
LO3	Perform the matrix computations outlined in the syllabus description below;
LO4	Solve a linear system using Gaussian elimination;
LO5	Compute the inverse of an invertible matrix;
LO6	Find the orthogonal projection of a vector onto a hyperplane;
LO7	Compute the determinant of a square matrix;
LO8	Compute the characteristic equation of a matrix;
LO9	Find the eigenvectors corresponding to a given eigenvalue;
LO10	Diagonalise a diagonalisable matrix;

MA211: Calculus I (Semester:3 Group not available to select online)

Module Details

Title Short:	Calculus I APPROVED
Module Code:	MA211
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	20 programme(s)
Module Owner:	SEJONG PARK
Module Discipline:	MA - Mathematics
Module Level:	Pass
Module Description:	This is a continuation of first year Calculus, dealing with more advanced topics. Further techniques of integration, reduction formulas, volumes of revolution. Introduction to Hyperbolic functions and their inverses. Series and convergence. Improper Integrals. Some differential equations.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Solve some definite integrals via reduction formulas.
LO2	Calculate volumes of revolution in straightforward instances.
LO3	State the definition of the hyperbolic functions and their inverses and properties of these functions.
LO4	Define the notion of limit of a sequence and be able to apply the comparison, ratio and root tests, and the integral test for convergence of series.
LO5	Evaluate improper integrals and so-called p-integrals.
LO6	Solve linear 1st and 2nd order diferential equations.

MA212: Calculus II (Semester:4 Group not available to select online)

Module Details

Title Short:	Calculus II APPROVED
Module Code:	MA212
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	19 programme(s)
Module Owner:	KEVIN PATRICK JENNINGS
Module Discipline:	MA - Mathematics
Module Level:	Pass
Module Description:	An introduction to the calculus of functions of two variables, and vector valued functions. The topics include: Vectors; Multivariate Calculus; Optimization of elementary multivariate functions; Integration of elementary multivariate functions over polygons.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Apply vectors to describe lines and planes in 3-d;
LO2	Solve 3-d geometric problems using vectors;
LO3	Compute partial derivatives of chains of elementary multivariate functions;
LO4	Interpret gradient and tangent planes graphically;
LO5	Classify extreme values of elementary multivariate functions;
LO6	Solve a range of optimization problems modelled by multivariate functions;
LO7	Compute iterated integrals of multivariate functions over polygons;
LO8	Solve problems related to computing volumes in 3-d.

MA215: Mathematical Molecular Biology I (Semester:3 Group not available to select online)

Module Details

Title Short:	Mathematical Molecular Biology I APPROVED
Language of Instruction:	English
Module Code:	MA215
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	13 programme(s)
Module Owner:	CATHAL SEOIGHE
Module Discipline:	MA - Mathematics
Module Level:	Pass
Module Description:	This course covers mathematical and algorithmic methods applied to problems in molecular biology, including genome sequence assembly, DNA and amino acid sequence alignment, phylogenetics and models of RNA secondary structure.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe several problems in molecular sequence biology;
LO2	use graph theoretical methods to solve toy genome assembly problems;
LO3	apply algorithms to align homologous DNA sequences;
LO4	infer phylogenetic trees using parsimony and/or genetic distance based methods;
LO5	describe concepts in transformational grammars;
LO6	determine the grammar class that corresponds to a set of rules;
LO7	parse a DNA (or other) string using regular and context-free grammars;
LO8	describe key concepts in systems biology.

MA216: Mathematical Molecular Biology II (Semester:4 Group not available to select online)

Module Details

Title Short:	Mathematical Molecular Biology II APPROVED
Language of Instruction:	English
Module Code:	MA216
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	18 programme(s)
Module Owner:	HAIXUAN YANG
Module Discipline:	MA - Mathematics
Acknowledgment:	This module is developed from Dr. Tim Downing's work. Also thanks Prof. Cathal Seoighe for his help.
Module Level:	Pass
Module Description:	This module is intended to give students an understanding and knowledge of the application of mathematical or algorithmic methods to defined problems in molecular biology. The focus is primarily on problems involving mutation discovery and evolutionary inference.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe how genes and genomes can change between generations;
LO2	apply algorithmic methods to infer unknown genotypes in a sample;
LO3	understand how genome structure alters mutation discovery power;
LO4	use DNA linkage patterns to assess evolutionary neutrality in a population;
LO5	infer historical changes in genetic diversity for defined examples;
LO6	outline fundamental concepts in molecular evolution;
LO7	use population genetic methods to measure mutation at a gene;
LO8	outline methods for genome-wide association studies using simple data.

MA283: Linear Algebra (Semester:4 Group not available to select online)

Module Details

Title Short:	Linear Algebra APPROVED
Language of Instruction:	English

Module Code:	MA283

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	18 programme(s)

Module Owner:	MARY KELLY

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	This course covers the theory and practice of Linear Algebra and its applications.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Perform matrix computations, solve linear systems of equations and determine bases of the related spaces.
LO2	Find the nullspace, row space and column space of a matrix; apply the rank-nullity theorem.
LO3	Find bases for the canonical subspaces associated with a linear transformation.
LO4	Use eigenvector bases to diagonalize a square matrix and use the diagonalization to analyze the properties of the matrix.
LO5	Compute orthogonal projections and least squares solutions of overdetermined linear systems.
LO6	Write proofs of facts about vector spaces and linear transformations.
LO7	Identify practical situations where the techniques of Linear Algebra can be applied and carry out the application.

MA284: Discrete Mathematics (Semester:3 Group not available to select online)

Module Details

Title Short:	Discrete Mathematics APPROVED
Module Code:	MA284
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1
Module Delivered in	24 programme(s)
Module Owner:	NOELLE GANNON
Module Discipline:	MA - Mathematics
Module Level:	Honours
Module Description:	This course covers topics in combinatorics, graph theory, and their applications. Section titles are as follows. Addition and multiplication principles; Permutations and combinations; Ordered and unordered selections with repetition; Inclusion and Exclusion; Graph isomorphism, subgraphs, connectedness; Traveling around a graph; Vertex coloring; Planarity; Trees.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Use the addition and multiplication principles correctly and appropriately.
LO2	Construct a combinatorial proof from first principles.
LO3	Distinguish between different combinatorial situations and use suitable techniques to solve the problems involved.
LO4	Identify inherent properties of graphs (planarity, Eulerian and Hamiltonian properties) from pictorial representations.
LO5	Apply graph-theoretic ideas to solve scheduling and optimisation problems.
LO6	Model relevant real-life problems using trees and solve them.

MA301: Advanced Calculus (Semester:5 Optional)

Module Details

Title Short:	Advanced Calculus APPROVED
Module Code:	MA301
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	13 programme(s)
Module Owner:	MICHAEL HAYES
Module Discipline:	MA - Mathematics
Module Level:	Pass
Module Description:	This calculus course builds on earlier basic calculus knowledge. Topics covered include: convergence of sequences & series, Taylor's & the Maclaurin series, multiple integrals using Cartesian, polar and elliptical coordinates, Fourier series, computation of line integrals directly and by using Green's theorem.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define and describe a sequence and establish if a sequence converges.
LO2	Define a series and establish if a series converges/diverges, converges absolutely/ conditionally. Define a geometric, telescopic and the harmonic series. Use the integral test and in particular use it to find which values of p for which the p series converges. Apply the comparison test, ratio test and root test.
LO3	Define a general Taylor and Maclaurin series. Compute the coefficients of the power series and establish the centre, radius and interval of convergence. Evaluate approximately a function at various points using power series.
LO4	Define a Fourier series, even and odd functions and compute Fourier coefficients
LO5	Compute volumes under surfaces using double integrals over rectangler and non-rectangler domains.
LO6	Use polar and elliptical coordinates to compute volumes over full/segments of circular/elliptical domains.
LO7	Compute line integrals over curves in the Euclidian 2 space directly and by using Green's theorem.

MA302: Complex Variable (Semester:6 Optional)

Module Details

Title Short:	Complex Variable APPROVED
Module Code:	MA302
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	23 programme(s)
Module Owner:	MICHAEL HAYES
Module Discipline:	MA - Mathematics
Module Level:	Pass
Module Description:	This course introduces complex variable theory. Topics covered include: Cauchy-Riemann equations, Laplace's equation, complex numbers to the power of complex numbers, Integral evaluation in the complex plane, Cauchy's integral theorem, Cauchy's integral formula and Cauchy's integral formulae for derivatives, residues and the residue theorem.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Simplify complex numbers and plot the result in the Argand diagram. Calculate derivatives of a complex function. Define: complex conjugate, real part and imaginary part of a complex number.
LO2	Use the Cauchy-Riemann equations to find the points in the complex plane where a function is differentiable. Compute the derivative at these points.
LO3	Show that certain functions are harmonic functions and calculate the harmonic conjugate of a harmonic function.
LO4	Write complex numbers in polar form; find and plot their roots in the complex plane. Find complex powers of complex numbers and write the result in polar form or in the form: a+ib. Verify expressions for various inverse trigonometrical functions.
LO5	State Cauchy's integral theorem and all the associated technical details. Compute integrals of analytic and non-analytic functions over various paths in the complex plane.
LO6	State Cauchy's integral formula and Cauchy's integral formula for derivatives. Use these to compute integrals around simple closed curves where there are poles within these simple closed curves.
LO7	Obtain the Taylor series centered about a point. Find the Laurent series centered about a point valid in different regions.
LO8	State the Residue Theorem. Use it to compute integrals around simple closed curves.

MA310: Actuarial Mathematics I (Semester:6 Core)

Module Details

Title Short:	Actuarial Mathematics I APPROVED
Module Code:	MA310
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	4 programme(s)
Module Owner:	NOELLE GANNON
Module Discipline:	MA - Mathematics
Module Description:	This module introduces students to the basic theory of actuarial mathematics. Students who successfully complete the module can earn an exemption on the Institute of Actuaries CT1 exam. The module covers actuarial notation, project appraisal, investments, forward contracts, interest rate term structures.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Use actuarial notation for level and increasing annuities in basic calculations.
LO2	Financially appraise projects under fixed interest conditions.
LO3	Describe a range of standard investments instruments.
LO4	Calculate forward contracts.
LO5	Calculate interest term structures.

MA311: Annuities & Life Assurance
(Semester:5 Optional)

Module Details

Title Short:	Annuities & Life Assurance APPROVED

Module Code:	MA311

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	MICHAEL HAYES

Module Discipline:	MA - Mathematics

Module Description:	This course is the learner's first course in actuarial science. Topics covered include: life table (select and ultimate); probability of survival; payments on survival e.g. annuities, pure endowments; payments on death e.g. life assurance; accumulation with survivorship benefit; net and office premiums; future life time.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Calculate probabilities of survival and death over different future time periods using ultimate and select mortality. Understand the concept of the force of mortality and know when to apply it rather than the above probabilities. Obtain mathematical relationships between the above functions.
LO2	Apply actuarial techniques to value survival benefits including level, increasing, decreasing annuities paid over different periods of life e.g. life, deferred, temporary. (These payments could be paid annually or at other frequencies.) Obtain mathematical relationships between these functions.
LO3	Apply actuarial techniques to compute various accumulations with survivorship benefits
LO4	Apply actuarial techniques to value death benefits e.g. whole of life assurance, term/temporary assurance, deferred assurance. (These benefits could be paid at the end of policy year of death or immediately on death.)
LO5	Compute net and office premiums and have an awareness of their financial application.
LO6	Apply actuarial techniques to obtain mathematical relationships between annuities and life assurances and justify these relationships intuitively.
LO7	Apply actuarial techniques to compute retrospective and prospective reserves and show equality mathematically and intuitively.
LO8	Apply actuarial techniques to calculate the probability of dying over non-integer ages and to find an expression for the expected value and variance of exact and curtate future lifetime.

MA313: Linear Algebra I
(Semester:5 Optional)

Module Details

Title Short:	Linear Algebra I APPROVED
Module Code:	MA313
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	12 programme(s)
Module Owner:	AISLING MCCLUSKEY
Module Discipline:	MA - Mathematics
Module Level:	Pass
Module Description:	An advanced course in the theory and application of linear algebra, including the theory of vector spaces, linear independence, dimension and linear mappings.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Identify and categorise examples of linear and nonlinear spaces.
LO2	Decide whether or not a given set is a spanning set for a given vector space.
LO3	Decide whether or not a given subset of R^n is linearly independent
LO4	Compute the rank of a matrix
LO5	Find a basis for the image and kernel of a linear transformation
LO6	Compute the matrix representation of a linear transformation on finite dimensional vector spaces
LO7	Use the Gram-Schmidt process to find an orthonormal basis for an inner product space
LO8	Prove the Cauchy-Schwarz inequality
LO9	Compute the Fourier coefficients of some simple periodic functions
LO10	Find the linear least squares fit to a given data set.

MA324: Introduction to Bioinformatics (Honours) (Semester:6 Core)

Module Details

Title Short:	Introduction to Bioinformatics (Honours) APPROVED
Module Code:	MA324
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	14 programme(s)
Module Owner:	CATHAL SEOIGHE
Module Discipline:	MA - Mathematics
Module Description:	The course will give students an appreciation of the application of computers and algorithms in molecular biology. This includes foundation knowledge of bioinformatics; the ability to perform basic bioinformatic tasks; and to discuss current bioinformatic research with respect to human health.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	outline key bioinformatics principles and approaches
LO2	discuss the relevance of bioinformatics to medicine
LO3	obtain molecular sequence data from public repositories
LO4	implement key bioinformatics algorithms by hand on toy datasets
LO5	use bioinformatics software tools, including tools for sequence alignment, homology searching, phylogenetic inference and promoter analysis;
LO6	describe key high throughput data generation technologies and the steps involved in data pre-processing and basic analysis of these data.

MA334: Geometry
(Semester:6 Optional)

Module Details

Title Short:	Geometry APPROVED
Language of Instruction:	English

Module Code:	MA334

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	26 programme(s)

Module Owner:	JAMES CRUICKSHANK

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	This course introduces the students to Euclidean and non-Euclidean geometry. The Euclidean geometry component covers both the synthetic and the algebraic approaches. It also covers some applications of spherical geometry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe, with reference to appropriate examples, the difference between the synthetic approach and the algebraic approach to Euclidean geometry;
LO2	state and prove some of the basic propositions of Euclidean geometry;
LO3	apply deductive reasoning to solve geometric problems;
LO4	explain the classification of isometries of the Euclidean plane;
LO5	describe the symmetries of some simple shapes such as regular polygons;
LO6	calculate spherical distance, angles and areas;
LO7	compare and contrast the geometry of the plane with that of the sphere

MA335: Algebraic Structures (Semester:6 Optional)

Module Details

Title Short:	Algebraic Structures APPROVED
Language of Instruction:	English

Module Code:	MA335

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	23 programme(s)

Module Owner:	RACHEL QUINLAN

Module Discipline:	MA - Mathematics

Module Description:	An introduction to the theory and application of modern abstract algebra.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the terms ring, field and group, and use the definitions to identify examples and non-examples.
LO2	Use the language and terminology of abstract algebra in an accurate and knowledgeable way.
LO3	State and prove some major theorems of abstract algebra
LO4	Perform calculations in symmetric groups.

MA341: Metric Spaces
(Semester:5 Optional)

Module Details

Title Short:	Metric Spaces APPROVED
Module Code:	MA341
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	28 programme(s)
Module Owner:	AISLING MCCLUSKEY
Module Discipline:	MA - Mathematics
Module Level:	Honours
Module Description:	This module introduces the theory of metric spaces. The real line with its natural notion of distance is a metric space, from which the metric space definition and theory readily evolves. Familiar concepts such as convergence and continuity are explored in this new broader context while new concepts and properties, such as closed sets and compactness, illuminate key basic facts about functions.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Write down, explain and use definitions of key concepts encountered throughout the module
LO2	Demonstrate how key definitions emerge naturally from the parent example given by the real line
LO3	Establish that each example from a given list forms a metric space and illustrate other properties which such examples may have
LO4	Construct proofs which connect and relate metric concepts
LO5	Produce examples which illustrate and distinguish definitions such as limit point of a set, complete metric space, closed set etc.
LO6	Write down all mathematical work with rigour and precision
LO7	Create new or other lines of mathematical enquiry on the basis of mathematical ideas encountered in this module

MA342: Topology
(Semester:6 Optional)

Module Details

Title Short:	Topology APPROVED
Module Code:	MA342
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	27 programme(s)
Module Owner:	GRAHAM J. ELLIS
Module Discipline:	MA - Mathematics
Module Level:	Honours
Module Description:	An introduction to the theory and application of topology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand and use the basic algebra of set theory, including De Morgan's Laws
LO2	State the definition of a topological space and describe several examples of this concept
LO3	Explain the relationship between topologies and continuous functions
LO4	Understand the concept of homeomorphism
LO5	Construct new topological spaces using the subspace and quotient constructions
LO6	Understand and explain the concept of compactness, prove some basic theorems relating to this concept
LO7	Understand and explain the concept of connectedness, prove some basic theorems relating to this concept
LO8	Apply topological ideas to solve problems in other areas of mathematics or applied mathematics e.g. topological proof of the fundamental theorem of algebra or a proof of the Brouwer fixed point theorem

MA378: Numerical Analysis II

(Semester:6 Optional)

Module Details

Title Short:	Numerical Analysis II APPROVED
Module Code:	MA378
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	11 programme(s)
Module Owner:	MICHAEL HAYES
Module Discipline:	MA - Mathematics
Module Level:	Honours
Module Description:	Polynomial interpolation and its applications in numerical integration, numerical differentiation, splines, and finite element methods for ODEs.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Construct Lagrange and Hermite interpolating polynomials to a function/set of points
LO2	Bound the error in polynomial interpolation
LO3	Derive Cauchy's theorem
LO4	Construct piecewise linear and cubic splines
LO5	Derive formulas for Newton-Cotes quadrature in low degrees
LO6	Derive formulas for Gaussian quadrature in low degrees
LO7	Bound the error in Newton-Cotes and Gaussian quadrature
LO8	Use the FEM to approximately solve ODEs
LO9	Derive the system of equations of the FEM solution with piecewise linear basis functions

MA385: Numerical Analysis I (Semester:5 Optional)

Module Details

Title Short:	Numerical Analysis I APPROVED
Language of Instruction:	English
Module Code:	MA385
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	13 programme(s)
Module Owner:	MARY KELLY
Module Discipline:	MA - Mathematics
Module Level:	Continuous Calculator (M.Sc.) (PG Dip)
Module Description:	This module is a first course on the mathematical analysis of numerical methods for solving important computational problems. Topics covered include: Solving nonlinear equations; Techniques for computing solutions to initial value problems; Matrix factorisation methods for solving linear systems; The estimation and applications of eigenvalues

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Derive Newton's (and related) methods for solving nonlinear equations
LO2	Give a mathematical analysis of the convergence properties of iterative methods for nonlinear equations
LO3	Provide a derivation and anaysis of Euler's method based on Taylor's series
LO4	Motivate and apply Runge-Kutta methods for solving initial value problems
LO5	Construct a matrix factorisation method for solving systems of linear equations
LO6	Analyse the stability of linear solvers based on condition numbers
LO7	Estimate the eigenvalues of large symmetric matrices
LO8	Implement the numerical algorithms described above in Matlab

MA410: Artificial Intelligence (Semester:8 Optional)

Module Details

Title Short:	Artificial Intelligence APPROVED
Module Code:	MA410
ECTS Credits:	5
NFQ Level:	N/A
EQF Level:	
EHEA Level:	
Valid From:	2014-15 (01-09-14 – 31-08-15)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	MARY KELLY
Module Discipline:	MA - Mathematics
Module Description:	The course covers topics in the modern Artificial Intelligence, including: optimised tree searching, game theory, propositional and predicate logic, reasoning under uncertainty, utility, and the Prolog language.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Prove computational complexity of the main tree search algorithms
LO2	Traverse game trees to calculate optimal playing strategies
LO3	Manipulate compound logical statements using conjunctive normal form
LO4	Use inference to prove validity of logical statements
LO5	Use Bayesian networks to answer queries in probabilistic reasoning
LO6	Apply decision networks to determine utilities for a range of potential decisions
LO7	Complete all computer laboratory sessions satisfactorily.

MA416: Rings
(Semester:7 Optional)

Module Details

Title Short:	Rings APPROVED

Module Code:	MA416

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	24 programme(s)

Module Owner:	EMIL SKOLDBERG

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	An introduction to ring theory, covering topics like PIDs, Polynomial rings, and Euclidean rings.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Determine whether a given algebraic structure is a ring or not
LO2	Determine the group of units and the set of zerodivisors in a ring
LO3	Explain the concepts of homomorphisms, ideals, kernels and quotient rings and relate them to each other
LO4	Calculate the field of fractions of an integral domain
LO5	Determine whether a given polynomial is irreducible or not
LO6	Prove Gauss lemma and Eisenstein's criterion
LO7	Find the maximal and prime ideals of a given commutative ring
LO8	Decide whether a given domain is a Euclidean ring

MA418: Differential Equations With Financial Derivatives (Semester:6 Optional)

Module Details

Title Short:	Differential Equations With Financial Derivatives APPROVED
Module Code:	MA418
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	6 programme(s)
Module Owner:	DONAL O'REGAN
Module Discipline:	MA - Mathematics
Module Description:	This course introduces the theory of Stochastic Differential Equations. Topics covered include Gaussian Processes, Brownian Motion, Martingales, Stochastic Integrals, Ito's Lemma's, Stochastic Differential Equations, Call and Put Options and the Black-Scholes model.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the fundamentals in Stochastic Processes, Brownian Motion, Stochasic Integrals and Stochastic Differential Equations
LO2	Solve problems associated with Brownian Motion and Martingales
LO3	Solve problems associated Ito's Lemma's and Stochastic Differential Equations
LO4	Understand Call and Put Options and ideas associated with Finance and the Black-Scholes model.

MA430: Mathematics Project (Semester:8 Optional)

Module Details

Title Short:	Mathematics Project APPROVED
Module Code:	MA430
ECTS Credits:	10
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	4 programme(s)
Module Owner:	GRAHAM J. ELLIS
Module Discipline:	MA - Mathematics
Module Description:	In this module, the student works on a Mathematics problem under the supervision of an academic at the School of Mathematics, Statistics and Applied Mathematics. The student is required to produce a mid-term project report, a final project report, and to deliver an oral presentation on the project to members of the School.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	In this module, the student works on a Mathematics problem under the supervision of an academic at the School of Mathematics, Statistics and Applied Mathematics. The student is required to produce a mid-term project report, a final project report, and to deliver an oral presentation on the project to members of the School.
LO2	work under supervision and individually on a mathematical subject;
LO3	organise their results into a written document;
LO4	use computational methods as required;
LO5	use a mathematics typesetting software or an equation editor in a word processor;
LO6	summarise their report into a visual presentation;
LO7	deliver a clear presentation of their results;
LO8	answer questions about their report.

MA437: Introduction to Mathematical Research Topics I (Semester:7 Optional)

Module Details

Title Short:	Introduction to Mathematical Research Topics I APPROVED
Module Code:	MA437
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	2 programme(s)
Module Owner:	JAMES CRUICKSHANK
Module Discipline:	MA - Mathematics
Module Description:	This module introduces students to an active research topic in mathematics. Students will be guided through the introductory research literature on the topic and they will consider one or more problems that research mathematicians are actively trying to solve. The module should give students a good idea of what “research” means to a mathematician. The particular research topic will vary from year to year.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	read an introductory research article on some mathematical topic.
LO2	describe a research problem that mathematicians are actively trying to solve
LO3	explain some of the difficulties involved in the problem.
LO4	prove various results related to the problem.
LO5	perform various calculations related to the problem.

MA438: Introduction to Mathematical Research Topics II (Semester:8 Optional)

Module Details

Title Short:	Introduction to Mathematical Research Topics II APPROVED
Module Code:	MA438
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	2 programme(s)
Module Owner:	GOTZ PFEIFFER
Module Discipline:	MA - Mathematics
Module Description:	This module introduces students to an active research topic in mathematics. Students will be guided through the introductory research literature on the topic and they will consider one or more problems that research mathematicians are actively trying to solve. The module should give students a good idea of what “research” means to a mathematician. The particular research topic will vary from year to year.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	read an introductory research article on some mathematical topic.
LO2	describe a research problem that mathematicians are actively trying to solve.
LO3	explain some of the difficulties involved in the problem.
LO4	prove various results related to the problem.
LO5	perform various calculations related to the problem.

MA461: Probabilistic Models for Molecular Biology (Semester:6 Optional)

Module Details

Title Short:	Probabilistic Models for Molecular Biology APPROVED
Language of Instruction:	English

Module Code:	MA461

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	25 programme(s)

Module Owner:	CATHAL SEOIGHE

Module Discipline:	MA - Mathematics

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	This course covers applications of probabilistic models and related techniques in genomics and systems biology. Beginning with a review of stochastic processes, the course will consider the use of Hidden Markov models (HMMs) to predict genes and identify genomic regions with shared epigenetic characteristics; the use of continuous-time Markov processes to model molecular evolution; applications of Gibbs sampling to infer haplotypes from genotype data among other models and applications.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	derive key results that are applied in the course;
LO2	decode sequences of symbols generated from a HMM using the Viterbi algorithm;
LO3	calculate hidden state probabilities using forward/backward algorithms;
LO4	align a pair of DNA or amino acid sequences using a probabilistic model;
LO5	apply probabilistic models to describe sequence evolution over a phylogenetic tree;
LO6	infer haplotypes from a set of genotype data by hand;
LO7	describe several problems in molecular biology/systems biology and explain the application of probabilistic models to solve these problems;
LO8	construct a pair-HMM for sequence alignment.

MA482: Functional Analysis (Semester:8 Optional)

Module Details

Title Short:	Functional Analysis APPROVED
Module Code:	MA482
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	21 programme(s)
Module Owner:	DONAL O'REGAN
Module Discipline:	MA - Mathematics
Module Level:	Honours
Module Description:	This course introduces the theory of Linear Functional Analysis. Topics include Banach Spaces, Bounded Linear Operators, Dual Spaces, Hilbert Spaces, Orthogonal Complements and Direct Sums, Representation of Functionals on Hilbert Spaces and the Hilbert-Adjoint Operator.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the fundamentals in Normed Spaces, Linear Operators and Dual Spaces.
LO2	Understand the fundamentals of Inner Product Spaces, Direct Sums and Hilbert-Adjoint Operators.
LO3	Solve problems associated with Banach Spaces, Continuous Linear Operators, Normed Spaces of Operators and Dual Spaces.
LO4	Solve problems associated with Inner Product Spaces, Orthogonal Complements, Orthonormal Sets and Sequences, Functionals on Hilbert Spaces and the Hilbert-Adjoint Operator.

MA490: Measure Theory
(Semester:7 Optional)

Module Details

Title Short:	Measure Theory APPROVED
Language of Instruction:	English

Module Code:	MA490

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	25 programme(s)

Module Owner:	MARY KELLY

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	A 'measure' on a set is a systematic way to assign a number to each suitable subset of that set, intuitively interpreted as its size. Measure is a generalisation of the concepts of length, area, and volume. An important example is Lebesgue measure, which assigns the conventional length, area and volume of Euclidean geometry to suitable subsets of n-dimensional space. Measure Theory is the basis for Integration and it is the foundation for an understanding of Probability Theory.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Carry out basic operations on sequences of sets
LO2	Decide whether a given set function is a measure and execute basic operation with measures
LO3	Apply the theory of integration in a wide range of settings, including the real numbers and probability spaces. Decide when term by term integration of a sequence or series of functions is permissible
LO4	Give an account of the basic facts about measure spaces and integration
LO5	Compose and write proofs of theorems about measures and integrals.

MA495: Actuarial Mathematics: Life Contingencies II (Semester:5 Optional)

Module Details

Title Short:	Actuarial Mathematics: Life Contingencies II APPROVED
Module Code:	MA495
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	6 programme(s)
Module Owner:	DONAL O'REGAN
Module Discipline:	MA - Mathematics
Module Description:	This course introduces some material on Life Contingencies. Topics include Multiple Lives (including Joint Life and the Last Survivor Status), the Z Method, Contingent Probabilities and Assurances, Multiple Decrement Tables, Random Vectors and Distributions

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the fundamentals in Joint Life and other Statuses, Contingent Functions and Assurances
LO2	Understand the fundamentals of Multiple Decrement Tables, Random Vectors and Distributions
LO3	Solve problems involving Multiple Life Statuses and Contingent Probabilities
LO4	Solve problems involving Multiple Decrement Tables and Joint Distributions

MA2286: Differential Forms (Semester:3 Group not available to select online)

Module Details

Title Short:	Differential Forms APPROVED
Language of Instruction:	English

Module Code:	MA2286

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	22 programme(s)

Module Owner:	COLLETTE MCLOUGHLIN

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	Introduction to functions of several variables and vector valued functions. Topics include partial derivatives, local extrema, curvature, parametric curves, double integrals, Green's Theorem .

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Sketch or describe graphs of 2-variable functions;
LO2	Determine equations of tangent planes;
LO3	Find parametrisations of common curves;
LO4	Compute arc length and curvature of a curve;
LO5	Optimise certain functions; apply method of Lagrange multipliers;
LO6	Compute line integrals and double integrals over specified domains;
LO7	Know and be able to apply Green's Theorem.

MA2287: Complex Analysis (Semester:4 Group not available to select online)

Module Details

Title Short:	Complex Analysis APPROVED
Module Code:	MA2287
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	21 programme(s)
Module Owner:	COLLETTE MCLOUGHLIN
Module Discipline:	MA - Mathematics
Module Level:	Honours
Module Description:	This module introduces the theory of functions of a complex variable, statring with an introduction to complex numbers and ending with applications of the Residue Theorem and conformal transformations.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	represent a complex number as a point in the plane; calculate the modulus and argument of a complex number; switch between cartesian and polar forms; calculate the n-th roots of a complex number
LO2	decide where a function is diffrentiable (resp. analytic) using the Cauchy-Riemann equations
LO3	calculate the complex derivative of a function; decide whether a function is harmonic; calculate the harmonic conjugate of a harmonic function;
LO4	do various calculations involving exponentials and logarithms
LO5	parameterize a variety of paths in the plane
LO6	calculate the integral of a function along a given path
LO7	apply Cauchy's Theorem to compute integrals; apply Cauchy's Integral Formula to calculate various integrals;
LO8	calculate the Taylor series of a variety of elementary functions;
LO9	deduce the Laurent series of a range of functions;
LO10	apply the Residues Theorem to calculate various improper integrals.

MA3101: Euclidean and Non-Euclidean Geometry (Semester:5 Optional)

Module Details

Title Short:	Euclidean and Non-Euclidean Geometry APPROVED
Language of Instruction:	English

Module Code:	MA3101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	18 programme(s)
Module Owner:	JOHN MICHAEL BURNS
Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics
Acknowledgment:	3BS9 (core), 3BMS2 (optional), 3BA1 (Mathematics students only) Pre-Requisites: MA283 & MA284, MA286 & MA287
Module Level:	Common
Module Description:	This course is an introduction to non-Euclidean, projective and Riemannian geometry. Topics covered include Riemannian metrics, their isometries, geodesics, curvature and the Gauss-Bonnet theroem.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Give examples of geometries that violate the parallel postulate.
LO2	Identify isometries and geodesics in Euclidean and standard non-Euclidean geometries.
LO3	Calculate distance in Euclidean and non-Euclidean geometries.
LO4	Manipulate homogeneous coordinates in projective spaces.
LO5	Perform rotations using Quaternions.
LO6	Calculate the Gaussian and the mean curvature of a surface.
LO7	Prove the Gauss-Bonnet theorem.

MA3102: Codaigh agus Córais Dhinimiciúla Réadacha (Semester:5 Group not available to select online)

Module Details

Title Short:	Codaigh agus Córais Dhinimiciúla Réadacha APPROVED
Language of Instruction:	Irish

Module Code:	MA3102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	4 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics

Module Level:	Common

Module Data:	1 - 4 NON LAB

Module Description:	This module introduces the students to fractals and dynamical systems. The fundamental notions of: measure, dimension (Hausdorff and Minkowski), order, chaos, periodic points and bifurcation are studied.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe some fractals and real dynamical systems.
LO2	Calculate the Minkowski and Hausdorff dimension of a set.
LO3	Apply results from Calculus to the study of dynamical systems.
LO4	Compare and contract the behaviour of the logistic map for different values of the associated parameter.
LO5	Calculate Schwartzian derivatives.
LO6	State and prove Sharkovsky's theorem.

MA3343: Groups
(Semester:5 Optional)

Module Details

Title Short:	Groups APPROVED
Language of Instruction:	English

Module Code:	MA3343

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	22 programme(s)

Module Owner:	COLLETTE MCLOUGHLIN

Module Discipline:	MA - Mathematics

Module Level:	Honours

Module Description:	Introduction to Group Theory. Topics covered include the group axioms, symmetries, cyclic groups, dihedral groups, groups of matrices, symmetric groups, homomorphisms, normal subgroups, Isomorphism Theorems.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain what a group is and use the definition of a group to identify examples and non-examples.
LO2	Use the language and terminology of group theory in an accurate and knowledgeable way.
LO3	Give examples of groups with certain specified properties, and determine whether a given group has a specified property.
LO4	Describe symmetries of geometric objects in terms of permutations or matrices
LO5	State and prove some significant theorems in group theory.
LO6	Critically assess proposed proofs of statements in group theory, and compose independent proofs.

MA3491: Fields and Applications (Semester:6 Optional)

Module Details

Title Short:	Fields and Applications APPROVED
Module Code:	MA3491
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	20 programme(s)
Module Owner:	COLLETTE MCLOUGHLIN
Module Discipline:	MA - Mathematics
Module Level:	Honours
Module Description:	This is an introduction to the theory of Field Extensions, their Galois groups and the application of finite fields to constructing BCH codes.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	State the definition of a field and finite extensions of a field.
LO2	Compute the degree of such an extension.
LO3	Define the notion of algebraic number, transcendental number, the algebraic closure of a field.
LO4	State the 3 famous problems of ancient Greek geometry, Ruler and Compass constructions, and how Field Theory contributes to answering these problems and also the construction of regular n-gons via roots of cyclotomic polynomials.
LO5	Define the notion of automorphisms of an extension field relative to the field of rational numbers.
LO6	Be able to construct the splitting field of an irreducible polynomial over Q and the corresponding Galois group of automorphisms in the case of small degree.
LO7	Know why there is no general formula for 'solving the quintic by radicals' and what that expression means.
LO8	Construct finite fields of small order, properties of finite fields, the Frobenius automorphism. The formula of Gauss for the number of monic irreducible polynomials of degree n over a given finite field.
LO9	Use finite fields in constructing BCH codes of a designated distance d over such a field.

MA4101: Teaching and Learning in Mathematics (Semester:7 Optional)

Module Details

Title Short:	Teaching and Learning in Mathematics APPROVED
Language of Instruction:	English

Module Code:	MA4101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	MA - Mathematics

Module Level:	Common

Module Data:	1 - 4 NON LAB

Module Description:	This is an experiential learning module for final year students in the School of Maths. It is an optional module that is ideally suited to students who are considering a career in education. The module will involve the study of principles of Mathematics education and mathematical communication in a practical context. Each student will deliver 20 hours of tutorial support in the SUMS Centre over ten weeks, for specified first year modules, as well as attending a series of lectures and workshops. This work will be supervised by the lecturer who will provide detailed individual guidance and feedback. The number of places will be limited and there will be an application procedure including an interview.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Reflect on their teaching practice and identify strategies for dealing with common difficulties that arise.
LO2	Explain mathematical concepts and processes in a clear and concise manner, in conversation and in writing.
LO3	Design and evaluate learning resources for particular topics.
LO4	Demonstrate proficiency in organisation, communication, presentation and academic writing.

MA4344: Advanced Group Theory
(Semester:8 Optional)

Module Details

Title Short:	Advanced Group Theory APPROVED
Language of Instruction:	English

Module Code:	MA4344

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	19 programme(s)

Module Owner:	COLLETTE MCLOUGHLIN

Module Discipline:	MA - Mathematics

Module Description:	The course covers monoids and groups and their actions. Topics covered include finite state machines, orbits and stabilizers, applications in combinatorics (e.g. vertex colorings), Sylow theory, finite simple groups.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define monoid actions; state and prove fundamental theorems about them
LO2	Determine regular languages for finite automata
LO3	Use orbit-stabilizer theory to compute automorphism groups of graphs
LO4	State and prove Sylow's theorems
LO5	Prove there is no finite non-abelian simple group of order less than 60

ME572: Human Reliability
(Semester:8 Core)

Module Details

Title Short:	Human Reliability APPROVED
Language of Instruction:	English

Module Code:	ME572

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	15 programme(s)

Module Owner:	ENDA FRANCIS FALLON

Module Discipline:	ME - Mechanical Engineering

Module Description:	Nature of Human Error, Categories of Human Error, Modelling Human Error. Human Reliability in Risk Assessment. The Human Reliability Assessment Process; human error analysis, human-error quantification, impact assessment, human-error risk reduction. Human Error Analysis Methods: SHERPA, SPEAR, MURPHY DIAGRAMS, HEART, TEAM-BASED HEART, THERP, SPAR-H. Systems Failures and Disaster Case Studies

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Comprehend the concept of human error and how it is categorised
LO2	Comprehend the role of human reliability in safety-related systems development
LO3	Identify and distinguish between different categories of human errors or potential human errors in safety related systems
LO4	Describe and analyse industrial accidents and incidents in order to gain an understanding of underlying causes, in particular those related to human activities.
LO5	Comprehend and understand how human error is modeled and to analyse various scenarios using human error modeling methods
LO6	Analyse work activities (industrial and healthcare) for human error potential using established human error analysis methods and analytical techniques

ME2102: Safety System Design
(Semester:4 Core)

Module Details

Title Short:	Safety System Design APPROVED
Language of Instruction:	English

Module Code:	ME2102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	VICTORIA HOGAN

Module Discipline:	ME - Mechanical Engineering

Module Description:	Systems safety overview. Safety in the design process. Safety and large systems projects. Preliminary hazard analysis (PHA). Operating and support hazard analysis (O&SHA). Energy trace and barrier analysis (ETBA). Failure mode and effect analysis (FMEA). Fault and function hazard analysis. Fault tree analysis (FTA). Hazard operability analysis (HAZOP).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	To comprehend the role of safety in systems development.
LO2	To comprehend a range of risk assessment techniques and the stage in the development process at which they can be applied.
LO3	To analyse real machine systems and/or pilot plant using a range of risk assessment techniques.
LO4	To gain awareness and understanding of real-life applications of advanced risk assessment techniques.
LO5	To analyse and describe industrial accidents and incidents in order to gain an understanding of their underlying cause.
LO6	To gain awareness and learn how to utilise a software system to model risk assessment problems.
LO7	To understand the relationship between occupational health and safety and system safety.
LO8	To gain an awareness and understanding of the application of standards to occupational health and safety management systems.

ME2104: Environmental Health & Safety Practice (Semester:3 Core)

Module Details

Title Short:	Environmental Health & Safety Practice APPROVED
Language of Instruction:	English

Module Code:	ME2104

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	ENDA FRANCIS FALLON

Module Discipline:	ME - Mechanical Engineering

Module Level:	Common

Module Description:	Introduction to Health & Safety and Environmental Legislation, Regulations and Standards. Risk Assessment, Accident Investigation and Emergency Response. Dealing with Hazardous Substances, SDS Sheets, Licencing and Ecological Impact. Practical Safety and Environmental Management on Construction Sites, Laboratories, Farms, industry and Public Utilities

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the responsibilities of employers and employees to develop, implement and maintain health & safety and environmental policies, structures, procedures and practices.
LO2	Understand EHS knowledge representation and communication techniques and develop basis implementation skills.
LO3	Select risk assessment methodologies to analyse and manage environmental health & safety in typical workplaces such as construction sites, laboratories, farms and industry and public utilities.
LO4	Plan, implement, monitor, audit and improve a comprehensive health & safety and environmental management system.

ME3104: Introduction to Regulatory Affairs in Manufacturing (Semester:5 Core)

Module Details

Title Short:	Introduction to Regulatory Affairs in Manufacturing APPROVED
Language of Instruction:	English

Module Code:	ME3104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	12 programme(s)

Module Owner:	PAT DONNELLAN

Module Discipline:	ME - Mechanical Engineering

Module Level:	Honours

Module Description:	Safe Product Design, medical device directive, FDA regulations & GMP, medical device risk assessment, machinery directive, Risk management.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand and state the role of Regulatory Affairs in business from a product design, approval and process perspective, specifically the EU MDD and US FDA regulations.
LO2	State the concepts of Good Manufacturing Practice(cGMP), Corrective and preventive action(CAPA) as applied to a regulated manufacturing environment such as medical device manufacturing.
LO3	State product safety and regulatory requirements and develop a product liability prevention programme.
LO4	State the requirements of the EU machinery directive and be able to apply them to a machinery manufacturer and be able to carry our relevant risk assessments.
LO5	Carry our risk assessment and risk management activities as required to support product and process design.

ME4104: Ergonomic Design of the Workplace (Semester:5 Core)

Module Details

Title Short:	Ergonomic Design of the Workplace APPROVED
Language of Instruction:	English

Module Code:	ME4104

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	MARTINA KELLY

Module Discipline:	ME - Mechanical Engineering

Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Identify, formulate, analyse and solve ergonomics design problems.
LO2	Utilise a selection of ergonomic tools and methods towards user-centred design and approach.
LO3	Utilise mock-ups and models to explore and present solutions to ergonomics design problems.
LO4	Recommend various methodologies, equipment and software packages to assess the risk to the individual from specified manual handling tasks
LO5	Describe and assess the risk to the individual of Work Related Upper Limb Disorders associated with working with Display Screen Equipment/Visual Display Units
LO6	Interpret the role of standards and regulations in ergonomic design problems
LO7	Consider the measurement of body size, shape, strength and working capacity and their application to ergonomic design problems.
LO8	Consider the responsibilities of the health & safety professional towards people.
LO9	Justify how ergonomics can contribute to effective, productive and safe outcomes in manufacturing.

ME4108: Environmental and Safety Systems Case Studies

(Semester:8 Core)

Module Details

Title Short:	Environmental and Safety Systems Case Studies APPROVED
Language of Instruction:	English

Module Code:	ME4108

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	ENDA FRANCIS FALLON

Module Discipline:	ME - Mechanical Engineering

Module Description:	Safety Standards Compliance and Safety Standards for Machinery; Case Studies: Major Emergency Management, Teamwork, Usability, and Computerized Decision Support in Health Care: A Human Factors Assessment, Industry Standards for EHS Management, Major Environmental Disasters, IPPC Licencing Case Studies, Green Energy and Traditional Energy Production.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	To recognize the role of environmental and safety in systems development.
LO2	To evaluate the relationship between environmental and occupational health & safety and system safety.
LO3	To justify the application of standards to occupational and environmental health & safety management systems.
LO4	To examine real-life applications of advanced risk assessment techniques.
LO5	To recognize the relationship between systems safety methods and risk assessment in healthcare and related applications including major emergency management.
LO6	To examine green and traditional energy production systems in relation to EHS.

ME5102: Quality Systems
(Semester:5 Core)

Module Details

Title Short:	Quality Systems APPROVED
Language of Instruction:	English

Module Code:	ME5102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	24 programme(s)

Module Owner:	PAT DONNELLAN

Module Discipline:	ME - Mechanical Engineering

Module Description:	Quality management systems, Six sigma philosophy, basic statistical quality control, tools for quality improvement, process capability analysis, Kaizen, quality costs, quality auditing, Quality in a regulated sector e.g. Medical Devices.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	State the elements and documentation requirements, and be able to develop a quality management system.
LO2	State the Six Sigma philosophy and how it is applied in a business.
LO3	Design Statistical Quality Control charts for attributes and variables and develop a quality improvement programme.
LO4	Appreciate the role of audit programs and benchmarking.
LO5	State the quality system requirements of a regulated manufacturing environment such as medical device manufacturing e.g. ISO13485 or FDA QSRs.
LO6	Develop a quality cost management program.
LO7	Familiarity with the requirements of ISO9001.
LO8	Use the basic tools of quality management.

ME5105: Fundamentals of Operations Engineering (Semester:4 Core)

Module Details

Title Short:	Fundamentals of Operations Engineering APPROVED
Language of Instruction:	English

Module Code:	ME5105

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	PAT DONNELLAN

Module Discipline:	ME - Mechanical Engineering

Module Description:	Introduction to operations engineering, design of products & services, lean and JIT manufacturing systems, facility design & layout, forecasting, capacity planning and aggregate production planning, inventory management, enterprise resource planning, scheduling.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Be able to state the role of operations engineering in a business from a product/service and process perspective.
LO2	For various product and process configurations, be able to design a lean/JIT manufacturing system to produce products or services.
LO3	Be capable of solving operations oriented problems in an industrial setting with an emphasis on productivity, process planning, scheduling, inventory management, forecasting.
LO4	Identify the main stages in service design.
LO5	Identify the main stages in product design and development.

MI202: Laboratory Skills in Microbiology I
(Semester:3 Group not available to select online)

Module Details

Title Short:	Laboratory Skills in Microbiology I APPROVED

Module Code:	MI202

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	CONOR O'BYRNE

Module Discipline:	MI - Microbiology

Module Description:	This module aims to give students the basic lab skills that they will need to study microorganisms in a laboratory. In this module they will learn how to culture bacteria on agar-based media. They will learn how to stain bacteria and how to differentiate the major groups groups using a microscope. They will be trained in the preparation and use of different culture media to isolate the major groups of bacteria. The module will consist of 6 three hour laboratory sessions supplemented by 6 lects.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Perform a simple streak plate
LO2	Perform a Gram stain and differentiate between Gram positive and Gram negative bacteria
LO3	Use a basic light microscope
LO4	Prepare culture medium and perform a pour plate
LO5	Prepare culture medium and perform a pour plate
LO6	Prepare culture medium and perform a pour plate
LO7	Describe the thoery behind the basic methodologies used during the laboartory sessions
LO8	Discuss the nutrient and environmental parameters that influence microbial growth

MI203: Laboratory Skills in Microbiology II (Semester:4 Group not available to select online)

Module Details

Title Short:	Laboratory Skills in Microbiology II APPROVED
Module Code:	MI203
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	8 programme(s)
Module Owner:	CONOR O'BYRNE
Module Discipline:	MI - Microbiology
Module Description:	This module aims to further develop the basic laboratory techniques that students would need to study microorganisms in practice. Students will learn how to identify bacterial isolates using basic biochemical tests, to perform a genetic conjugation between two bacterial strains and how to perform an MIC test. The module will consist of 18 h of practical work, supplemented by 6 one-hour lectures that aim to provide students with a theoretical understanding of the methodologies being used.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Perform biochemical tests on isolated cultures to aid identification
LO2	Isolate and enumerate coliforms using membrane filtration
LO3	Set up a bacterial conjugation reaction
LO4	Enumerate coliforms using the Most Probable Number method
LO5	Establish the MIC of a bacterial culture in relation to an antibiotic
LO6	Determine whether plasmid DNA has been transferred in a conjugation reaction
LO7	Describe the metabolic reactions that underpin the use of biocehmical tests in microbiological identification tests
LO8	Discuss the processes involved in bacterial conjugation

MI204: Microbes and the Environment (Semester:4 Group not available to select online)

Module Details

Title Short:	Microbes and the Environment APPROVED

Module Code:	MI204

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	10 programme(s)

Module Owner:	CONOR O'BYRNE

Module Discipline:	MI - Microbiology

Module Description:	This module aims to give students an understanding of the key medical and environmental impacts of microorganisms. The unit will be delivered as a series of 24 lectures covering background on microbial classification, microbial genetics and metabolic diveristy, biogeochemical cycling, waste treatement systems, the role of microbes and viruses in human and animal diseases. The role of the host immune system and commensal microflora in protecting against infection will also be covered.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Identify the main domain of life on a phylogetic tree based on ribosomal RNA sequences.
LO2	Describe the main systems used to classify microorganisms
LO3	Differentiate between the main metabolic strategies used by microorganisms in the biosphere
LO4	describe the harnessing of microbial metabolisms for environmental biotechnologies, 5. discuss linking ecology (identity) & physiology (activity) using labelled substrates;
LO5	Discuss the different microbe-based strategies used for waste management and biofuel production
LO6	Describe the basic elements of the human immune system
LO7	Describe the role of specific microbes in human an animal diseases
LO8	Describe the life cycle of a typical animal virus

MI306: Marine Microbiology (Semester:5 Optional)

Module Details

Title Short:	Marine Microbiology APPROVED
Module Code:	MI306
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	8 programme(s)
Module Owner:	CINDY SMITH
Module Discipline:	MI - Microbiology
Module Description:	To provide an understanding of marine microorganisms and the roles they play in marine ecosystems. Emphasis on primary productivity and fate of carbon, trophic interactions and flows of material and energy in marine food webs, biogeochemical cycles, microbial diversity and ecology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	outline the major groups of marine microorganisms
LO2	describe the role of marine microorganisms in primary production and understand the implications of this for ecosystem functioning.
LO3	discuss the fate of primary productivity and the role of microorganism in marine food webs.
LO4	outline marine carbon and nitrogen cycles and
LO5	be able to discuss the biogeochemical and ecological roles of marine microbes
LO6	describe culture-independent molecular techniques used in molecular microbial ecology
LO7	to discuss microbial biodiversity in marine ecosystems.

MI322: Environmental Microbiology (Semester:6 Optional)

Module Details

Title Short:	Environmental Microbiology APPROVED
Language of Instruction:	English

Module Code:	MI322

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	8 programme(s)

Module Owner:	GAVIN COLLINS

Module Discipline:	MI - Microbiology

Module Description:	This module aims to provide an understanding of the phylogenetic, and metabolic diversity, as well as the energy conservation strategies and metabolic flexibility, of microorganisms in the Environment. Students will contextualise this in terms of the major biogeochemical cycles in Nature, as well as the industrial exploitation of element cycling for waste treatment and other aspects of environmental management. Students will consider how molecular microbial ecology is applied to understand metabolic interactions between microbes in the environment. It will comprise 18 h of lectures (combining traditional lectures, tutorials & Twitter sessions). It will also include 6 h of practical sessions focused on detecting microbes in environmental samples.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	explain the basis for microbial energy conservation and metabolic diversity
LO2	identify microbial roles in productivity and degradation;
LO3	explain the roles microbes play in carbon and nitrogen cycling;
LO4	describe the harnessing of microbial metabolisms for environmental biotechnologies, 5. discuss linking ecology (identity) & physiology (activity) using labelled substrates;
LO5	critically discuss ‘[eco]systems [micro]biology’ based on combining ‘omics.

MI323: Food and Industrial Microbiology
(Semester:5 Optional)

Module Details

Title Short:	Food and Industrial Microbiology APPROVED
Language of Instruction:	English

Module Code:	MI323

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	CONOR O'BYRNE

Module Discipline:	MI - Microbiology

Module Description:	This module will discuss the fermentations and processes involved in cheese, beer and wine production. The causative agents of food-borne disease will also be discussed. It will present and explore the diversity of scientific disciplines/technologies underpinning food and industrial fermentations. To present examples of applied industrial fermentations, producing products of significance. To provide an understanding of the importance that the organism, medium and process manipulation plays in Bioprocessing. To provide students with teaching of bioreactor design, operation, monitoring and scale up.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the process involved in the production of cheese, beer and wine.
LO2	Outline the fermentation reactions relevant to these processes.
LO3	Describe the main types of food-borne disease and identify the key organisms responsible for each type.
LO4	Identify important aspects of laboratory-scale and production bioreactor design/construction.
LO5	Describe the characteristics of key microbial species commonly used in industrial fermentations.
LO6	Outline and discuss critical operational variables (medium, organism, process manipulation and productivity) of industrial fermentations.

MI324: Immunology and Recombinant Techniques (Semester:6 Optional)

Module Details

Title Short:	Immunology and Recombinant Techniques APPROVED
Module Code:	MI324
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	9 programme(s)
Module Owner:	GERARD WALL
Module Discipline:	MI - Microbiology
Module Description:	To describe the principles and mechanisms of prokaryotic genetic engineering and its impact on modern molecular biotechnology. To provide an overview of the use of molecular prokaryotic biotechnology to engineer cell factories for the production of recombinant biomolecules. To provide detailed information on the fundamentals of the immune system and its response to microbial infection.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the most common techniques that underpin recombinant DNA technology and genomics.
LO2	Discuss and detail DNA technologies for the production of genetically modified (micro-)organisms and recombinant proteins of industrial importance.
LO3	Outline in detail the components and reactions of the innate and adaptive immune systems.
LO4	Discuss the importance of host surveillance/pathogen recognition and the basis of immune memory.
LO5	Detail applications of recombinant DNA technologies in immunomodulation and biotechnology.

MI325: Microbial Infectious Diseases
(Semester:6 Optional)

Module Details

Title Short:	Microbial Infectious Diseases APPROVED
Language of Instruction:	English

Module Code:	MI325

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	JAMES P O'GARA

Module Discipline:	MI - Microbiology

Module Description:	This module will introduce how bacterial and viral pathogens cause disease. Important virulence mechanisms in representative pathogens will be discussed. The clinical implications of microbial infections will be addressed. Host responses to infection, immunization, vaccines, antibiotics and antibiotic resistance will be described.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define the terms virulence and pathogenesis in microbial pathogens.
LO2	Describe, with examples, the key virulence mechanisms used by microbial and viral pathogens.
LO3	Describe the major classes of antibiotics
LO4	Describe the general mechanisms of antibiotic resistance found in bacteria
LO5	Discuss the immune response to microbial pathogens.
LO6	Discuss the role of vaccine in preventing infectious diseases.

MI326: Microbial Metabolic and Molecular Systems (Semester:5 Optional)

Module Details

Title Short:	Microbial Metabolic and Molecular Systems APPROVED
Module Code:	MI326
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	8 programme(s)
Module Owner:	THOMAS BARRY
Module Discipline:	MI - Microbiology
Module Description:	This Module has two areas of focus in defining the bacterial cell as a factory in terms of its metabolic and genetic processes. At a metabolic level, the course describes and explains the relevance of metabolism in the context of microbial structure and growth. Focusing on nutrition, metabolism and other factors influencing microbial growth will be presented. At a genetic level, the course looks at DNA by way of its structure, mutagenesis and recombination as well as gene regulation and explores the use of mutant cells in the analysis and function of bacterial genes.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the mechanisms of cellular metabolism in microbes. With emphasis on catabolism of nutrients other than sugars.
LO2	Describe the more important metabolic mechanisms of anabolic reactions of microbial cells.
LO3	Understand the causes of mutation and significance of mutation with regard to bacterial gene mapping.
LO4	Describe how bacteria exchange genetic information within and between cells
LO5	Discuss the molecular mechanisms of the regulation of gene expression in microbes

MI405: Project
(Semester:7 Optional)

Module Details

Title Short:	Project APPROVED

Module Code:	MI405

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	GERARD WALL

Module Discipline:	MI - Microbiology

Module Description:	The Project is an 8-week training period in molecular, cellular and process techniques relevant to environmental, biomedical and/or marine microbiology. Students work in groups, typically pairs, to investigate a research problem in the laboratory. Background literature and initial protocols are provided at the beginning of the work. Students develop and progress the initial project plan through formulation of original ideas and reading of relevant literature. Results interpretation and experimental troubleshooting are important for successful completion of the described project. Examination is through preparation of a ~25-page thesis describing the project and presentation and defence of the project work in a 30-min oral presentation upon completion of the lab work.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	demonstrate an understanding of and discuss the scientific literature related to the project
LO2	demonstrate good ability in lab techniques relevant to the research topic.
LO3	design experiments and troubleshoot technical problems that arise
LO4	work in a team with project partners to plan and maximise the amount of work carried out.
LO5	identify novel approaches to progress the project.
LO6	discuss and critique published research papers in the field of the project.

MI413: Problem Solving Papers I & II (Semester:8 Optional)

Module Details

Title Short:	Problem Solving Papers I & II APPROVED
Module Code:	MI413
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	GERARD WALL
Module Discipline:	MI - Microbiology
Module Description:	"The ability to read, understand, distil and process data and information from scientific papers and other sources is an essential skill for any professional scientist. In this module, students will receive training in mathematical calculations; reading and summarising scientific papers; and interpreting and critiquing scientific data and results. The module is broadly divided into 3 parts: (i) Mathematical calculations (ii) Reading and summarising papers (iii) Evaluation and interpretation of experimental data. The module will be largely run on a self-directed learning basis. Students will have access to past exam papers and will be encouraged to attempt questions from these. Tutorials, both formal class-based and informal, small-group meetings, will be held to solve sample problems from past papers as guidance in how to answer questions.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Complete basic mathematical calculations based on laboratory problems;
LO2	Understand, summarise and write an appropriate title of anonymised research papers;
LO3	Evaluate and understand experimental data from (micro)biologically relevant studies;
LO4	Critically assess experimental data and results and express opinions on those results.

MI437: Bacterial Pathogenesis (Semester:8 Optional)

Module Details

Title Short:	Bacterial Pathogenesis APPROVED
Language of Instruction:	English

Module Code:	MI437

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	CONOR O'BYRNE

Module Discipline:	MI - Microbiology

Module Description:	This module will explore the genetic basis of microbial pathogenicity, in representative gram-positive and gram-negative pathogens. The module will address virulence mechanisms and host pathogen interactions. Specific topics that will be covered include virulence factors, type III secretion systems and infection strategies.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the molecular interactions that occur when bacteria invade into host cells.
LO2	Critically evaluate research papers in the field of bacterial pathogenesis.
LO3	Explain how bacteria manipulate host cell signalling pathways and host cell behaviours
LO4	Discuss the benefits to the bacterium of manipulating host cell signalling pathways and host cell behaviours

MI439: The Meaning of Life: Bioinformatics (Semester:8 Optional)

Module Details

Title Short:	The Meaning of Life: Bioinformatics APPROVED
Language of Instruction:	English

Module Code:	MI439

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	GAVIN COLLINS

Module Discipline:	MI - Microbiology

Module Description:	The module will cover a range of topics in the theory of Bioinformatics, ranging from fundamental concepts on the Central Dogma of Biology, through sequencing technologies in genomics, transcriptomics, proteomics and metabolomics. It will provide students with an insight into the potential impact of bioinformatics data can have on our understanding of microbial phylogeny; microbial community functioning; and microbial processes, including pathogenesis. It will also provide training for students in the tools used to interpret DNA and amino acid sequence information, including database interrogations; phylogenetic analyses; and interpretation of protein structural motifs.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe the Central Dogma of Biology and the importance of Bioinformatics in modern Microbiology, medicine and environmental science;
LO2	discuss how next generation DNA sequencing technology can be used to advance our understanding of microbial phylogeny, physiology, and pathogenicity;
LO3	describe the tools available for proteomics and protein informatics;
LO4	oultine the strategies used for analyses of complex next-generation sequencing datasets;
LO5	describe the steps in developing bacterial diagnostics assays based on molecular targets
LO6	perform intermediate-level analyses of DNA, RNA and protein sequences using a range of tools, including sequence databases and alignment editors.

MI440: Dynamics of microbial gene regulation (Semester:8 Optional)

Module Details

Title Short:	Dynamics of microbial gene regulation APPROVED
Module Code:	MI440
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	2 programme(s)
Module Owner:	CYRIL CARROLL
Module Discipline:	MI - Microbiology
Module Description:	Bacteria inhabit almost every environment on the planet and they respond to the different environmental conditions they encounter. Bacteria can sometimes adapt to a single stressful condition and at other times they respond to multiple stresses.In this module, we take an overview of multigene regulation, at both the DNA and RNA level, in bacteria such as E. coli and Salmonella and explore examples of microbial responses drawn primarily from different kinds of environmental stresses.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the dynamics of Microbial gene expression at both the RNA and DNA level.
LO2	Demonstrate a broad comprehension of varied functions, roles and activities of translated and nontranslated RNAs of the bacterial cell
LO3	discribe the role of non-translated regulatory RNAs of the microbial cell
LO4	Describe the underlying regulatory mechanism of bacterial responce to environmental stress at the DNA, RNA and protein transduction level.
LO5	Outline in detail the bacterial SOS response to DNA damage
LO6	Explain the underlying regulatory mechanism of bacterial chemotaxis via protein signal transduction pathway.

MI442: Bioprocessors and Recombinant Protein Production (Semester:8 Optional)

Module Details

Title Short:	Bioprocessors and Recombinant Protein Production APPROVED
Language of Instruction:	English

Module Code:	MI442

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	GERARD FLEMING

Module Discipline:	MI - Microbiology

Module Description:	This module will examine how recombinant proteins are engineered in the context of productive microbial cell factories and how traditional and advanced bioprocess technologies are employed for the industrial-scale production of such products. This unit will introduce major expression systems – E. coli, yeast and mammalian cells, and cell-free – used in recombinant protein production. Factors affecting the choice of expression host and approaches to identifying bottlenecks in expression of biomedically and biotechnologically important products will be reviewed. The unit will also review recombinant biotherapeutics currently available on the market and consider how they are produced. Bioprocess technology will investigate the production of biomass, primary and secondary metabolite production on the industrial scale by means of technologies associated with submerged cultures and solid-state fermentations.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the common eukaryotic, prokaryotic and cell-free expression systems in which recombinant proteins can be produced.
LO2	Identify limitations and advantages of each of these systems.
LO3	Explain how recombinant protein production experiments can be evaluated.
LO4	Make and explain rational choices of expression systems for the production and purification of target recombinant proteins.
LO5	Show evidence of understanding of the underlying principles of the design and operation of submerged and solid-state bioprocessor systems by being able to describe and classify the key components and operational parameters of these reactors.
LO6	Be able to critically discuss and evaluate the relative merits of these systems for the production of cell biomass, primary /secondary metabolites and recombinant proteins.
LO7	Be able to translate their understanding of bioprocess systems by evidential composition and evaluation of practices as described in the published literature.

MI4101: Host microbe interactions (Semester:8 Optional)

Module Details

Title Short:	Host microbe interactions APPROVED
Language of Instruction:	English

Module Code:	MI4101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	MICHELLE KILCOYNE
Module Discipline:	MI - Microbiology
Module Level:	Honours
Module Data:	1 - 4 NON LAB
Module Description:	This module will explore the human gastrointestinal tract microbiome and host microbe interactions of commensals and pathogens, with a particular focus on the mucus layer and microbial glycobiology. This module also considers the impact of the microbiome on human health and immune function. Interactions between the hospital pathogen Staphylococcus aureus and the host will be explored with an emphasis on colonisation and biofilm mechanisms, virulence and antimicrobial tolerance.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the molecular interactions that occur upon commensal colonisation of the mucus layer.
LO2	Explain how the gut microbiome influences human health and immune function.
LO3	Describe the mechanisms of colonisation and biofilm used by staphylococci.
LO4	Describe how host–staphylococcal interactions influence biofilm formation, virulence and antimicrobial tolerance.

MI4102: Microbial Ecosystems Services & Systems Biology (Semester:8 Optional)

Module Details

Title Short:	Microbial Ecosystems Services & Systems Biology APPROVED
Language of Instruction:	English

Module Code:	MI4102

ECTS Credits:	5

NFQ Level:		**EQF Level:**		**EHEA Level:**	

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	ALEXANDRE DE MENEZES

Module Discipline:	MI - Microbiology

Module Data:	1 - 4 NON LAB

Module Description:	This module will focus on two distinct topics: i) the role of microbes in providing ecosystem services in different environments, and ii) the application of novel 'omics' methodologies to understand microbial consortia behaviour. In the first part of the course, microbial-driven ecosystem services will be discussed, particularly the role of microbes in nutrient cycling in natural and managed environments and in plant growth promotion and disease resistance. The role of microbial diversity, resilience and resistance will also be discussed. In the second part of the course, an EcoSystems [Micro]Biology approach to understanding the structure and function of complex communities will be discussed in detail; this will include the application of genomics, transcriptomics, proteomics and metabolomics to understand dynamic interactions between microbial trophic groups in complex systems.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain how microbes drive nutrient cycling in terrestrial and aquatic environments, showing an understanding of real-world impacts, e.g. nutrient cycling in agriculture and eutrophication.
LO2	Discuss the role of the plant microbiome in plant health promotion and disease resistance, show understanding of the "plant extended phenotype" concept and its potential implications in food security.
LO3	Show an understanding of microbial ecological concepts such as microbial diversity, resilience and resistance, and their relevance to environmental health.
LO4	Explain their understanding of techniques and approaches used in genomics, transcriptomics, proteomics and metabolomics to study microbial communities.
LO5	Discuss how Systems Biology approaches can be used to better understand potential functions, and real activity, in complex microbial communities.
LO6	Discuss future applications of this approach to optimise biotechnologies and the activity of microbial communities.

MI4103: Environmental Biotechnology (Semester:8 Optional)

Module Details

Title Short:	Environmental Biotechnology APPROVED
Language of Instruction:	English

Module Code:	MI4103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	GAVIN COLLINS

Module Discipline:	MI - Microbiology

Module Description:	This module will focus on the exploitation, and optimisation, of complex microbial communities in biotechnology. The following areas will be covered: (1) Important applications of anaerobic microbial communities, including in wastewater treatment, biorefining and conversions into energy. (2) Bioremediation of soils, sediments and oil spills. (3) Metal-microbe interactions will also be discussed in detail, and comprehensively, and will be focused on: metal removal from wastewater; biomining for metal recovery from metal ores; biooxidations for gold and silver mining; and acid mine drainage microbiology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss the application of microbial communities for a range of biotechnologies, including anaerobic digestion, microbial fuel cells and in biorefineries
LO2	Discuss the application of microbial communities for Bioremediation of soils, sediments and oil spills
LO3	Discuss biotechnologies for metal removal from wastewater; biomining for metal recovery from metal ores; and biooxidations for gold and silver mining.
LO4	Explain the microbiological basis of the biotechnologies covered by this module
LO5	Discuss the microbiology of acid mine drainage

MI4104: Scientific Communication (Semester:7 Optional)

Module Details

Title Short:	Scientific Communication APPROVED
Language of Instruction:	English

Module Code:	MI4104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	CONOR O'BYRNE

Module Discipline:	MI - Microbiology

Module Description:	A critical skill for any professional scientist is the ability to present their ideas and research in an accessible and engaging manner. Two commonly used formats are the scientific essay and the poster presentation. These two communication elements will be the focus of this module. Essay: Coherent, well structured, properly referenced scientific documents are the main means of disseminating research ideas and results within the scientific community and to a wider audience. Progress in science is driven by the dissemination of such written material and is also shaped by the critical peer evaluation that such documents receive (i.e, the process of peer review). The self-study essay module aims at combining essay writing with peer evaluation to develop these key research skills. Students will research and write a 2500 word essay on a topic chosen from a selection of 20 essay titles provided. The essay topics span a whole range of different areas of microbiology. Students will be expected to consult the primary scientific literature and to cite this literature appropriately in their essays. The essays will be marked by peer evaluation. Each essay will be independently evaluated by 5 peers. Then this group of 5 will convene to agree a final overall mark for the essay. The essays will be evaluated on 5 categories: Clarity and readability; Structure and presentation; Depth and level of detail; Creativity and use of novel arguments; Bibliography and citations. In order to train students in the peer evaluation process the essay writing will be preceded by a sample marking exercise, where students get to access essays from a previous year. This process will mirror exactly the process that will be used for the real peer evaluation. Poster: The findings of research projects are often presented in a semi-formal format of a poster, typically presented at national or international scientific conferences. The goal of poster is to explain the research goals and highlight the main findings of the study in an engaging manner that is easily accessible to other conference delegates in a short period of time. The skills necessary for this include an ability to present the project background and results in a visually appealing and clear manner, as well as an ability to talk about the results and wider context of the study. In this module students will receive instruction in typical poster formats with suggestions for optimal arrangements (as well as the pitfalls). They will then compile posters based on their first semester research projects. These will be presented at an open poster session which can be viewed by other students, postgraduate researchers and staff. Staff members will evaluated the posters.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Access information from the primary scientific literature
LO2	Write a coherent scientific essay
LO3	Evaluate scientific essays
LO4	Cite the scientific literature correctly
LO5	Explain and demonstrate the key elements of well written essay
LO6	Peer evaluate scientific essays
LO7	Construct and present scientific data in poster format

MP180: Applied Mathematics

(Semester:1 Optional)

Module Details

Title Short:	Applied Mathematics APPROVED
Language of Instruction:	English

Module Code:	MP180

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	6 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	AM - Applied Mathematics

Source:	Introducing Mechanics and Further mechanics by B. Jeffersona and T.Beadsworth. Classical Mechanics - a modern perspective by V.D. Barger and M.G. Olsson.

Module Description:	This is an introductory course in Applied Mathematics. The material presented assumes no prior knowledge of applied mathematics or honours second level mathematics. The course mainly covers topics in mechanics such as velocity and acceleration, Newton's laws, momentum and energy, harmonic motion, circular motion, rigid body motion and planetary motion. Some more general modelling problems are also discussed such as population modelling, Newton's law of cooling and radioactive decay. All the necessary mathematical tools required especially differential and integral calculus and vector methods are developed in the course

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	The student will be able to use mathematical tools such as calculus and vectors to model simple mechanical and other real-world systems
LO2	Solve problems in 1-dimensional kinematics relating position, velocity and acceleration
LO3	Apply vector methods to solve such problems in 2 or 3 dimensions and methods of differential and integral calculus
LO4	Apply Newton's laws to simple systems of forces
LO5	Be able to apply momentum and energy methods in simple mechanical systems
LO6	Solve for motion of circular and simple harmonic systems
LO7	Apply calculus to mathematically model simple real- world systems
LO8	Demonstrate an understanding of some more advanced topics such as rigid body motion, planetary motion and damped and forced simple harmonic motion

MP191: Mathematical Methods I (Semester:2 Core)

Module Details

Title Short:	Mathematical Methods I APPROVED
Language of Instruction:	English

Module Code:	MP191

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	GIUSEPPE ZURLO

Module Discipline:	AM - Applied Mathematics

Module Description:	The module is designed as an introductory course to the theory and applications of linear difference and ordinary differential equations. The module includes many examples of how these types of equations are used to describe real applications, especially economics applications. No prior knowledge of difference or differential equations is assumed.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Solve first- and second- order, linear, homogeneous and inhomogeneous difference equations
LO2	Solve first- and second-order, linear, homogeneous and inhomogeneous ordinary differential equations, using the various methods of separation of variables, integrating factor, and judicious guessing of a particular solution

MP211: Modelling, Analysis and Simulation (Semester:4 Core)

Module Details

Title Short:	Modelling, Analysis and Simulation APPROVED
Language of Instruction:	English

Module Code:	MP211

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	PETRI TOMAS PIIROINEN

Module Discipline:	AM - Applied Mathematics

Module Description:	This course is designed to introduce the concepts, analysis methods and economic applications of dynamical systems. A project describing different models will be presented at the end of the course.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Set up basic difference equations for some economic models.
LO2	Solve difference equations.
LO3	Set up basic differential equations for some economic models.
LO4	Solve differential equations.
LO5	Use the computer software Matlab to simulate difference and differential equations.
LO6	Write project reports.
LO7	Present a project in front of an audience.

MP231: Mathematical Methods I (Semester:3 Group not available to select online)

Module Details

Title Short:	Mathematical Methods I APPROVED
Language of Instruction:	English

Module Code:	MP231

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	14 programme(s)

Module Owner:	MICHAEL TUITE

Module Discipline:	AM - Applied Mathematics

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	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.
LO2	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.
LO3	Carry out multiple integrals of a function; interpret results in terms of area and/or volume; calculate the area bounded by multiple curves.
LO4	Exhibit Green's theorem by calculating the relevant double integral and single (line) integrals.

MP232: Mathematical Methods II (Semester:4 Group not available to select online)

Module Details

Title Short:	Mathematical Methods II APPROVED
Language of Instruction:	English

Module Code:	MP232

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	13 programme(s)

Module Owner:	MARTIN MEERE

Module Discipline:	AM - Applied Mathematics

Module Description:	This is a mathematical methods course that considers the following topics: Laplace transforms, vector calculus, multiple integration and integral theorems.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	calculate the Laplace transforms of some elementary functions;
LO2	calculate the inverse Laplace transform of some elementary functions using standard techniques;
LO3	solve various initial value problems for ordinary differential equations using Laplace transforms;
LO4	calculate the gradient and directional derivative of a scalar field and be able to interpret these quantities;
LO5	calculate the divergence and curl of a vector field and be able to interpret these quantities;
LO6	find the normal of a surface, find the tangent plane to a surface, and calculate surface integrals;
LO7	calculate volume integrals and be able to verify the divergence theorem for elementary volumes and vector fields.

MP236: Mechanics I (Semester:3 Group not available to select online)

Module Details

Title Short:	Mechanics I APPROVED
Language of Instruction:	English

Module Code:	MP236

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	11 programme(s)

Module Owner:	MARTIN MEERE

Module Discipline:	AM - Applied Mathematics

Module Description:	This is a mechanics course for students who have already been exposed to an elementary mechanics course. Topics covered include dimensional analysis, variational calculus, Lagrangian mechanics and rigid body motion.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	re-write a law expressed in dimensional quantities in an equivalent dimensionless form using the Buckingham pi theorem;
LO2	analyse some simple systems using dimensional analysis and appropriate experimental data;
LO3	use the concept of similarity in conjunction with dimensional analysis to aid in the design of scale models;
LO4	solve some simple optimisation problems in the calculus of variations using the Euler Lagrange equations;
LO5	obtain the equations of motion of mechanical systems using the Lagrangian formulation of mechanics;
LO6	mathematically model the motion of a rigid body, and solve some simple problems involving rigid bodies.

MP237: Mechanics II (Semester:4 Group not available to select online)

Module Details

Title Short:	Mechanics II APPROVED
Language of Instruction:	English

Module Code:	MP237

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	11 programme(s)

Module Owner:	MARTIN MEERE

Module Discipline:	AM - Applied Mathematics

Module Description:	This course consists principally of an introduction to the theory and applications of partial differential equations. Topics covered include the heat equation, the wave equation, Laplace's equation, and a brief introduction to the special theory of relativity.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	formulate a well-posed problem for the heat equation;
LO2	solve some initial boundary value problems for the heat equation using the method of separation of variables;
LO3	find the general solution to the one-dimensional wave equation using characteristic variables;
LO4	construct solutions to the one-dimensional wave equation on an infinite and semi-infinite domain using characteristic variables;
LO5	construct separable variable solutions to the wave equation;
LO6	construct separable variable solutions to Laplace's equation;
LO7	state Einstein's two postulates of special relativity;
LO8	perform simple calculations in special relativity involving time dilation, length contraction, velocity transformations, energy and momentum.

MP305: Modelling I
(Semester:5 Optional)

Module Details

Title Short:	Modelling I APPROVED
Language of Instruction:	English

Module Code:	MP305

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	19 programme(s)

Module Owner:	PETRI TOMAS PIIROINEN

Module Discipline:	AM - Applied Mathematics

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	This course introduces the student to modelling techniques for four different real-world problems. The problems cover the topics network-flow optimisation, activity networks, network analysis and game theory.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Set up and solve basic network flow problems.
LO2	Set up and solve basic activity network problems.
LO3	Use adjacency matrices to represent different types of networks.
LO4	Use degrees measures to describe different features of networks.
LO5	Describe what network centrality and PageRank are.
LO6	Describe what a matrix game is.
LO7	Analyse any 2 by N matrix game and find the optimal game.
LO8	Use the software Maple in to analyse problems from the topics taught in the course.

MP307: Modelling II
(Semester:6 Optional)

Module Details

Title Short:	Modelling II APPROVED
Module Code:	MP307
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	15 programme(s)
Module Owner:	PETRI TOMAS PIIROINEN
Module Discipline:	AM - Applied Mathematics
Module Description:	This course introduces the student to modelling techniques for three different real-world problem areas. The problems cover the topics queueing theory, population dynamics and control theory.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Set up and solve basic queueing theory problems.
LO2	Set up and solve basic population dynamics problems.
LO3	Set up and solve basic control theory problems.
LO4	Be able to use the software MAPLE to analyse problems from queueing theory and population dynamics.

MP345: Mathematical Methods I
(Semester:5 Optional)

Module Details

Title Short:	Mathematical Methods I APPROVED
Language of Instruction:	English

Module Code:	MP345

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	15 programme(s)

Module Owner:	MICHEL DESTRADE

Module Discipline:	AM - Applied Mathematics

Module Description:	This course introduces some advanced methods of mathematical physics for solving ordinary differential equations, using analytical, series approximation and numerical methods.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	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;
LO2	Find a second, linearly independent, solution to a second-order differential equation when one is known;
LO3	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;
LO4	Derive orthogonality relations for trigonometric, Legendre and Bessel functions;
LO5	Compute real integrals using the theorems of complex contour integration.
LO6	Approximate the solution to a second-order ordinary differential equation using finite differences

MP346: Mathematical Methods II (Semester:6 Optional)

Module Details

Title Short:	Mathematical Methods II APPROVED
Language of Instruction:	English

Module Code:	MP346

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	15 programme(s)

Module Owner:	MARTIN MEERE

Module Discipline:	AM - Applied Mathematics

Module Description:	This is a mathematical methods course, and amongst the topics considered are the heat equation, Laplace's equation, Sturm-Liouville theory, the Fourier transform, and the numerical solution of partial differential equations using finite difference techniques.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Solve the 1-dimensional heat equation subject to different boundary conditions and initial conditions
LO2	Prove orthogonality of eigensolutions and reality of eigenvalues of a Sturm-Liouville system
LO3	Calculate eigenvalues and construct corresponding eigenfunctions for some simple Sturm-Liouville problems
LO4	Solve the 2-dimensional Laplace equation subject to different boundary conditions in a rectangular or a rotationally symmetric region
LO5	Solve the 1-dimensional heat equation on an infinite region by use of the Fourier transform
LO6	Solve the 1-d heat equation numerically by use of the finite difference method

MP365: Fluid Mechanics
(Semester:6 Optional)

Module Details

Title Short:	Fluid Mechanics APPROVED
Language of Instruction:	English

Module Code:	MP365

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	12 programme(s)

Module Owner:	MICHEL DESTRADE

Module Discipline:	AM - Applied Mathematics

Module Description:	(This course will be run every other year.) This course consists of an introduction to the theory of fluid mechanics. Topics covered include: a review of vector calculus and differential operators, ideal fluids, Bernoulli's equation, irrotational flow, stream functions, potential theory, the Navier-Stokes equations, elementary viscous flow with examples, very viscous flows.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	become familiar with vector calculus, index notation, differential operators;
LO2	mathematically model the behaviour of an ideal fluid;
LO3	superpose elementary stream solutions to construct the solution of a flow past an obstacle;
LO4	understand the assumptions made in deriving the Navier-Stokes equations for fluid motion;
LO5	construct some analytical solutions for some elementary viscous fluid flows.

MP366: Electromagnetism (Semester:5 Optional)

Module Details

Title Short:	Electromagnetism APPROVED
Language of Instruction:	English

Module Code:	MP366

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	MARTIN MEERE

Module Discipline:	AM - Applied Mathematics

Module Description:	(This course runs every other year.) This course introduces the theory of electromagnetism. Topics covered include electrostatics, the electrostatics of materials, magnetostatics, the magnetostatics of materials, and a brief introduction to Maxwell's laws.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	calculate electric fields for distributions of point charges, make rough sketches of electric field lines for some simple charge distributions;
LO2	calculate electric fields in geometries with high symmetry using Gauss's law, calculate the capacitance of some standard capacitors;
LO3	approximate electric fields at large distances from a charge source using a multipole expansion;
LO4	calculate the electric field and polarization in linear dielectrics with simple geometries by solving boundary value problems;
LO5	calculate magnetic fields for some simple systems by direct integration;
LO6	calculate magnetic fields for systems with high symmetry using Ampere's law;
LO7	derive the wave equation from Maxwell's laws in vacuum in the absence of sources;
LO8	construct plane wave solutions to Maxwell's equations in vacuum and calculate the energy associated with such solutions.

MP403: Cosmology And General Relativity (Semester:8 Optional)

Module Details

Title Short:	Cosmology And General Relativity APPROVED
Module Code:	MP403
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	9 programme(s)
Module Owner:	MICHAEL TUITE
Module Discipline:	AM - Applied Mathematics
Module Level:	Honours
Module Description:	In the study of cosmology where gravitation is the dominant force over the large scales considered, general relativity is the basic component. This course introduces general relativity. Topics covered include geometry, geodesics, black holes, different model universes and cosmogony.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Find the Gaussian curvature of a 2-dimensional space;
LO2	Use the Euler-Lagrange equations to find the geodesics of a space-time;
LO3	Derive of the Schwarzschild solution of Einstein's field equations using physical arguments;
LO4	Find the event horizon of a spherically symmetric black hole;
LO5	Use the concepts of general relativity to derive the Robertson-Walker line element;
LO6	Use dimensional analysis to derive the Friedmann equation;
LO7	Classify the solutions of the Friedman equation and the model universes they describe.

MP420: Applied Mathematics Project
(Semester:8 Optional)

Module Details

Title Short:	Applied Mathematics Project APPROVED
Module Code:	MP420
ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	6 programme(s)
Module Owner:	PETRI TOMAS PIIROINEN
Module Discipline:	AM - Applied Mathematics
Module Description:	In this module, the student works on an Applied Mathematics problem under the supervision of an academic at the School of Mathematics, Statistics and Applied Mathematics. The student is required to produce a mid-term project report, a final project report, and to deliver an oral presentation on the project to members of the School.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	conduct a literature search on an applied mathematics topic
LO2	work under supervision and individually on an applied mathematics subject
LO3	organise their results into a written document
LO4	use computational methods as required
LO5	use a mathematics typesetting software or an equation editor in a word processor
LO6	summarise their report into a visual presentation
LO7	deliver a clear presentation of their results
LO8	answer questions about their report.

MP491: Non Linear Systems (Semester:6 Optional)

Module Details

Title Short:	Non Linear Systems APPROVED
Module Code:	MP491
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	16 programme(s)
Module Owner:	PETRI TOMAS PIIROINEN
Module Discipline:	AM - Applied Mathematics
Module Level:	Honours
Module Description:	This course is an introductuion to the analysis of systems of nonlinear Ordinary Differential Equations (ODEs) and Maps.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Locate and calculate the stability for equilibria in 1-dim ODEs;
LO2	Locate and classify bifurcations for equilibria in 1-dim ODEs;
LO3	Locate, classify and calculate the stability for equilibria in linear 2-dim systems of ODEs;
LO4	Sketch phase-plane portraits about equilibria in linear 2-dim systems of ODEs;
LO5	Locate equilibria in nonlinear 2-dim systems of ODEs;
LO6	Linearise nonlinear 2-dim systems of ODEs, calculate the linear stability of equilibria and classify equilibria;
LO7	Sketch phase-plane portraits of nonlinear 2-dim systems of ODEs using iso-curves;
LO8	Analyse 2-dim Hamiltonian systems and sketch their phase-plane portraits;
LO9	Locate and classify Hopf bifurcations in nonlinear 2-dim systems of ODEs, and determine the stability of the corresponding limit cycles;
LO10	Locate and calculate the stability for fixed points and periodic orbits in 1-dim nonlinear maps;
LO11	Locate bifurcations in 1-dim nonlinear maps;
LO12	Describe period-doubling cascades to chaos in 1-dim nonlinear maps.

MP494: Partial Differential Equations (Semester:5 Optional)

Module Details

Title Short:	Partial Differential Equations APPROVED
Language of Instruction:	English

Module Code:	MP494

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	11 programme(s)

Module Owner:	MARTIN MEERE

Module Discipline:	AM - Applied Mathematics

Module Description:	(This course will run every other year.) This course introduces the theory of partial differential equations (PDEs).Topics covered include first order PDEs, linear second order PDEs in two variables, maximum principles and well-posedness of problems, separable variable and similarity solutions.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	solve a first order linear partial differential equation using the method of characteristics;
LO2	solve some nonlinear first order partial differential equations using Charpit's method;
LO3	classify second order linear partial differential equations in two variables and reduce them to canonical form;
LO4	calculate the general solution to some second order linear partial differential equations;
LO5	prove the maximum principle for Laplace's equation in a planar domain and be able to apply it to prove that some problems have unique solutions;
LO6	rigorously justify the validity of some separable variable solutions to Laplace's equation;
LO7	prove a maximum principle for the heat equation;
LO8	construct simple similarity solutions to some parabolic equations.

MR409: Marine Science Essay and Presentation (Semester:7 Core)

Module Details

Title Short:	Marine Science Essay and Presentation APPROVED
Module Code:	MR409
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1 and Semester 2
Module Delivered in	1 programme(s)
Module Owner:	MARK PETER JOHNSON
Module Discipline:	EOS - Earth & Ocean Sciences
Module Description:	Module involves writing two focussed essays on topics offered, with the intention of broadening and deepening learners' abilities at reasoning, research and presenting a logical set of arguments. A single presentation is included to reinforce skills in organization and presentation of technical material to peers.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Find scientific literature relevant to a chosen topic, drawn from a range of disciplines
LO2	Organize the information available in literature into a coherent written essay
LO3	Identify differing points of view in the literature
LO4	Support assertions and cite literature appropriately
LO5	Evaluate information from different sources
LO6	Present a short and structured verbal summary of a scientific topic
LO7	Appreciate how feedback from one task can inform a second

MR413: Research Project (Semester:7 Core)

Module Details

Title Short:	Research Project APPROVED
Module Code:	MR413
ECTS Credits:	20
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1 and Semester 2
Module Delivered in	1 programme(s)
Module Owner:	MARK PETER JOHNSON
Module Discipline:	EOS - Earth & Ocean Sciences
Module Description:	The learner will take responsibility for carrying out a piece of scientific research under the guidance of a member of staff. This may involve laboratory, field, computer simulations or any other method appropriate to research.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	read and critically appraise interdisciplinary scientific literature and place their own work within the context of previously conducted scientific research
LO2	collect data on the phenomenon under investigation
LO3	obtain high quality data through attention to detail in record-keeping and related aspects of the process
LO4	analyse data using appropriate statistical techniques
LO5	describe the rationale for the project, including a statement of aims and sufficient detail for the report to be a lasting record of the research carried out.
LO6	draw conclusions and make recommendations for future research in the study area
LO7	communicate about the project appropriately in writing and through oral presentation, with an awareness of the scientific conventions for the level of information in terms of detail, including the composition of graphs and tables
LO8	take responsibility for tasks, seeking assistance where appropriate

MR414: Field Skills in Marine Science
(Semester:7 Core)

Module Details

Title Short:	Field Skills in Marine Science APPROVED
Language of Instruction:	English

Module Code:	MR414

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	MARTIN WHITE

Module Discipline:	EOS - Earth & Ocean Sciences

Module Description:	This module provides the student with detailed practical knowledge necessary to design, plan and execute a multidisciplinary oceanographic survey, including sample collection and processing and post-survey data analysis and interpretation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Design, plan and execute an oceanographic research survey.
LO2	Work in teams to collect and preserve oceanographic samples.
LO3	Apply the range of skills required to collect, preserve, and analyse oceanographic samples.
LO4	Describe the application of scientific sampling equipment and instrumentation onboard a survey vessel.
LO5	Acquire, process and analyse oceanographic data
LO6	Prepare a detailed scientific survey report

PAB2101: AgriBiosciences (Semester:4 Group not available to select online)

Module Details

Title Short:	AgriBiosciences APPROVED
Language of Instruction:	English

Module Code:	PAB2101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	SARA FARRONA

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	Since the origin of agriculture ten thousand years ago, innovations in genetics and agricultural (plant & livestock) biosciences have continued to play a critical role in ensuring future food security and sustainable development on our planet. This module provides cutting-edge training in agricultural biosciences (plants, animals), using case studies of major scientific advances and bio-challenges.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the genetic and biological origins of agriculture, domestication and human civilisation
LO2	Describe and appreciate how conventional and molecular genetics plays a role in provision of food, fibre, feed, fuel and other bio-derived resources supporting humanity
LO3	Understand at the molecular level the types of genetic variation and biochemical processes that artificial selection and breeding processes act on for improvement of crops and livestock
LO4	Understand how crop and livestock improvement is conducted and the role that current advances in genetics, biochemistry and biosciences are playing in developing improved varieties, breeds and genotypes.
LO5	Describe and critically evaluate the major challenges for sustainable agricultural intensification over the decades ahead to meet growing demand.

PAB3101: Soil Science
(Semester:5 Optional)

Module Details

Title Short:	Soil Science APPROVED
Language of Instruction:	English

Module Code:	PAB3101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	CHARLES SPILLANE

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	An introduction to soil sciences in natural and agricultural environments. The module will also include assessment of plant interactions with their physical environment. The course examines how the distribution and growth of plants responds to climate, soil, nutrients and salinity. The course will prepare students for understanding soil-plant-environment interactions in ecological, physiological and agronomic contexts.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Critically assess the importance of links between plant and crop communities and their prevailing environment, including climate, soil type, and the availability of water and nutrients.
LO2	Relate the characters of plant communities to variation in nutrient status, soil and salinity.
LO3	Describe, measure and calculate key characteristics of soils from different habitats.
LO4	Make and interpret soil profiles and texture triangles.
LO5	Relate different soils to their possible agricultural uses, and consider the possible environmental impacts of these.

PAB3102: AgriBiosciences for Sustainable Global Development (Semester:5 Optional)

Module Details

Title Short:	AgriBiosciences for Sustainable Global Development APPROVED
Language of Instruction:	English

Module Code:	PAB3102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	6 programme(s)

Module Owner:	CHARLES SPILLANE

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	BPS304:Life forms arose on earth 3.5 billion years ago, yet human civilisation emerged ~10,000 years due to domestication of plants & animals (the advent of agriculture). By 2050, the human population will be 9 billion (9000 million) people with requirements for food, feed, fuel (energy), fibre, fuel, chemicals & medicines to sustain their health & livelihoods. Agribiosciences innovations are required to ensure future food security & sustainable development, particularly in developing countries

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand what is meant by sustainable global development and food security
LO2	Describe the evidence-base for the emerging mega-challenges for sustainable development and food security
LO3	Critically appraise the relative role that science and technology (in particular agribiosciences) can play in meeting current and future needs of humanity
LO4	Identify and detail the key sectors, issues and areas where innovations are necessary in order to transition humanity to a more sustainable development trajectory
LO5	Gain an understanding of agribiosciences research and development underway at present to meet urgent needs regarding food security and sustainable development in developing countries
LO6	Have developed critical thinking skills for appraising and identifying different pathways that can be taken towards sustainable development and food security.
LO7	Have developed foresight and horizon-scanning capabilities for identification of key areas where innovations are necessary for sustainable development and food security
LO8	Be proficient in science communication, and understand how policy and media interfaces with science and technology.

PAB3103: Plant and Agricultural Genetics (Semester:6 Optional)

Module Details

Title Short:	Plant and Agricultural Genetics APPROVED
Language of Instruction:	English

Module Code:	PAB3103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	SARA FARRONA

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	This module provides training in fundamental and applied genetics in relation to plants (crops) and animals (livestock), including molecular agricultural biotechnologies. Conventional, molecular, population and quantitative genetics aspects will be covered, including the latest advances in genetics, genomics, genetic modifications and applied systems biology as applied to crops and livestock.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the role that agricultural plant and animal research has played and continues to play in the emergence of our current level of understanding of genetics
LO2	Describe and discuss different genetic techniques and approaches for the improvement of crops and livestock
LO3	Critically appraise the contribution that genetics has made to agricultural productivity compared to other innovations
LO4	Use scientific evidence to appraise benefits or risks associated with new varieties (genotypes) of crops or livestock
LO5	Understand the distinctions, relationships and synergies between different branches of genetics (e.g. mendelian, population, quantitative, epigenetics etc)
LO6	Developed their abilities to read, interpret, appraise and present the results in genetics research papers from leading-edge scientific journals.
LO7	Have gained an understanding of multiple traits of relevance to agriculture that have been improved through past and current advances in genetics.
LO8	Be proficient in science communication, and understand how policy and media interfaces with the field of plant and livestock genetics

PAB3104: Systems Biology of Plant-Environment Interactions (Semester:6 Optional)

Module Details

Title Short:	Systems Biology of Plant-Environment Interactions APPROVED
Language of Instruction:	English

Module Code:	PAB3104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	RONAN SULPICE

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	This module examines plant growth, development and interactions with the biotic and abiotic environment in a holistic manner taking into account regulation at the levels of gene expression, enzyme activities, and the role of specific metabolites. The course is taught through lectures and practicals enabling students to appreciate how plants can adapt in various environments.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Develop an appreciation of how plant systems biology research is designed, performed and presented
LO2	Outline the mechanisms of cellular development at meristems and vascular tissue
LO3	Discuss the importance of interactions with the environment that control plant growth and flowering time
LO4	Critique the importance of secondary metabolites for interactions between plants and their environment
LO5	Explain how and why plants can sense changes in their nutrient status and adjust their growth and metabolism over different time-scales accordingly
LO6	Describe the role of the circadian clock in plant metabolism

PAB4101: PAB Research Project
(Semester:7 Optional)

Module Details

Title Short:	PAB Research Project APPROVED
Language of Instruction:	English

Module Code:	PAB4101

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	RONAN SULPICE

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	The PAB Research Project is conducted and completed in both Semester 1 and 2, and is conducted research supervision of a PAB staff member. The student conducts an extensive literature review and conducts research experiments that provide an in depth immersion in the principles of scientific research in plant and agribiosciences. The student makes an oral presentation of their results, and prepares a written thesis under the guidance of their supervisor.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand how to design and conduct scientific research in botany and plant science to a professional level.
LO2	Have gained an understanding of the scientific method, including fomulation of testable hypotheses and an appreciation of the importance of controls
LO3	Write a scientific review as an introductory chapter, using referencing software such as Endnote and to a professional format
LO4	Draft a methods and materials section of a thesis or scientific paper so that the experiments could be repeated by other researchers.
LO5	Analyse and present scientific data in a critical and coherent manner, including through the use of statistics to test for significance of results obtained.
LO6	Interpret and critically analyse and evaluate results obtained, including how results obtained relate to results published in the scientific literature
LO7	Effectively develop scientific research presentations and to deliver them to audiences and to deal with scientific questions posed.
LO8	Evaluate whether they have a talent, affinity and aptitute for scientific research that is conducted at a professional and competitive level.

PAB4102: Plant Genetics & Systems Biology (Semester:7 Optional)

Module Details

Title Short:	Plant Genetics & Systems Biology APPROVED
Language of Instruction:	English

Module Code:	PAB4102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	4 programme(s)

Module Owner:	RONAN SULPICE

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	Module provides advanced training in plant molecular genetics and systems biology. Fundamental aspects covered including nuclear and extranuclear inheritance, meiosis, genomes and comparative genetics, organellar genetics, epigenetics, transposons, cell and tissue biology, plant developmental and reproductive genetics, plant cell wall, plant model organisms, genetic and metabolic engineering, chromosomes & polyploidy, synthetic biology, and systems biology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Have developed a solid understanding of plant genetics and systems biology
LO2	Understand relationships between genes, genomes, genotypes, phenotypes and environmental interactions in the contex of plant biology
LO3	Describe the developmental biology and genetics of key organs that define a plant
LO4	Define what is meant by a metabolic pathway or network and the factors that can influence the functioning of metabolism in plants
LO5	Have an appreciation of basic principles and techniques of genetic modifications, systems biology and synthetic biology
LO6	Explain the relationship between genetics and epigenetics, in the context of fundamental and applied plant biology
LO7	Have developed a capability to read, interpret and discuss the evidence presented in reviews and primary research papers.

PAB4103: Climate Change, Plants & Agriculture (Semester:7 Optional)

Module Details

Title Short:	Climate Change, Plants & Agriculture APPROVED
Language of Instruction:	English

Module Code:	PAB4103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	PETER MC KEOWN

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	This module provides students with an advanced introduction to challenges regarding climate change, crop production and agriculture. The module will present the latest findings regarding climate change models, crop yield modelling and approaches underway to develop climate smart agricultural processes.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the links between plant evolution and changing atmospheric composition
LO2	Have an understanding of impacts of climate change on crop and agricultural production.
LO3	Relate current issues in plant biology to ongoing climate change challenges to agriculture, ecosystems and sustainable development

PAB4104: Plant and Agri-Biotechnologies (Semester:8 Optional)

Module Details

Title Short:	Plant and Agri-Biotechnologies APPROVED
Language of Instruction:	English

Module Code:	PAB4104

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	SARA FARRONA

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	This module provides an advanced understanding of plant and agri-biotechnologies. Such biotechnologies encompass a wide range of technologies and they can be applied for a range of different purposes, such as the genetic improvement of plant varieties and animal populations to increase their yields or efficiency; genetic characterization and conservation of genetic resources; plant or animal disease diagnosis; vaccine development; and improvement of feeds. Some of the technologies may be applied to all the food and agriculture sectors, such as the use of molecular DNA markers or genetic modification, while others are more sector-specific, such as tissue culture (in crops and forest trees), embryo transfer (livestock) or triploidization and sex-reversal (fish). When appropriately integrated with other technologies for the production of food, agricultural products and services, biotechnology can be of significant assistance in meeting the needs of an expanding and increasingly urbanized population.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	To provide an advanced understanding of the range and applications of plant and agricultural biotechnologies for meeting human needs.
LO2	To be able to describe plant and livestock improvement strategies using biotechnological approaches.
LO3	To consider how biotechnological approaches can be used to meet agricultural and sustainability challenges.

PAB4105: AgriBiosciences Research Internship Project (Semester:7 Optional)

Module Details

Title Short:	AgriBiosciences Research Internship Project APPROVED
Language of Instruction:	English

Module Code:	PAB4105

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	CHARLES SPILLANE

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	This module provides the opportunity for students to engage in an agribiosciences internship project with a partner organisation of the Plant and AgriBiosciences Research Centre (PABC) e.g. Teagasc.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Communicate the role that agricultural research plays in the field of biosciences.
LO2	Be able to design and conduct scientific research in the agiobiosciences to a professional level.
LO3	Have gained an understanding of the scientific method, including fomulation of testable hypotheses and an appreciation of the importance of controls
LO4	Write a scientific review as an introductory chapter, using referencing software such as Endnote and to a professional format
LO5	Be able to draft a methods and materials section of a thesis or scientific paper so that the experiments could be repeated by other researchers
LO6	Analyse and present scientific data in a critical and coherent manner, including through the use of statistics to test for significance of results obtained.
LO7	Developed their abilities to read, interpret, appraise and present the results in research papers from leading scientific journals.
LO8	Effectively develop scientific research presentations and to deliver them to audiences and to deal with scientific questions posed.

PAB4106: Current Topics in Plant & AgriBiosciences (Semester:7 Optional)

Module Details

Title Short:	Current Topics in Plant & AgriBiosciences APPROVED
Language of Instruction:	English

Module Code:	PAB4106

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	4 programme(s)

Module Owner:	SARA FARRONA

Module Discipline:	NAT_SCI - School of Natural Sciences

Module Description:	This module provides students with training and state-of-the art knowledge on a range of current topics in plant and agribiosciences. Through a combination of essay writing assignments, attendance at seminar-series, career & entrepreneurship development training and didactic interaction with visiting plant researchers and scientists, students will gain exposure and training in plant and agribioscience topics of direct relevance to real life issues and applications.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate a keen interest and understanding of current topics in plant and agricultural biosciences
LO2	Research and write scientific essays on a range of assigned topics
LO3	Demonstrate attendance and engagement in research seminars throughout the Honours year of their degree
LO4	Describe the differences between scientific and non-scientific knowledge sources
LO5	Show a capability to read, interpret and discuss the evidence presented in reviews and primary research literature relating to current topics in plant and agri-biosciences, and accounts of the experimental techniques which support them
LO6	Have gained an understanding of career pathways and opportunities in Ireland and worldwide for students with a training in plant and agri-biosciences

PH101: Physics
(Semester:1 Optional)

Module Details

Title Short:	Physics APPROVED
Language of Instruction:	English

Module Code:	PH101

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	12 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This module lays a broad foundation in physics, both for students who will continue to study physics in subsequent years of their degree programme and for those who will continue to study other subjects. No prior knowledge of physics is assumed, though a significant minority of students (perhaps 33%) will have a Leaving Certificate qualification in physics. The level of mathematics required is simple algebra and trigonometry.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand and explain basic physical principles related to topics such as motion, forces, energy, heat, waves, electricity, light, atoms and radiation.
LO2	Identify basic physical principles governing the behaviour of simple systems.
LO3	Describe physical processes using simple equations and solve numerical problems.
LO4	Make measurements in the physics laboratory.
LO5	Record and analyze experimental data and draw conclusions based on these data.

PH222: Astrophysical Concepts
(Semester:5 Optional)

Module Details

Title Short:	Astrophysical Concepts APPROVED
Language of Instruction:	English

Module Code:	PH222

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus
LO4	analyze physical situations using concepts, laws and techniques learned in this module
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH328: Physics of the Environment I (Semester:5 Optional)

Module Details

Title Short:	Physics of the Environment I APPROVED
Language of Instruction:	English

Module Code:	PH328

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	14 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This module responds to the need to understand the physics behind environmental problems such as air pollution, climate change, fuel shortages, etc. The focus is on air pollution

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define atmospheric pressure, temperature, humidity, density and describe the pattern of variation of these parameter values in the atmosphere with varying altitude.
LO2	Explain the principles of operation of state-of-the-art scientific equipment used to measure the above parameter values and compare different models.
LO3	Describe the relationship, as informed by current research, between adverse respiratory health due to air pollution exposure both indoors and outdoors, and also between adverse auditory health and occupational noise exposure
LO4	Recognise the location of legislative documentation on environmental noise control, occupational noise control, and urban air quality.

PH329: Physics of the Environment II (Semester:6 Optional)

Module Details

Title Short:	Physics of the Environment II APPROVED
Language of Instruction:	English

Module Code:	PH329

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	13 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This course responds to the need to understand the physics behind environmental challenges such as fossil fuel combustion and its associated atmospheric pollution burden, renewable energy technology, nuclear power, nuclear accidents and radiation protection

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define thermal comfort and describe the environmental parameters that are required as inputs for the Thermal Comfort Equation.
LO2	Explain the principles of operation of fossil fuel combustion facilities, and estimate the rate of CO2 production associated with given fossil fuel combustion scenarios.
LO3	Explain the principles of operation of various renewable energy technologies, such as wind turbines, wave generators and fuel cells.
LO4	Describe the nuclear fuel cycle, and the sequence of events that resulted in accidents at nuclear installations such as Chernobyl and Fukushima.
LO5	Recognise the location of legislative documentation on environmental and occupational radiation protection.

PH331: Wave Optics
(Semester:5 Optional)

Module Details

Title Short:	Wave Optics APPROVED
Language of Instruction:	English

Module Code:	PH331

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Data:	1 - 4 NON LAB

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	Outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	Analyze physical situations using concepts, laws and techniques learned in this module.
LO5	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH333: Quantum Physics
(Semester:5 Optional)

Module Details

Title Short:	Quantum Physics APPROVED
Language of Instruction:	English

Module Code:	PH333

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Data:	1 - 4 NON LAB

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define terms and explain concepts relating to the physical principles covered by this module's syllabus
LO2	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.
LO3	Outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	Analyze physical situations using concepts, laws and techniques learned in this module.
LO5	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH335: Nuclear & Particle Physics
(Semester:6 Optional)

Module Details

Title Short:	Nuclear & Particle Physics APPROVED
Language of Instruction:	English

Module Code:	PH335

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Data:	1 - 4 NON LAB

Module Description:	In this module students learn how subatomic particles form nuclei, study nuclear properties, and radioactive decay, and see how nuclear energy may be released in fission and fusion processes. Students also study fundamental particles, which are the building blocks of nature, and consider the ways in which these particles interact with each other. Prior knowledge is assumed to the level of material covered in PH2XX Thermodynamics and Atomic Physics and PH333 Quantum Physics.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	Outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	Analyze physical situations using concepts, laws and techniques learned in this module.
LO5	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH337: Thermal Physics
(Semester:6 Optional)

Module Details

Title Short:	Thermal Physics APPROVED
Language of Instruction:	English

Module Code:	PH337

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Data:	1 - 4 NON LAB

Module Description:	This module provides a comprehensive microscopic interpretation of the laws of thermodynamics based on statistical mechanics and probability theory. Some principles of quantum physics are included.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	Outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	Analyze physical situations using concepts, laws and techniques learned in this module.
LO5	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH338: Properties of Materials (Semester:6 Optional)

Module Details

Title Short:	Properties of Materials APPROVED
Language of Instruction:	English

Module Code:	PH338

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Data:	1 - 4 NON LAB

Module Description:	This course provides a comprehensive introduction to the physics of materials. The mechanical, thermal, electronic, and optical properties of “hard” and “soft” condensed matter are introduced using concepts primarily based on classical physics with some quantum concepts where appropriate.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define terms and explain concepts relating to the physical principles covered by this module’s syllabus.
LO2	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.
LO3	Outline applications to real-world situations of the physical principles covered by this module’s syllabus.
LO4	Analyze physical situations using concepts, laws and techniques learned in this module.
LO5	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module’s syllabus.

PH340: Biomedical Physics (Semester:6 Optional)

Module Details

Title Short:	Biomedical Physics APPROVED
Language of Instruction:	English

Module Code:	PH340

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This course is designed to demonstrate how imaging methods utilize physical principles to address problems in clinical diagnosis, patient management and biomedical research. This module also covers the physics of radiotherapy and future directions for imaging & therapy.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	identify the major medical imaging methods and methods used in biomedical research.
LO2	describe the physical processes underlying major medical imaging modalities.
LO3	understand the essential mathematical concepts of image formation and reconstruction.
LO4	describe methods for generating 2D and 3D medical images.
LO5	explain the properties of medical images.
LO6	describe a variety of applications of medical imaging techniques.
LO7	understand the role of physics in radiotherapy

PH341: Measurement of Health Hazards at Work (Semester:5 Optional)

Module Details

Title Short:	Measurement of Health Hazards at Work APPROVED
Language of Instruction:	English

Module Code:	PH341

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	understand the role of the occupational hygiene professional within the health and safety function
LO2	identify, locate and interpret sources of occupational hygiene information, relevant legislation, standards and guidance which influence occupational hygiene practice
LO3	identify, locate and interpret sources of occupational hygiene information, relevant legislation, standards and guidance which influence occupational hygiene practice ??
LO4	perform occupational hygiene surveys to evaluate risk from heat and cold stress, biological and chemical hazards in a wide variety of workplaces.
LO5	interpret and communicate occupational exposure data
LO6	will appreciate the need for continuous professional development and role of professional ethics in practice.

PH362: Stellar Astrophysics (Semester:6 Optional)

Module Details

Title Short:	Stellar Astrophysics APPROVED
Language of Instruction:	English

Module Code:	PH362

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	10 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	A comprehensive model for stellar structure and evolution is developed and used to understand star formation, evolution and destruction and the properties of extrasolar planets.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus
LO4	analyze physical situations using concepts, laws and techniques learned in this module
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH421: Quantum Mechanics (Semester:7 Optional)

Module Details

Title Short:	Quantum Mechanics APPROVED
Language of Instruction:	English

Module Code:	PH421

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH422: Solid State Physics (Semester:7 Optional)

Module Details

Title Short:	Solid State Physics APPROVED
Language of Instruction:	English

Module Code:	PH422

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH423: Applied Optics and Imaging
(Semester:8 Optional)

Module Details

Title Short:	Applied Optics and Imaging APPROVED
Language of Instruction:	English

Module Code:	PH423

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	11 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH424: Electromagnetism and Special Relativity (Semester:7 Optional)

Module Details

Title Short:	Electromagnetism and Special Relativity APPROVED
Language of Instruction:	English

Module Code:	PH424

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This module will be an in-depth course on Electromagnetism and Relativity, building on previous courses, in particular PH2X1 Electricity, Magnetism & Circuits and PH2X3 Light, Atomic & Nuclear Physics. The course will include continuous assessment (MCQ), with short problems involving basic concepts. Students will also learn to solve advanced problems on both electromagnetism and relativity (homework assignments), featuring more advanced and lengthy problems from David Griffiths' book "Electrodynamics".

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH425: Lasers and Spectroscopy (Semester:8 Optional)

Module Details

Title Short:	Lasers and Spectroscopy APPROVED
Language of Instruction:	English

Module Code:	PH425

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	9 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This module will provide students with an in-depth introduction to several aspects of Photonics. Particular emphasis will be placed on atomic spectroscopy and the interaction of radiation with atoms. The operation of lasers and conditioning of laser radiation will also be developed.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH426: Problem Solving and Physics Research Skills (Semester:8 Optional)

Module Details

Title Short:	Problem Solving and Physics Research Skills APPROVED
Module Code:	PH426
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	7 programme(s)
Module Owner:	RAY BUTLER
Module Discipline:	EP - Physics
Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	scrutinize problems from diverse areas of physics and identify the physical concepts required to facilitate solution of such problems.
LO2	consult appropriate reference sources to locate formulae required to assist in the solution of physics problems outside the tightly-defined contexts of standard lecture modules.
LO3	apply physics learned in lecture modules, along with appropriate mathematical tools, to solve problems outside the tightly-defined contexts of the syllabi of such modules.
LO4	author an essay that addresses an assigned topic in a manner that demonstrates that the student has developed an appreciation of the relevance of physics, and its past and present applications, to contemporary society.
LO5	explain clearly what are meant by plagiarism and scientific ethical writing and, accordingly, cite sourced reference material in a manner that unambiguously acknowledges the origin of the material.

PH427: Practical Work (Including Project) (Semester:8 Optional)

Module Details

Title Short:	Practical Work (Including Project) APPROVED
Language of Instruction:	English

Module Code:	PH427

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	The final-year practical-work module aims to prepare students to carry out advanced experimental work, analysis of data, and, presentation of results to the level expected of a professional with an honours physics degree. It includes training in relevant techniques and software for data analysis. Students carry out appropriate advanced experiments and a research project over the course of the academic year. Each student prepares a detailed report, and makes a short presentation, on their project work. The report and presentation should be at a level corresponding to the presentation and publication of results at a scientific conference.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	design experiments to test a given hypothesis.
LO2	set up experimental apparatus and evaluate its operation.
LO3	maintain a clear record of experimental data and procedures in a well-kept laboratory notebook.
LO4	analyse data using appropriate statistical and computational tools.
LO5	interpret experimental results and draw conclusions.
LO6	source relevant reference material and cite it in a manner that unambiguously acknowledges its origin.
LO7	produce scientific reports to a level equivalent to a scientific publication or a professional industrial report.
LO8	prepare and present a professional-level seminar to communicate results.

PH428: Atmospheric Physics and Climate Change (Semester:7 Optional)

Module Details

Title Short:	Atmospheric Physics and Climate Change APPROVED
Language of Instruction:	English

Module Code:	PH428

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	6 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.
LO6	discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in physics research and technology.

PH429: Nanotechnology (Semester:8 Optional)

Module Details

Title Short:	Nanotechnology APPROVED
Language of Instruction:	English

Module Code:	PH429

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	7 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This course provides a comprehensive review of the electronic and optical properties of nanostructures. The course describes the physics of low-dimensional structures using concepts based on quantum mechanics. The course also provides a comprehensive review of the bottom-up and top-down processing techniques used to fabricate nanostructures.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	. identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.
LO6	discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in physics research and technology.

PH430: Biophotonics
(Semester:7 Optional)

Module Details

Title Short:	Biophotonics APPROVED
Language of Instruction:	English

Module Code:	PH430

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	10 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.
LO6	discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in biomedical physics and medical physics.

PH431: Medical Image Processing (Semester:8 Optional)

Module Details

Title Short:	Medical Image Processing APPROVED
Language of Instruction:	English

Module Code:	PH431

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	This module will provide students with an in-depth introduction to several aspects of modern Medical Image processing. It will cover modern 3D imaging modalities including Computed Tomography and Magnetic Resonance Imaging. The course will involve students carrying out sample image processing tasks on medical images using relevant software packages.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module.
LO5	. identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.
LO6	discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in biomedical physics and medical physics.

PH432: Project
(Semester:8 Optional)

Module Details

Title Short:	Project APPROVED

Module Code:	PH432

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	In this module, a student is assigned a research project, and carries out supervised research in the assigned topic over Semester 2. Each student prepares a detailed report, and makes a short presentation, on their project work. The report and presentation should be at a level corresponding to the presentation and publication of results at a scientific conference.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	design and execute a scientific study to investigate a given hypothesis.
LO2	maintain a clear record of a scientific study in a well-kept notebook or portfolio.
LO3	analyse data, or evaluate simulations/models, using appropriate statistical and computational tools.
LO4	interpret scientific results and draw conclusions.
LO5	source relevant reference material and cite it in a manner that unambiguously acknowledges its origin.
LO6	produce scientific reports to a level equivalent to a scientific publication or a professional industrial report.
LO7	prepare and present a professional-level seminar to communicate results.

PH466: Astrophysics
(Semester:7 Optional)

Module Details

Title Short:	Astrophysics APPROVED
Language of Instruction:	English

Module Code:	PH466

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	define terms and explain concepts relating to the physical principles covered by this module's syllabus
LO2	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.
LO3	outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	analyze physical situations using concepts, laws and techniques learned in this module
LO5	identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus
LO6	discuss state-of-the-art applications of physical principles covered by this module's syllabus to contemporary themes in astrophysics.

PH2101: Mechanics & Electromagnetism (Semester:3 Group not available to select online)

Module Details

Title Short:	Mechanics & Electromagnetism APPROVED
Language of Instruction:	English

Module Code:	PH2101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1
Module Delivered in	6 programme(s)
Module Owner:	RAY BUTLER
Module Discipline:	EP - Physics
Source:	Merger, and partial reduction, of former PH215 + PH216 lecture content. Suggested new code: PH231
Module Data:	1 - 4 NON LAB
Module Description:	In this module, calculus and vector techniques are used to provide an in-depth study of: (1) Electric and magnetic fields and forces. The principles developed will be applied to dc and ac circuit analysis; (2) The motion of objects and 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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	Outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	Analyze physical situations using concepts, laws and techniques learned in this module.
LO5	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH2102: Physics Laboratory and Problem Solving I (Semester:3 Group not available to select online)

Module Details

Title Short:	Physics Laboratory and Problem Solving I APPROVED
Language of Instruction:	English

Module Code:	PH2102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 1
Module Delivered in	6 programme(s)
Module Owner:	RAY BUTLER
Module Discipline:	EP - Physics
Source:	Merger of former PH215 + PH216 practical/continuous assessment content. Suggested new code: PH232
Module Data:	1.7 - 2 LAB
Module Description:	This is a practical and continuous assessment module, consisting of laboratory sessions, problem solving sessions, and homework. It is a companion to, and co-requisite of, the "Mechanics & Electromagnetism" lectures module in the same semester.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Analyze physical situations using concepts, laws and techniques learned in the companion module 'Mechanics and Electromagnetism'.
LO2	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of the companion module 'Mechanics and Electromagnetism'.
LO3	Work in collaboration with a partner to observe and measure physical phenomena accurately, using appropriate instrumentation.
LO4	Record data, and the manner in which they are obtained, using a working laboratory notebook.
LO5	Interpret measurements in terms of their physical significance and the experimental or computational context in which they are obtained.

PH2103: Thermodynamics & Atomic Physics (Semester:4 Group not available to select online)

Module Details

Title Short:	Thermodynamics & Atomic Physics APPROVED
Language of Instruction:	English

Module Code:	PH2103

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Source:	Merger, and partial reduction, of former PH217 + PH218 lecture content. Suggested new code: PH233

Module Data:	1 - 4 NON LAB

Module Description:	This module builds on content delivered in the general PH101 Physics course, given in First Year, to provide a more in-depth look at: (1) Thermodynamics based on classical physics. It includes topics such as temperature & heat, thermal properties of matter, and first and second laws of thermodynamics. (2) Atomic Physics and Nuclear Physics, with related introductions to quantum mechanics, light emission & propagation, and special relativity. The module will also consider some computational methods with applications to nuclear & thermodynamics problems;

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Define terms and explain concepts relating to the physical principles covered by this module's syllabus.
LO2	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.
LO3	Outline applications to real-world situations of the physical principles covered by this module's syllabus.
LO4	Analyze physical situations using concepts, laws and techniques learned in this module.
LO5	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of this module's syllabus.

PH2104: Physics Laboratory and Problem Solving II (Semester:4 Group not available to select online)

Module Details

Title Short:	Physics Laboratory and Problem Solving II APPROVED
Language of Instruction:	English
Module Code:	PH2104
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 2
Module Delivered in	6 programme(s)
Module Owner:	RAY BUTLER
Module Discipline:	EP - Physics
Source:	Merger of former PH217 + PH218 practical/continuous assessment content. Suggested new code: PH234
Module Data:	1.7 - 2 LAB
Module Description:	This is a practical and continuous assessment module, consisting of laboratory sessions, problem solving sessions, and homework. It is a companion to, and co-requisite of, the "Thermodynamics and Atomic Physics" lectures module in the same semester.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Analyze physical situations using concepts, laws and techniques learned in the companion module 'Thermodynamics and Atomic Physics'.
LO2	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of the companion module 'Mechanics and Electromagnetism'.
LO3	Work in collaboration with a partner to observe and measure physical phenomena accurately, using appropriate instrumentation.
LO4	Record data, and the manner in which they are obtained, using a working laboratory notebook.
LO5	Interpret measurements in terms of their physical significance and the experimental or computational context in which they are obtained.

PH3101: Experimental and Computational Physics (Semester:5 Optional)

Module Details

Title Short:	Experimental and Computational Physics APPROVED
Language of Instruction:	English

Module Code:	PH3101

ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	4 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Source:	Merger and extension of former 8 "core Physics" modules' practical/continuous assessment content. Suggested new code: PH345

Module Data:	1.7 - 2 LAB

Module Description:	This is a year-long practical and continuous assessment module, consisting of laboratory sessions and associated teaching. It is a companion to, and co-requisite of, the 5 "core Physics" 3rd year lecture modules PH331, PH333, PH335, PH337, and PH338

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Analyze physical situations using concepts, laws and techniques learned in the companion modules PH331, PH333, PH335, PH337, and PH338.
LO2	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of the companion modules PH331, PH333, PH335, PH337, and PH338.
LO3	Work singly and in group collaborations to observe and measure physical phenomena accurately, using appropriate instrumentation.
LO4	Record data, and the manner in which they are obtained, using a working laboratory notebook.
LO5	Interpret measurements in terms of their physical significance and the experimental or computational context in which they are obtained.
LO6	Produce a professional CV, write a well-crafted job application, and perform well at an interview for a job or a postgraduate research position.

PH3102: Experimental and Computational Physics for Theoretical Physics (Semester:5 Optional)

Module Details

Title Short:	Experimental and Computational Physics for Theoretical Physics APPROVED
Language of Instruction:	English

Module Code:	PH3102

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	RAY BUTLER

Module Discipline:	EP - Physics

Source:	Merger and extension (in teaching delivery) but also reduction (in number of labs) of the former 8 "core Physics" modules' practical/continuous assessment content. Suggested new code: PH346

Module Data:	1.7 - 2 LAB

Module Description:	This is a year-long practical and continuous assessment module, consisting of laboratory sessions and associated teaching. It is a companion to, and co-requisite of, the 4 "core Physics" 3rd year lecture modules taken by the Physics with Theoretical Physics stream - PH331, PH335, PH337, and either PH333 or PH338 [the latter alternate between years]

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Analyze physical situations using concepts, laws and techniques learned in the companion modules PH331, PH333, PH335, PH337, and PH338.
LO2	Identify and apply pertinent physics concepts, and appropriate mathematical techniques, to solve physics problems related to the content of the companion modules PH331, PH333, PH335, PH337, and PH338.
LO3	Work singly and in group collaborations to observe and measure physical phenomena accurately, using appropriate instrumentation.
LO4	Record data, and the manner in which they are obtained, using a working laboratory notebook.
LO5	Interpret measurements in terms of their physical significance and the experimental or computational context in which they are obtained.
LO6	Produce a professional CV, write a well-crafted job application, and perform well at an interview for a job or a postgraduate research position.

PH3103: Exposure Science (Semester:5 Core)

Module Details

Title Short:	Exposure Science APPROVED
Language of Instruction:	English

Module Code:	PH3103

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	1 programme(s)

Module Owner:	MARIE COGGINS

Module Discipline:	EP - Physics

Module Level:	Common

Module Description:	This module aims to provide students with the fundamental principles of occupational hygiene and environmental assessment. Students will develop specific skills and competencies to anticipate, evaluate and control occupational and environmental hazards through practical application

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the role of occupational and environmental assessment in protecting the health and well being of the worker and the community
LO2	Anticipate exposure risks to the worker and the environment arising from biological chemical and physical hazards at work
LO3	Assess exposure risk arising from the presence of physical, chemical and biological hazards in the work environment
LO4	Select and apply appropriate measurement tools and protocols for assessing occupational and environmental hazards
LO5	Analyse and interpret occupational and environmental assessment data
LO6	Communicate the results from occupational and environmental assessments both orally and in written form
LO7	Develop policies for management of exposure risks to the worker and the environment arising from work activities
LO8	Appreciate the need for continuous professional development in this area

PM208: Fundamental Concepts in Pharmacology (Semester:3 Group not available to select online)

Module Details

Title Short:	Fundamental Concepts in Pharmacology APPROVED
Module Code:	PM208
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	22 programme(s)
Module Owner:	MAURA GREALY
Module Discipline:	PM - Pharmacology
Module Description:	This module introduces students to fundamental pharmacological concepts of pharmacodynamics and pharmacokinetics. A combination of lectures, tutorials and workshops will be used.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	describe the main drug targets
LO2	interpret dose response curves for agonists, antagonists, inverse agonists
LO3	calculate molarities, concentrations, volumes required in making solutions
LO4	access and critically analyse and interpret pharmacological data
LO5	describe the processes of absorption, distribution, metabolism and excretion for specific drugs
LO6	explain the effects of different routes of administration on absorption of drugs, and effects of food and drug interactions on drug disposition
LO7	derive pharmacokinetic data and use them to predict clinical properties of drugs

PM209: Applied Concepts in Pharmacology (Semester:3 Group not available to select online)

Module Details

Title Short:	Applied Concepts in Pharmacology APPROVED
Language of Instruction:	English

Module Code:	PM209

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	16 programme(s)

Module Owner:	MAURA GREALY

Module Discipline:	PM - Pharmacology

Module Description:	This module introduces students to autonomic pharmacology and drug discovery and development. A combination of lectures, tutorials and workshops will be used.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the process of adrenergic and cholinergic neurotransmission including receptors and transporters.
LO2	Relate drug mechanism of action to autonomic neurotransmission
LO3	Describe how new molecular entities are discovered and developed into drug candidates for human clinical trials
LO4	Summarize the clinical trial process including adverse effects
LO5	Derive dose-response curves for agonists and antagonists in the ANS
LO6	Interpret clinical trial data

PM210: Molecular Pharmacology and Signalling

(Semester:4 Group not available to select online)

Module Details

Title Short:	Molecular Pharmacology and Signalling APPROVED
Module Code:	PM210
ECTS Credits:	10
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	2 programme(s)
Module Owner:	MAURA GREALY
Module Discipline:	PM - Pharmacology
Module Description:	This module introduces students to molecular pharmacology and signalling. Topics will include receptors, ion channels, DNA replication, transcription, translation, apoptosis, immunopharmacology and respiratory and GIT Pharmacology. A combination of lectures, tutorials and labs will be used.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Classify the different drug receptors and compare and contrast their structure and function
LO2	explain the mechanisms and importance of switches in receptor signalling
LO3	Describe the mechanisms of DNA replication, transcription, translation, cell cycle and apoptosis
LO4	Relate the mechanism of action and selectivity of antibacterial and anti-parasitic drugs to 3 above
LO5	Distinguish between innate and adaptive immune responses, and describe their mechanisms including the inflammatory mediators, eicosanoids, cytokines, histamine and bradykinin
LO6	Describe the pathophysiology of asthma, ulcers and vomiting and categorize the drugs used in the treatment of these diseases
LO7	Perform a variety of drug assays including pipetting, weighing, making up solutions, drawing standard curves, and assaying samples with accuracy and precision

PM309: Drugs and Disease I (Semester:5 Optional)

Module Details

Title Short:	Drugs and Disease I APPROVED
Language of Instruction:	English

Module Code:	PM309

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	DAVID FINN

Module Discipline:	PM - Pharmacology

Module Description:	This module builds upon the fundamentals of pharmacology taught in 2nd year by introducing and expanding on topics including signalling and molecular pharmacology. In addition, and in keeping with the increased emphasis in 3rd year on pharmacology applied to disease, drugs used to treat cardiovascular and endocrine diseases and disorders are covered. The module is delivered through a combination of lectures, 'wet' laboratory practicals and Computer-Aided Learning (CAL) sessions.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe and critically discuss the major cellular signalling pathways and molecular pharmacology methodologies
LO2	Describe and critically discuss the major classes of therapeutic drugs that affect the cardiovascular and endocrine systems
LO3	Relate mechanisms of drug action to management of cardiovascular and endocrine disease/disorders
LO4	Carry out a plasma glucose assay
LO5	Describe protein and DNA gel electrophoresis
LO6	Apply basic bioinformatics skills
LO7	Analyse, graph and interpret data relating to cardiovasular, endocrine and molecular pharmacology
LO8	Perform SDS-PAGE

PM310: Drugs and Disease II (Semester:6 Optional)

Module Details

Title Short:	Drugs and Disease II APPROVED
Language of Instruction:	English

Module Code:	PM310

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	DAVID FINN

Module Discipline:	PM - Pharmacology

Module Description:	This module builds upon the fundamentals of pharmacology taught in 2nd year and in Drugs and Disease I (sem I 3rd year). The module covers drugs acting on the nervous system (e.g. psychiatric disorders, neurological disorders, pain and drugs of abuse), immune system (immunopharmacology) and chemotherapeutic agents. The module is delivered through a combination of lectures and laboratory practicals and workshops.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe and critically discuss the role of CNS neurotransmitters in psychiatric and neurological disease and in reward processes
LO2	Describe and critically discuss the pharmacology of major CNS therapeutics, analgesic and anaesthetic drugs, drugs of abuse, chemotherapeutic agents and drugs modulating the immune system
LO3	Relate mechanisms of drug action to management of psychiatric and neurological disorders, immune-related disorders and cancer, fungal and viral infections
LO4	Carry out an acetylcholineterase assay; generate and interpret results
LO5	Describe how HPLC assays are performed, analyse data from HPLC-FD and HPLC-MS experiments using Excel and Graphpad Prism and critically interpret such data.
LO6	Describe how to assay for different forms of cell death and how to analyse and critically interpret data from a commonly used cytotoxicity assay
LO7	Analyse, graph and interpret data relating to CNS pharmacology, Immunopharmacology and Chemotherapy

PM311: Introduction to Toxicology (Semester:5 Optional)

Module Details

Title Short:	Introduction to Toxicology APPROVED
Language of Instruction:	English

Module Code:	PM311

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	8 programme(s)

Module Owner:	HOWARD OLIVER FEARNHEAD

Module Discipline:	PM - Pharmacology

Module Description:	A 5ECTS module developed to provide an introduction to Toxicology to third year science students who have an interest in poisons and a background in Pharmacology, Biochemistry, Physiology, Anatomy or Chemistry. The course involves lectures delivered over one semester and is assessed through continuous assessment and a 2 hour written examination at semester's end.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	use the language, terms, and definitions of toxicology
LO2	describe the factors affecting toxic responses
LO3	describe specific mechanisms of toxic action
LO4	apply this knowledge to explain specific examples of target organ toxicity
LO5	describe how toxicity assessed and the challenges of risk assessment
LO6	collect toxicological information and apply toxicological principles to specific classes of toxicant and specific situations

PM312: Applied pharmacology (Semester:6 Optional)

Module Details

Title Short:	Applied pharmacology APPROVED
Module Code:	PM312
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	3 programme(s)
Module Owner:	DAVID FINN
Module Discipline:	PM - Pharmacology
Module Description:	This module builds upon the fundamentals of pharmacology taught in 2nd year and it complements the 3rd year Drugs and Disease I and II modules. The module expands upon the topics of ligand binding and pharmacokinetics. It also includes training in research manuscript critique and seminar delivery. The module is delivered through a combination of lectures, laboratory workshops and seminar tutorials.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe and critically discuss advanced principles and concepts of ligand-receptor binding
LO2	Describe and critically discuss advanced principles and concepts of pharmacokinetics
LO3	Describe how radioligand binding assays are performed, analyse data from saturation and competition binding experiments using Excel and Graphpad Prism and critically interpret such data.
LO4	Prepare and deliver an oral presentation of a published original research manuscript and critically analyse and interpret research manuscripts.

PM325: Pharmacology Research Mini Project (Semester:6 Optional)

Module Details

Title Short:	Pharmacology Research Mini Project APPROVED
Module Code:	PM325
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	DEREK MORRIS
Module Discipline:	PM - Pharmacology
Module Description:	The module builds on the knowledge and skills the student has accumulated in the " Research methods in Biomedical science" module and involves carrying out a research project in a laboratory in one of the Biomedical Science disciplines. Students will research, design and implement a research project. The results of the projects will be presented in the form of a poster presentation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Research a scientific topic
LO2	Design an experimental plan to implement a research project
LO3	work as part of a team in the overall research effort
LO4	Carry out the technical components of the research
LO5	write a report of the results
LO6	critically analyze data
LO7	design and deliver a poster of the research results
LO8	Defend the design of the experiment and the results obtained

PM431: Research Project (Semester:7 Optional)

Module Details

Title Short:	Research Project APPROVED
Module Code:	PM431
ECTS Credits:	20
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	EILÍS DOWD
Module Discipline:	PM - Pharmacology
Module Description:	This is a 12-week individual laboratory-based research project. The overarching aim of this module is to provide the students with “hands-on” experience of scientific research.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Design a scientific experiment to address a specific research question.
LO2	Demonstrate an awareness of the ethical considerations and safety implications of their scientific experiment.
LO3	Demonstrate technical skill and competency in relevant scientific procedures.
LO4	Work independently, responsibly and safely in the laboratory.
LO5	Generate, analyse, depict and critically interpret scientific data.
LO6	Synthesise and critically review relevant historical and state-of-the-art scientific literature.
LO7	Communicate scientific findings through appropriate verbal, written and visual means.

PM432: Experimental Pharmacology (Semester:7 Optional)

Module Details

Title Short:	Experimental Pharmacology APPROVED
Module Code:	PM432
ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	EILÍS DOWD
Module Discipline:	PM - Pharmacology
Module Description:	This module will focus on the critical analysis and interpretation of prevously published scientific literature. The module will centre around a series of data interpretation workshops and journal clubs in which published scientific manuscripts will assessed.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Critically interpret published scientific data generated using various molecular, in vitro and in vivo techniques and presented in different quantitative and qualitative formats.
LO2	Rapidly identify the key elements of a research manuscript (i.e. the background/rationale, aim, experimental design/methods, key findings and impact) and compile these into a short abstract.
LO3	Communicate the key elements of a research manuscript to the other members of the class using appropriate visual means (PowerPoint seminar).
LO4	Participate in critical discussions of research manuscripts.

PM433: Drug Development & Emerging Therapies (Semester:8 Optional)

Module Details

Title Short:	Drug Development & Emerging Therapies APPROVED
Module Code:	PM433
ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	3 programme(s)
Module Owner:	EILÍS DOWD
Module Discipline:	PM - Pharmacology
Module Description:	This module will provide students with an insight into the drug development process through preparation of an evidence-based drug portfolio, essay and poster focusing on the stages of drug development.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Use literature databases (e.g. PubMed) to find published manuscripts relevant to the main stages in the development of a CNS drug, and identify and extract the key information from the relevant manuscripts.
LO2	Compile and present the extracted data in clearly accessible formats (tabulated and essay).
LO3	Synthesise and critically assess the published literature in order to make an evidence-based judgement on the development of a CNS drug.
LO4	Demonstrate an awareness of the complexity of, and challenges inherent within, the CNS drug development process.
LO5	Make an evidence-based, critical judgement on the potential of an emerging therapy/novel target to address the unmet clinical needs of, and limitations of existing therapies for, human CNS conditions.
LO6	Design and prepare an informative and visually accessible poster using PowerPoint® software which highlights the evidence for progression (or otherwise) of an emerging therapy/novel target to the clinical marketplace.
LO7	Engage in a scientific discussion regarding the potential of an emerging therapy/novel target for the treatment of human CNS disease.

PM434: Molecular Pharmacology & Therapeutics (Semester:8 Optional)

Module Details

Title Short:	Molecular Pharmacology & Therapeutics APPROVED
Module Code:	PM434
ECTS Credits:	10
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	3 programme(s)
Module Owner:	EILÍS DOWD
Module Discipline:	PM - Pharmacology
Module Description:	The aim of this module is to expose the students to the state-of-the-art in modern molecular pharmacology and therapeutics research, specifically in the areas of G-protein-coupled receptors, transcription factors and molecular drug development, and the treatment of cancer, immune diseases and pain.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an in-depth knowledge of recent developments in molecular pharmacology research specifically in the areas of G-protein-coupled receptors, transcription factors and molecular drug development
LO2	Critically discuss the contribution that recent advances in molecular pharmacology have made (or may make in the future) to human health specifically in the areas of G-protein-coupled receptors, transcription factors and molecular drug development.
LO3	Demonstrate an in-depth knowledge of recent developments in molecular therapeutics research specifically in the treatment of cancer, immune diseases and pain.
LO4	Critically discuss the contribution that recent advances in molecular pharmacology have made (or may make in the future) to human health specifically in the treatment of cancer, immune diseases and pain.

PM435: Advanced Technologies for Therapeutics (Semester:8 Optional)

Module Details

Title Short:	Advanced Technologies for Therapeutics APPROVED
Module Code:	PM435
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	3 programme(s)
Module Owner:	EILÍS DOWD
Module Discipline:	PM - Pharmacology
Module Description:	The aim of this module is to expose the students to state-of-the-art modern technologies used for therapeutics, specifically in the areas of biopharmaceuticals, drug delivery, cell therapy and gene therapy.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an in-depth knowledge of recent developments in technologies for therapeutics, specifically in the areas of biopharmaceuticals, drug delivery, cell therapy and gene therapy.
LO2	Critically discuss the contribution that modern approaches to technologies for therapeutics have made (or may make in the future) to human health, specifically in the areas of biopharmaceuticals, drug delivery, cell therapy and gene therapy.

PM436: Advanced Toxicology (Semester:8 Optional)

Module Details

Title Short:	Advanced Toxicology APPROVED
Module Code:	PM436
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2017-18 (01-09-17 – 31-08-18)
Teaching Period:	Semester 2
Module Delivered in	3 programme(s)
Module Owner:	HOWARD OLIVER FEARNHEAD
Module Discipline:	PM - Pharmacology
Module Description:	This module is designed for 4th year students who wish to develop their knowledge of toxciology to a more advanced level. The specific aims are to further develop knowledge in the areas of environmental toxicology, target organ toxicity, mechanisms of toxicity and toxicity assessment. It consists of 15 lectures.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Use the language, terms, and definitions of toxicology.
LO2	To critically assess and discuss recent advances in the field of Toxicology
LO3	To Interpret toxicological data from the literature on specific toxicants and assess potential risk to human health or the environment

SI206: Introduction to Physiology and Gastrointestinal (Semester:3 Group not available to select online)

Module Details

Title Short:	Introduction to Physiology and Gastrointestinal APPROVED
Language of Instruction:	English

Module Code:	SI206

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	5 programme(s)

Module Owner:	AMIR SHAFAT

Module Discipline:	SI - Physiology

Module Description:	The course develops fundemental understanding of human body function. Starting with concepts in cellular physiology, body compartments and basic biochemical concepts such as diffusion, osmosis and electrochemical gradient. The different blood types, cells in the blood compartment and immune function are describe. The processes governing the gastrointestinal system are described in detail, including digestion absorption motility and secretion.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe body compartments, water distribution and the effects of changes in solute concentration on blood volume and cell volume
LO2	Understand the principles immunity and the cell types involved
LO3	Describe the different cells in the blood and their function
LO4	Understand the structure and function of the gastrointestinal tract
LO5	Discuss the different organs of the gastrointestinal system, and explain the key processes of digestion, absorption, secretion and motility
LO6	Understand the key mechanisms involved in regulation of some of the above processes
LO7	Perform and interpret key practical experiments to generate evidence relating to the cardiovascular, gastrointestinal, muscle and nervous systems

SI207: Nerve and Muscle (Semester:3 Group not available to select online)

Module Details

Title Short:	Nerve and Muscle APPROVED
Module Code:	SI207
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	5 programme(s)
Module Owner:	AMIR SHAFAT
Module Discipline:	SI - Physiology
Module Description:	The course develops fundemental understanding of human body function. Students develop their understanding of how the nervous system works, how cells communicate electrically and chemically. Next, the function of muscle tissue is decribed and the control of muscle contrcution discussed.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the cellular structure of nerve cells and muscle cells
LO2	Understand how nerve impulses are generated and propagated and the role of synapses and neurotransmitters in neural transmission
LO3	Understand the structure and function of skeletal and smooth muscle,
LO4	Discuss how these muscle types contract and the role of calcium, ATP and electrical stimulation
LO5	Describe the function of the autonomic nervous system
LO6	Understand the key mechanisms involved in regulation of some of the above processes
LO7	Perform and interpret key practical experiments to generate evidence relating to the cardiovascular, gastrointestinal, muscle and nervous systems

SI208: Cardiovascular Physiology (Semester:4 Group not available to select online)

Module Details

Title Short:	Cardiovascular Physiology APPROVED
Language of Instruction:	English

Module Code:	SI208

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	5 programme(s)

Module Owner:	KARL MCCULLAGH

Module Discipline:	SI - Physiology

Module Description:	The course develops fundemental understanding of human cardiovascular function. The heart and blood vessels are described and their function discussed. The principles of the circulatory system are detailed, as well as some of the control mechanisms in health and disease.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the structure and function of the components of the systemic circulation.
LO2	Describe the structure and function of the components of the systemic circulation.
LO3	Describe the mechanism involved in blood flow management and blood pressure control.
LO4	Perform and interpret key practical experiments to generate evidence relating to the cardiovascular

SI210: Health & Safety Physiology
(Semester:3 Core)

Module Details

Title Short:	Health & Safety Physiology APPROVED
Language of Instruction:	English

Module Code:	SI210

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	LOUISE ANN HORRIGAN

Module Discipline:	SI - Physiology

Module Description:	Health & Safety Physiology (SI210) is a blended learning 5 ECTS module that has been specifically created to provide students of Health & Safety Systems with some fundamental knowledge of human body function that is relevant to their course of study.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Appreciate the role of Physiology in the career of a Health & Safety professional.
LO2	Appreciate the concept of homeostatic mechanisms within the body or ‘body balance’.
LO3	Understand the importance of water in the body, and the relevance of body fluid compartments.
LO4	Demonstrate knowledge of how foreign substances or pathogens can gain access to the body to cause toxicity or disease, both at a systemic and at a cellular level.
LO5	Demonstrate knowledge of the physiology of the common routes of toxin entry, including the respiratory and gastrointestinal systems.
LO6	Demonstrate a basic knowledge of the physiology of the nervous system and some well-known examples of neurotoxins.
LO7	Demonstrate a basic knowledge of how muscles work, and some musculoskeletal disorders that are common in the workplace.
LO8	Demonstrate a basic knowledge of the functions and composition of the blood and some common vascular disorders.
LO9	Understand the fundamentals of how the heart works, and the electrocardiogram (ECG).
LO10	Demonstrate a basic knowledge of some mechanisms that the body uses to defend itself against disease and injury, including inflammation.
LO11	Demonstrate a basic knowledge of the physiological changes that occur in pregnancy, the development of a baby during pregnancy and the risks associated with teratogens.

SI212: Respiratory Physiology (Semester:4 Group not available to select online)

Module Details

Title Short:	Respiratory Physiology APPROVED
Module Code:	SI212
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	5 programme(s)
Module Owner:	AILISH HYNES
Module Discipline:	SI - Physiology
Module Description:	The course develops fundemental understanding of human respiratory physiology. The lung organs are described and their function discussed respectively. The principles of the respiratory system are detailed, as well as some of the control mechanisms in health and disease.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the structure of the human lung system, and explain how oxygen and carbon dioxide are exchanges within the alveoli and transported in the blood.
LO2	Understand the key mechanisms involved in regulation of some of the above processes
LO3	Perform and interpret key practical experiments to generate evidence relating to the respiratory system and renal system.

SI311: Neurophysiology (Semester:5 Optional)

Module Details

Title Short:	Neurophysiology APPROVED
Module Code:	SI311
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	7 programme(s)
Module Owner:	MICHELLE ROCHE
Module Discipline:	SI - Physiology
Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the principals of somatosensory processing and perception and apply this knowleadge to explain acute pain processing
LO2	Describe in detail the processess behind spinal reflexes and central control of movement
LO3	Describe the physiological processes underlying vision, hearing, sleep, learning, emotion, language, hunger and thermoregulation
LO4	Compare knowledge of the normal CNS function and symptoms associated with pathophysiology
LO5	Appreciate of the integrative nature of the CNS
LO6	Competence in the practical assessment of aspects of the physiology of vision and hearing
LO7	Integrate practical information with theoretical knowledge

SI312: Endocrinology
(Semester:5 Optional)

Module Details

Title Short:	Endocrinology APPROVED

Module Code:	SI312

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	7 programme(s)

Module Owner:	AILISH HYNES

Module Discipline:	SI - Physiology

Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss the role played by hormones in the maintenance of homeostasis.
LO2	Describe the importance of endocrine system in intra cellular communication
LO3	To compare and contrast hormones in terms of their structure, synthesis, transport, mechanism by which they elicit a receptor-mediated response in target tissues.
LO4	Describe mechanisms that regulate hormone synthesis and secretion
LO5	Discuss the physiological actions of specific hormones
LO6	Integrate and then apply their knowledge of the normal endocrine system to identify some common endocrine disorders and explain the mechanistic basis of the disorder
LO7	Demonstrate problem solving skills and assessment of biomedical data
LO8	Demonstrate skills and tools necessary to promote life-long learning

SI317: Human Body Function

(Semester:5 Optional)

Module Details

Title Short:	Human Body Function APPROVED
Language of Instruction:	English

Module Code:	SI317

ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	22 programme(s)

Module Owner:	Fiona Byrne

Module Discipline:	SI - Physiology

Module Description:	The 'Human Body Function' module teaches students the complex nature of how the mammalian body functions through the study of its component organ systems. Specifically, the following areas are covered: Body fluids and fluid compartments, haematology, nerve and muscle physiology, cardiovascular physiology, respiratory physiology, immunology and endocrinology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Know the distribution of water between the body fluid compartements and understand the role of body water in cell and system function.
LO2	Know the components of blood, understand the process of blood clotting and understand the principles of the ABO and rhesus blood groups.
LO3	Know the structure and function of nerve and muscle cells.
LO4	Understand how a nerve impulse is generated and propagated.
LO5	Understand the process of muscle contraction, and how nerves can stimulate muscle cells.
LO6	Understand the autonomic nervous system.
LO7	Know the structure and function of the heart and its electrophysiology, focusing on the electrical and mechanical events at each stage of the cardiac cycle.
LO8	Know the importance of blood pressure, and understand the basic principles of regulation.
LO9	Understand how breathing is performed and know the volumes and capacities associated with respiration.
LO10	Understand how oxygen and carbon dioxide are transported, and how oxygen delivery is regulated and controlled.
LO11	Understand the basics of hormone function, with a focus on glucose metabolism and the functions of growth hormone.
LO12	Understand the basics of immune defense.
LO13	Know the divisions of the central nervous system and have a basic knowledge of how the different areas function.

SI325: Physiology Research Mini Project (Semester:6 Optional)

Module Details

Title Short:	Physiology Research Mini Project APPROVED
Language of Instruction:	English

Module Code:	SI325

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	DEREK MORRIS

Module Discipline:	SI - Physiology

Module Description:	The module builds on the knowledge and skills the student has accumulated in the " Research methods in Biomedical science" module and involves carrying out a research project in a laboratory in one of the Biomedical Science disciplines. Students will research, design and implement a research project. The results of the projects will be presented in the form of a poster presentation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Research a scientific topic
LO2	Design an experimental plan to implement a research project
LO3	work as part of a team in the overall research effort
LO4	Carry out the technical components of the research
LO5	write a report of the results
LO6	critically analyze data
LO7	design and deliver a poster of the research results
LO8	Defend the design of the experiment and the results obtained

SI326: Advanced Cardiovascular Physiology (Semester:5 Optional)

Module Details

Title Short:	Advanced Cardiovascular Physiology APPROVED
Module Code:	SI326
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	6 programme(s)
Module Owner:	ANTONY WHEATLEY
Module Discipline:	SI - Physiology
Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an understanding of current knowledge in cardiac muscle function
LO2	Demonstrate an understanding of current knowledge in vascular smooth muscle function
LO3	Demonstrate an understanding of role played by the endothelium in vascular function
LO4	Demonstrate an understanding of microcirculation in relation to solute exchange
LO5	Demonstrate an understanding cardiovascular system in disease
LO6	Interpret results from current cardvascular literature
LO7	Demonstrate problem solving skills and assessment of biomedical data
LO8	Demonstrate skills and tools necessary to promote life-long learning

SI328: Exercise Physiology (Semester:6 Optional)

Module Details

Title Short:	Exercise Physiology APPROVED
Module Code:	SI328
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	7 programme(s)
Module Owner:	BRENDAN HIGGINS
Module Discipline:	SI - Physiology
Module Description:	The Exercise Physiology module provides knowledge on the key cardiovascular, respiratory, and muscular systems responses to acute and chronic exercise. Students will appreciate the key changes that occur in the various physiological systems at rest and during exercise. The module will also investigate the measurement techniques used to assess the physiological and metabolic responses to exercise.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe acute and chronic responses of respiratory and cardiovascular systems to exercise
LO2	Describe neuromuscular responses to exercise and the interaction between the muscular & nervous systems
LO3	Explain the contribution of the neuroendocrine system during exercise
LO4	Describe metabolism and energy expenditure during exercise
LO5	Describe the principle of how training improves health & sport performance
LO6	Demonstrate problem solving skills and assessment of biomedical data
LO7	Demonstrate skills and tools necessary to promote life-long learning

SI329: Laboratory Methods in Physiology
(Semester:5 Optional)

Module Details

Title Short:	Laboratory Methods in Physiology APPROVED

Module Code:	SI329

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	3 programme(s)

Module Owner:	Fiona Byrne

Module Discipline:	SI - Physiology

Module Description:	To provide students with practical and laboratory skills within physiological systems.Experimental design, data analysis and presentation will also be covered in this module.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the principals of experimental design and apply this to research questions
LO2	Effectively organise, analyse and present data. Competence in use of computer programmes for statistical analysis and graphical presentation of data.
LO3	Become proficient in basic laboratory skills including pipetting, solutions and dilutions
LO4	Perform bench assays for evaluation of physiological parameters in biological samples.
LO5	Assess spinal reflexes, identify factors which influence synaptic transmission and assess EEG and EMG recordings
LO6	Competence in various methodologies including microscopy, tissue culture, PCR and chromatography.
LO7	Acuratley read, interpret, analyse and discuss research papers.
LO8	Present research in poster format

SI331: Renal Physiology (Semester:6 Optional)

Module Details

Title Short:	Renal Physiology APPROVED
Module Code:	SI331
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	6 programme(s)
Module Owner:	LEO QUINLAN
Module Discipline:	SI - Physiology
Module Description:	The Renal Physiology module will provide students with a knowledge of the normal physiology of the mammalian renal system. Topics covered will include nephron organisation, clearance, filtration, reabsorption, secretion, salt, water and acid base balance and micturitation. Theoretical learning and understanding of will be aided by laboratory practicals investigating the physiology of osmoregulation and clearance

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	The Renal Physiology module will provide students with a knowledge of the normal physiology of the mammalian renal system. Topics covered will include nephron organisation, clearance, filtration, reabsorption, secretion, salt, water and acid base balance and micturitation. Theoretical learning and understanding of will be aided by laboratory practicals investigating the physiology of osmoregulation and clearance
LO2	Describe and explain in detail the processess behind the control of filtration
LO3	Explain the physiological processes underlying salt, water and acid base balance.
LO4	Integrate knowledge of the renal function so as to understand symptoms associated with pathophysiology of renal disease
LO5	Appreciate the integrative nature of the renal systems particularly in relation to fluid balance and blood pressure.
LO6	Competence in the practical assessment of the physiology of the renal system
LO7	Integrate practical information with theoretical knowledge

SI408: Immunology
(Semester:7 Optional)

Module Details

Title Short:	Immunology APPROVED

Module Code:	SI408

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	LOUISE ANN HORRIGAN

Module Discipline:	SI - Physiology

Module Description:	This module teaches the fundamental principles of immunology, as well as advanced study of topics currently relevant to immunological research.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain the differences between innate and adaptive immunity, and describe the interactions that occur between the components.
LO2	Display an understanding of the processes of antigen recognition and antigen presentation.
LO3	Discuss lymphocyte development and the identification of self from non-self.
LO4	Discuss the pathophysiology of autoimmune disorders.
LO5	Discuss the interactions between the immune system and cancer cells and understand the strategies for cancer immunotherapy.

SI422: Advanced Neurophysiology (Semester:7 Optional)

Module Details

Title Short:	Advanced Neurophysiology APPROVED
Module Code:	SI422
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	MICHELLE ROCHE
Module Discipline:	SI - Physiology
Module Description:	To provide students with an indeph knowledge of the function of the mammalian Central Nervous System and the pathophysiology underlying CNS disorders

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the physiological processes of pain transmission and the pathophysiology underlying chronic pain disorders
LO2	Display an indepth knowlegde of the pathophysiology underlying psychiatric disorders including depression and anxiety
LO3	Appraise and criticise current research in the field of CNS disorders
LO4	Describe the pathophysiology of specific neurological disorders
LO5	Demonstrate skills and tools necessary to promote life-long learning

SI432: Pathophysiology (Semester:8 Optional)

Module Details

Title Short:	Pathophysiology APPROVED
Module Code:	SI432
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	4 programme(s)
Module Owner:	BRENDAN HIGGINS
Module Discipline:	SI - Physiology
Module Description:	The purpose of this module is to provide the learner with a basic understanding of pathophysiology as a change from normal physiological functioning of the various systems of the human body. The course is based on illness and disease within a physiological systems framework. Lectures will focus on selected illnesses but also critically analyse the underlying causes of these diseases.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Develop an understanding of the concept of human disease
LO2	Describe and discuss the Pathophysiology of common diseases of selected organ systems
LO3	Be able to understand clinical scenarios to both illustrate and consolidate the pathophysiological mechanisms discussed
LO4	Critically review and evaluate causative factors, such as genetics and lifestyle, as contributors to illness
LO5	Appraise and critique current research in pathophysiological areas

SI435: Research Project
(Semester:8 Optional)

Module Details

Title Short:	Research Project APPROVED
Language of Instruction:	English

Module Code:	SI435

ECTS Credits:	20

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 2

Module Delivered in	3 programme(s)

Module Owner:	Fiona Byrne

Module Discipline:	SI - Physiology

Module Description:	This module will provide students with a knowledge and hands on experience of scientific research. Students will have the opportunity to work with research groups engaged in cutting edge research from single cell physiology to entire human body physiology. Students will get trainined in experimental design, data capture, data analyis and presentation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Appraise and criticise current research in the project area and prepare a litreature review.
LO2	Developing experimental expertise and problem solving in the context of their study i.e. learning the 'tricks of the trade'
LO3	Recognise the potential for multiple interpretations of data, methods of data analysis and presentation
LO4	Demonstrate skills and tools necessary to promote life-long learning

SI436: Therapeutics
(Semester:7 Optional)

Module Details

Title Short:	Therapeutics APPROVED
Language of Instruction:	English

Module Code:	SI436

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	Fiona Byrne

Module Discipline:	SI - Physiology

Module Description:	In this module students will be introduced to current research topics in cell and gene therapy. Instructors will deliver a series of lectures on historic, current, and future cell and gene therapy treatment strategies, borrowing also from the lecturers' own research experience and interests e.g. embryonic stem cells and muscle regeneration. Combined with published literature and self-directed learning, the students develop an in-depth understanding of selected topics in this field.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Develop knowledge of therapeutic strategies for genetically inherited and acquired diseases.
LO2	Obtained knowledge of pertinent techniques employed in the development of cell and gene therapy.
LO3	Be able to critique and discuss published peer reviewed research in the field.

SI437: Reproduction Development and Aging (Semester:7 Optional)

Module Details

Title Short:	Reproduction Development and Aging APPROVED
Module Code:	SI437
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	AILISH HYNES
Module Discipline:	SI - Physiology
Module Description:	This module, building on previous knowledge of DNA structure, replication and endocrinology, will equip students with a knowledge of the core concepts in reproduction, early embryonic development and aging. Students will be introduced to the principles of modern genetics and its application to the understanding inherited disease. Ethical and professional issues will be addressed in relation to modern techniques in assisted reproduction.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the physiology of male and female reproduction systems as well as the hormonal and nervous control of human reproduction
LO2	Have an appreciation of the physiological changes that occur in the mother during pregnancy
LO3	Discuss major fetal adaptations and neonatal changes that occur in major body systems
LO4	Understand the basis of sexual determination of sex as well as the major factors involved in the control of parturition and lactation
LO5	Have an appreciation of the practical, moral and ethical issues associated with genetic testing in modern medicine and some insight into the personal impacts of inherited diseases
LO6	Be able to describe the current research and technology available for artificical reproductive technologies and have an appreciation of the moral and ethical issues associated with some of these technologies
LO7	They should be competent enough to discuss current theories of aging and the physiological changes associated with the process
LO8	Be competent to understand, summarise and cite current up to date research publications in the area of reproduction
LO9	Demonstrate problem solving skills and assessment of biomedical data
LO10	Demonstrate skills and tools necessary to promote life long learning

SI438: Advanced Gastrointestinal Physiology (Semester:7 Optional)

Module Details

Title Short:	Advanced Gastrointestinal Physiology APPROVED
Module Code:	SI438
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 1
Module Delivered in	3 programme(s)
Module Owner:	Fiona Byrne
Module Discipline:	SI - Physiology
Module Description:	In this module students will be introduced to current research topics in gastrointestinal physiology. The module uses experts in this field from the Physiology discipline as well as expert lecturers from outside the physiology discipline to deliver up-to-date information. Combined with published literature and self-directed learning, the students develop an in-depth understanding of selected topics in this field. For example, gastric emptying rates, hepatic p

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Develop understanding of current knowledge in gastrointestinal physiology
LO2	Be able to interpret results from current literature
LO3	Be able and discuss results from the current literature
LO4	Solve problems relating to gastrointestinal physiological function and dysfunction
LO5	Develop practical competencies in gastrointestinal research methods

SI4101: Case Based Physiology
(Semester:8 Optional)

Module Details

Title Short:	Case Based Physiology APPROVED
Language of Instruction:	English

Module Code:	SI4101

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	2 programme(s)

Module Owner:	LEO QUINLAN

Module Discipline:	SI - Physiology

Module Description:	The purpose of this module is to provide the learner with an advanced intergrated understanding of physiology and pathophysiology. The course will be based on case study of pathophysiological and clinical senarios. Learners will be required to research assimilate and integrated fundamental and advanced concept and apply this knowledge to solve problem. Lectures will focus on selected cases but also critically analyse the underlying physiology.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Develop an integrated understanding of body systems.
LO2	Describe and discuss the Pathophysiology of common diseases of selected organ systems
LO3	Be able to understand clinical and physiological scenarios to both illustrate and consolidate the physiological mechanisms.
LO4	Critically review and evaluate causative factors, such as genetics and lifestyle, as contributors to illness
LO5	Appraise and critique current research data in physiological areas

SI4102: Science Communication Skills (Semester:7 Optional)

Module Details

Title Short:	Science Communication Skills APPROVED
Language of Instruction:	English

Module Code:	SI4102

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2016-17 (01-09-16 – 31-08-17)

Teaching Period:	Semester 1

Module Delivered in	2 programme(s)

Module Owner:	Fiona Byrne

Module Discipline:	SI - Physiology

Module Description:	The purpose of this module is to provide the learner with the fundamental skills to communicate science effectively. The course will be based on developing written, data interpretation and oral skills. Learners will be required to interpret data, interrogate, assimilate and integrate fundamental and advanced concepts and apply this knowledge to effectively communicate scientific information.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Appraise and critique current research data in physiological areas
LO2	Critically review and interpret scientific literature
LO3	Communicate science effectively in a scientific abstract
LO4	Communicate science effectively by poster presentation
LO5	Communicate science effectively by oral presentation

ST112: Probability
(Semester:1 Core)

Module Details

Title Short:	Probability APPROVED

Module Code:	ST112

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	1 programme(s)

Module Owner:	CATHAL SEOIGHE

Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics

Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	demonstrate the concepts of systematic and random variation, and that probability is concerned with the construction of mathematical models for random phenomena that are subject to stable relative frequencies; comprehend that probability and (inferential) statistics are opposite scientific processes, and be able to give examples where the former is used to justify statistical inferences made in the real world
LO2	demonstrate the role of probability both as a discipline in its own right with applications to e.g. financial decision-making, gambling, communications systems), and as the tool used in justifying statistical inferences (i.e. in justifying statements made about entire populations based on information available in samples taken from the populations)
LO3	demonstrate the frequentist and classical approaches to probability, be able to calculate probabilities for compound events, understand the ideas of mutually exclusive events and of independent events, and be able to perform calculations involving Bayes' formula
LO4	demonstrate the motivation for the introduction of the concept of random variable, and the idea that a given population can be viewed as synonymous with the distribution of an suitably-defined random variable
LO5	model basic discrete random variables and perform calculations based on hypergometric, multivariate hyergeometric, binomial, geometric, negative binomial and Poisson distributions
LO6	demonstrate the importance of the first two moments of discrete and continuous random variables as summary measures of a distribution, and be able to compute the mean and variance of certain discrete variables
LO7	demonstrate the idea underlying the density of a continuous random variable and be able to perform probability calculations for normally distributed variables
LO8	demonstrate the importance and properties of sampling distributions, especially that of the sample mean; be able to calculate probabilities about the mean of a random sample when sampling from a normal distribution
LO9	state the central Limit Theorem and apply it to compute probabilities relating to sums and means of values of both quantitative and Bernoulli variables

ST113: Statistics
(Semester:2 Core)

Module Details

Title Short:	Statistics APPROVED
Module Code:	ST113
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	EMMA HOLIAN
Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics
Module Description:	no description provided

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	identify sources of variation in observational and experimental data, identify ideas involved in some basic survey and experimental designs, and be aware of sensitivity of analyses to various assumptions
LO2	summarise data numerically and graphically
LO3	demonstrate how probability is used in the construction of interval estimates and in hypothesis testing, including the computation of p-value and power of tests
LO4	identify and perform some one and two-sample statistical inference procedures for parametric models
LO5	perform basic enumerative data analysis concluding good-of-fit and contingency table tests and tests for equality of several population proportions
LO6	calculate and interpret correlation and conduct analysis for simple linear regression models

ST235: Probability
(Semester:3 Core)

Module Details

Title Short:	Probability APPROVED
Language of Instruction:	English

Module Code:	ST235

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	27 programme(s)

Module Owner:	JOHN PHILIP HINDE

Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	This is an introductory course to probability theory. Topics include: algebra of events, concepts of conditional probability and independence of events; random variables (rv); discrete and continuous propability distributions; expectation, variance and functions of rv-s; probability and moment generating functions; basic probability inequalities.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Apply basic laws of probability theory to calculate probabilities of composite events obtained by applying set operations
LO2	Apply correct combinatorial random sampling rules and calculate probabilities
LO3	Use basic properties of probability distributions to calculate derived quantities
LO4	Calculate expectations, conditional expecations and variance of a variety of r.v.-s
LO5	Prove main theorems and results connecting basic probaility concepts including joint and conditional rv-s
LO6	Understand common properties and differences of discrete and continuous r.v.-s
LO7	Calculate expectations, variances and distributions of functions of rv-s
LO8	Apply generating functions to calculate corresponding distributional properties

ST236: Statistical Inference (Semester:4 Core)

Module Details

Title Short:	Statistical Inference APPROVED
Module Code:	ST236
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	24 programme(s)
Module Owner:	HAIXUAN YANG
Module Discipline:	MA - Mathematics
Acknowledgment:	This module is developed from Prof. John Hinde's work. Also thanks Dr Jerome N. Sheahan for his help.
Module Level:	Continuous Calculator (M.Sc.) (PG Dip)
Module Description:	An introduction to the ideas of statistical inference from a mathematical perspective. Topics covered include: populations and samples, properties of estimators, likelihood functions, principles and methods of point estimation, interval estimates, hypothesis testing and construction of tests.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Construct a full sampling distribution for a simple, small sample probability model and calculate the properties of standard estimators such as the sample mean and variance;
LO2	Derive a likelihood function for random samples from a probability model and under more complex sampling schemes, eg mixed populations, censoring;
LO3	Calculate simple unbiased estimators and calculate optimal combinations of estimators;
LO4	Find maximum likelihood estimators by solving the score equation and obtain an estimate of precision based on observed and expected information;
LO5	Find confidence intervals for simple problems using pivotal quantities;
LO6	Calculate the size and power function for a given test procedure;
LO7	Obtain a most powerful test of two simple hypotheses using the Neyman Pearson lemma and extend this to a uniformly most powerful test of one-sided alternatives;
LO8	Use the likelihood ratio procedure to derive a test of nested hypotheses for some simple statistical models.

ST237: Introduction to Statistical Data and Probability (Semester:3 Group not available to select online)

Module Details

Title Short:	Introduction to Statistical Data and Probability APPROVED
Language of Instruction:	English

Module Code:	ST237

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	34 programme(s)

Module Owner:	JOHN PHILIP HINDE

Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics

Module Description:	This course discusses the nature of statistical data and the use of probability to describe random phenomena. Topics covered include: data sources, data presentation, numerical and graphical summaries, basic ideas of probability, conditional probability and indpendence, random variables, standard discrete distributions, mean and variance, joint distributions, and an introduction to the normal distribution.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Construct appropriate graphical summaries for a sample of data, including stem-and leaf plots, dot-plots, box-plots.
LO2	Calculate numerical summaries for a sample of data, including the mean and variance, median and quartiles.
LO3	Use simple counting and combinatorial arguments to calculate probabilities.
LO4	Calculate probabilities for combinations of events, including unions, intersections and complements, using the laws of probability.
LO5	Calculate conditional probabilities and use Bayes theorem to reverse conditioning.
LO6	Construct probability distributions for random variables in simple settings.
LO7	Calculate means and variances of random variables.
LO8	Calculate marginal and conditional distributions of bivariate discrete distributions, calculate the correlation, assess independence.
LO9	Calculate probabilities from standard distributions (Binomial, Poisson, Normal) using tables.
LO10	Use Minitab to explore data both numerically and graphically and to calculate probabilities from standard probability models.

ST238: Introduction to Statistical Inference (Semester:4 Group not available to select online)

Module Details

Title Short:	Introduction to Statistical Inference APPROVED
Module Code:	ST238
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	21 programme(s)
Module Owner:	JEROME SHEAHAN
Module Discipline:	MA - Mathematics
Module Description:	This module is an introduction to the ideas and commoly used techniques in analysing data from experiments and observational studies. Participants learn the role of probability in statistical inference, review the ideas in sampling distributions, learn concepts of interval estimation and hypothesis tests, learn standard one and two-sample procedures for quantitative data, learn basic enumerative data analysis, and simple correlation and linear regression

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the difference between Probability and Statistics and the role of Probability in solving statistical inference problems.
LO2	Perform probability calculations about the sample mean and use them to make inferential statements.
LO3	Understand some basic ideas about interval estimation; be familiar with Type I and Type II errors in hypothesis tests and be able to calculate the p-value and power of various statistical tests.
LO4	Find confidence intervals and perform hypothesis tests about a single population mean, a single population proportion, the difference between two population means, and a single population variance.
LO5	Analyse enumerative data through chi-squared goodness-of-fit and contingency table tests.
LO6	Calculate and interpret the linear correlation coefficient for relating two variables.
LO7	Fit the least squares line to data pairs, and make statistical inferences about the slope of the underlying population equation, and perform basis prediction.
LO8	Understand the basics of some survey designs.
LO9	Understand when and in what ways a randomised block experimental design is often superior to the completely randomised design.

ST311: Applied Statistics I (Semester:5 Optional)

Module Details

Title Short:	Applied Statistics I APPROVED
Module Code:	ST311
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	29 programme(s)
Module Owner:	EMMA HOLIAN
Module Discipline:	MA - Mathematics
Module Description:	An introduction to methods and applications in applied statistical inference. This module is offered as an optional module, building on the statistical inferential methods demonstrated in pre-requisite module ST238 or similar modules. Various non-parametric hypothesis tests are demonstrated and a comparison of suitability of applying non-parametric and parametric methods is discussed. The module also builds on regression modelling, where topics covered include model estimation, model checking and inference for simple linear regression and multiple linear regression models, and procedures in variable selection. Models discussed are applicable for a single quantitative response with quantitative and/or qualitative predictors.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	demonstrate various non-parametric testing procedures, identify suitability of parametric methods and the their non-parametric alternative test method, discuss the advantages and disadvantages of parametric and non-parametric testing, define the the power of a test and intrepret its meaning in applications, formulate the power function and sketch power curves;
LO2	carry out parametric and non-parametric testing procedures with the use of software, Minitab;
LO3	calculate and interpret correlations between variables and make inferences about relationships;
LO4	formulate a linear regression model, calculate and interpret estimated coefficients and make statistical inferences on the fitted model by carrying out statistical tests using parameter estimates and using the ANOVA table. Regression models discussed include a single quantitative response explained by a single explanatory variable or mutliple explanatory variables which include quantitative and/or categorical explanatory variables and interactions between variables;
LO5	obtain fitted values and predictions at new data points, together with associated prediction and confidence intervals;
LO6	by calculating regression diagnostics and producing relevant plots check the adequacy of the model specification for the data presented and to check model assumptions, including linearity, normality, constant variance, independence and the presence of outliers and influential points;explore the need for transformations of response and explanatory variables;
LO7	interpret and use output from variable selection procedures to choose adequate models, including the best subsets procedure and step-wise;
LO8	carry out the regression analysis with the use of software, Minitab;
LO9	compile a statistical report, i.e. prepare a typed document which introduces the statistical research question being explored, describes the data collection method applicable to the research, describes relevant features of the sample data obtained, and outlines conclusions from inferential statistical analysis carried out using the sample data, incorporating output and plots from statistical software.

ST312: Applied Statistics II (Semester:6 Optional)

Module Details

Title Short:	Applied Statistics II APPROVED
Language of Instruction:	English

Module Code:	ST312

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	29 programme(s)

Module Owner:	HAIXUAN YANG

Module Discipline:	MA - Mathematics

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	Methods and applications in applied statistical inference. This module discusses factors for consideration in experiment design and demonstrates methods in the analysis of data emerging from designed experiments. Topics covered include confounding, blocking, a completely randomized design and a randomized block design, two-way ANOVA. The module also demonstrates regression modelling for a qualitative response, i.e. methods in logistic regression and generalized linear models.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	discuss topics in experiment design and carry out analysis for data collected from a completely randomized design, a randomized block design, and two-factor studies with interaction effects, interpret the results with reference to the data application;
LO2	formulate a logistic regression model and generalized linear model for a qualitative response, calculate and interpret estimated coefficients and make statistical inferences on the fitted model by carrying out statistical tests using parameter estimates, obtain fitted values and predictions at new data points, together with associated prediction and confidence intervals;
LO3	apply various techniques in analysis of a multivariate response, including topics from, principal components analysis, cluster analysis, time series analysis.
LO4	carry out analysis and testing procedures discussed with the use of software, Minitab;
LO5	compile a statistical report, i.e. prepare a typed document which introduces the statistical research question being explored, describes the data collection method applicable to the research, describes relevant features of the sample data obtained, and outlines conclusions from inferential statistical analysis carried out using the sample data, incorporating output and plots from statistical software.

ST313: Applied Regression Models
(Semester:7 Optional)

Module Details

Title Short:	Applied Regression Models APPROVED
Language of Instruction:	English

Module Code:	ST313

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	24 programme(s)

Module Owner:	HAIXUAN YANG

Module Discipline:	MA - Mathematics

Acknowledgment:	This module is developed from Prof. John Hinde's work. Also thanks Dr Jerome N. Sheahan for his help.

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	An introduction to the theory and application of regression models. Topics covered include the simple linear model, least-squares estimation, multiple linear regression, inference, model checking, model choice and variable selection, and the use of Minitab for practical applications.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	1 calculate and interpret correlations between variables and make inferences about relationships; 2 formulate a linear regression model, calculate estimated coefficients and make statistical inferences on the fitted model using both parameter estimates and the ANOVA table; 3 obtain fitted values and predictions at new data points, together with associated confidence intervals; 4 calculate regression diagnostics and use these to check model assumptions, including linearity, normality, constant variance, independence and the presence of outliers and influential points; 5 formulate a multiple regression model and specify this in matrix form; 6 derive least-squares estimates for

ST314: Introduction to Biostatistics (Semester:5 Core)

Module Details

Title Short:	Introduction to Biostatistics APPROVED
Module Code:	ST314
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	5 programme(s)
Module Owner:	JOHN NEWELL
Module Discipline:	MA - Mathematics
Module Description:	This course will introduce students to statistical concepts and thinking by providing a practical introduction to data analysis. The importance and practical usefulness of statistics in biomedical and clinical environments will be demonstrated through a large array of case studies. Students attending this course will be encouraged and equipped to apply simple statistical techniques to design, analyse and interpret studies in a wide range of disciplines.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	understand the key concept of variability;
LO2	understand the ideas of population, sample, parameter, statistic and probability;
LO3	understand simple ideas of point estimation;
LO4	recognise the additional benefits of calculating interval estimates for unknown parameters and be able to interpret interval estimates correctly;
LO5	carry out a variety of commonly used hypothesis tests
LO6	understand the difference between paired and independent data and be able to recognise both in practice;
LO7	understand the aims and desirable features of a designed experiment;
LO8	calculate the sample size needed for one and two sample problems.

ST412: Stochastic Processes

(Semester:6 Optional)

Module Details

Title Short:	Stochastic Processes APPROVED
Module Code:	ST412
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2016-17 (01-09-16 – 31-08-17)
Teaching Period:	Semester 2
Module Delivered in	13 programme(s)
Module Owner:	JEROME SHEAHAN
Module Discipline:	MA - Mathematics
Module Level:	Continuous Calculator (M.Sc.) (PG Dip)
Module Description:	The goal of the course is to introduce the main ideas and methods of stochastic processes with the focus on Markov chains (processes with discrete time index and finite state space). Branching processes and Poisson process (continuous time and discrete state space) will also be included in the study.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Use probability and moment generating functions to calculate corresponding distributional properties.
LO2	Derive properties of branching processes such as expectation, variance, and probability of extinction.
LO3	Calculate relevant probabilities in random walks with and without barriers
LO4	Use Markov property to prove various probabilistic statements about Markov chain
LO5	Classify states of Markov chains and determine stationarity properties
LO6	Calculate limiting and statitonary distributions
LO7	Prove and calculate various properties of Poisson process
LO8	Build and describe Markov chains to represent simplified real world problems, for example, such as those those used to model credit mobility

ST415: Probability Theory and Applications (Semester:7 Optional)

Module Details

Title Short:	Probability Theory and Applications APPROVED
Module Code:	ST415
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	21 programme(s)
Module Owner:	JEROME SHEAHAN
Module Discipline:	MA - Mathematics
Module Description:	This module develops probability theory that is useful in a myriad of applications. The theory is implemented in the development of statistical theory and methods, and a variety of applications will be given in IT and Communications Systems, and in other areas. The module is quite advanced and requires knowledge of probability to the level of at least ST235/MA235 or equivalent, and preferably also some mathematical statistics.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand probability and random variables at a measure-theoretic level.
LO2	Understand joint, marginal and conditional distributions and their moments.
LO3	Derive and compare various modes of convergence of random variables.
LO4	Develop properties of characteristic functions and be able to use them to establish various properties including limiting distributions.
LO5	Understand discrete-time Martingales.
LO6	Be able to apply the theory to various problems in statistical theory, Information Technology and Communications Systems, in Game Theory and in Finance.

ST417: Introduction to Bayesian Modelling (Semester:8 Optional)

Module Details

Title Short:	Introduction to Bayesian Modelling APPROVED
Language of Instruction:	English

Module Code:	ST417

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	21 programme(s)

Module Owner:	NOELLE GANNON

Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics

Module Level:	Continuous Calculator (M.Sc.) (PG Dip)

Module Description:	An introductory course to Bayesian statistical modelling and analysis. Covers basic theory and methods of Bayesian model development and focuses on inference which is based on simulations (computations done in R). A prerequisite is a calculus based course in probability (at the level of ST2x3/MA235, for example). Prior experience studying statistics or regression analysis is helpful but not necessary.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Determine likelihood and prior distributions as parts of a basic Bayesian model specification.
LO2	Apply Bayes theorem to obtain posterior distribution of unknown random variables in the model.
LO3	Derive posterior predictive distribution.
LO4	Write simple R scripts implementing basic random sampling methods.
LO5	Apply the basics of Markov chain theory to implement simulation algorithms for inference.
LO6	Implement Gibbs sampler and Metropolis algorithm to obtain samples from posterior distributions.
LO7	Compare and contrast basic Bayesian methods with classical statistics and realize advanatges and disadvantages of both.
LO8	Develop simple Bayesian models for analysis of real world data sets.

TI150: Principles of Human Geography
(Semester:1 Core)

Module Details

Title Short:	Principles of Human Geography APPROVED
Language of Instruction:	English

Module Code:	TI150

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	21 programme(s)

Module Owner:	TERRY MORLEY

Module Discipline:	TI - Tireolaiocht

Module Description:	This course seeks to introduce key problems, concepts and contexts within human geography. Its focus is a contemporary one: it strives to illuminate the world of today by exploring and analysing the origin of central issues that make the headlines (or not) in the media and beyond. The course places lectures alongside the information given on Blackboard; for examination purposes, both are essential.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Recognise and differentiate the key concepts within human geography.
LO2	Recognise and evaluate central issues and recent research within the field of human geography.

TI311: Advanced Gis
(Semester:7 Optional)

Module Details

Title Short:	Advanced Gis APPROVED
Language of Instruction:	English

Module Code:	TI311

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	25 programme(s)

Module Owner:	CHAOSHENG ZHANG

Module Discipline:	TI - Tireolaiocht

Module Description:	Based on the basic concepts and simple applications of GIS that were covered in the course “Introduction to GIS”, this course focuses on the advanced topics and advanced functions of GIS, which are more practical and problem-solving. The concepts of advanced analysis functions of network analysis and spatial interpolation are explained, and the topic Google Earth is discussed. Actual applications in geography are demonstrated and practical exercises are provided. The extensions of ArcGIS are selected as the software package for this course. Students will understand the latest development of the advanced GIS topics.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate the practical skills of a GIS project design and completion.
LO2	Make practical maps and perform advanced analyses through computer practical classes.

TI3115: TI3115 Coastal Dynamics (Sc) (Semester:7 Optional)

Module Details

Title Short:	TI3115 Coastal Dynamics (Sc) APPROVED
Language of Instruction:	English

Module Code:	TI3115

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	KEVIN LYNCH

Module Discipline:	TI - Tireolaiocht

Module Description:	The coastal zone exists at the interface of land, sea and atmosphere, making it a highly complex environment. Only through improved understanding of the processes operating in this zone can we hope to understand and manage this valuable resource in a sustainable manner. This course introduces the basic concepts of coastal science. The role of waves, wind and sea-level in shaping the coast are explored. Conversely, the shape of coastal landforms affects these processes; this interaction between process and form is considered within a morphodynamic framework.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an understanding of using the systems approach to coastal environments.
LO2	Demonstrate an understanding of contemporary coastal processes and landforms.
LO3	Appreciate and develop skills that are used in the investigation of coastal environments, with fieldwork as an essential part of this learning process.
LO4	Identify complex constraints on, and opportunities for, human exploitation of coastal resources.
LO5	Comprehend and evaluate the patterns and processes controlling long-term coastal evolution and relative sea-level change.

ZO208: Invertebrate Biology (Semester:4 Group not available to select online)

Module Details

Title Short:	Invertebrate Biology APPROVED
Language of Instruction:	English

Module Code:	ZO208

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	GRACE PATRICIA MCCORMACK

Module Discipline:	ZO - Zoology

Module Description:	The module covers the major invertebrate groups. The module focuses on how the groups differ in morphology, physiology, reproduction, development and ecology. Practical sessions illustrate the variety of invertebrate life and include a trip to the aquarium to observe marine species. Key skills include scientific drawing, dissection, species identification and classification.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the difference between the major clades based on morphological & molecular evidence
LO2	List the characteristics of the major invertebrate phyla
LO3	Draw and describe the body plans for the major invertebrate phyla?
LO4	Compare & contrast the key functions (e.g. locomotion, nutrition and reproduction) among the major invertebrate phyla
LO5	Discuss the life cycles of the the following phyla: Cnidaria, Platyhelminthes, Mollusca, Nematoda and different sub phyla and classes of the Arthropoda
LO6	Display practical skills in a range of techniques used to study animals in the laboratory

ZO209: Vertebrate Zoology (Semester:4 Group not available to select online)

Module Details

Title Short:	Vertebrate Zoology APPROVED
Language of Instruction:	English

Module Code:	ZO209

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	4 programme(s)

Module Owner:	GERHARD SCHLOSSER

Module Discipline:	ZO - Zoology

Module Description:	This module will give an introduction to the anatomy, physiology, ecology and systematics of vertebrates. Lectures will provide a brief overview of the general vertebrate body plan and will then proceed through various vertebrate groups (jawless vertebrates, fishes, amphibians, reptiles birds and mammals) highlighting their characteristic features and discussing evolutionary origins and systematic relationships. Practicals will give students the opportunity to study living and fixed specimens

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	distinguish main features of the vertebrate body plan
LO2	understand the basic morphology, physiology and life history of different vertebrate groups
LO3	describe the phylogenetic relationships of different vertebrate taxa
LO4	observe, analyse and document zoological specimens and preparations

ZO315: Applied Ecology
(Semester:6 Optional)

Module Details

Title Short:	Applied Ecology APPROVED

Module Code:	ZO315

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	COLIN LAWTON

Module Discipline:	ZO - Zoology

Module Description:	An examination of applied aspects of Animal Ecology, this course shows students how our knowledge of the ecology of animal populations and communities can be used in various fields, including conservation, pest management, habitat management and protection, parasitological studies and even forensic science. Anthropogenic influences on populations and animal behaviour is also explored.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	explain concepts of wildlife conservation, invasion ecology and pest species management and apply these to examples taken from Irish animal populations and other examples from further afield
LO2	discuss how the ecology of a parasite species can impact on animal and human populations and explain the role that hosts can have in the epidemiology of parasitic diseases
LO3	discuss how habitats can be monitored in Ireland and other countries, and explain the role nutrient cycling has in an ecosystem, and how those nutrients can be monitored.
LO4	describe the influence of the enviroment on behaviour, the genetic basis of behaviour and explain how anthropogenic influences can disrupt natural behaviour

ZO317: Evolutionary Biology (Semester:5 Optional)

Module Details

Title Short:	Evolutionary Biology APPROVED
Module Code:	ZO317
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	8 programme(s)
Module Owner:	GRACE PATRICIA MCCORMACK
Module Discipline:	ZO - Zoology
Module Description:	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.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the evolutionary forces acting on alleles and genotypes.
LO2	Describe the methods used to study genetic variation in natural populations.
LO3	Describe in detail different types of speciation, including detailed discussion on the degree and type of isolation, selection and genetic mechanisms at play.
LO4	Describe the evolutionary origin of development and of metazoans
LO5	Explain the different modes in which development can be repatterned during evolution
LO6	Discuss how developmental processes can affect the direction of evolution
LO7	Display enhanced skills in writing essays on selected key concepts of evolutionary biology

ZO318: Geographic Information Systems and Biostatistics (Semester:6 Optional)

Module Details

Title Short:	Geographic Information Systems and Biostatistics APPROVED
Module Code:	ZO318
ECTS Credits:	5
NFQ Level:	8
EQF Level:	6
EHEA Level:	First Cycle
Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	9 programme(s)
Module Owner:	MARK PETER JOHNSON
Module Discipline:	ZO - Zoology
Module Description:	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).

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Demonstrate an understanding of the different types of data used in ecology and geographic analyses
LO2	Explore data using descriptive statistics and apply inferential statistics
LO3	Understand the role of statistics in planning, validating and communicating the findings of ecological research
LO4	Describe different habitat classification schemes in use
LO5	Be able to create, edit and analyse spatial data using geographic information systems
LO6	Produce maps for visualisation and interpretation of ecological data

ZO319: Marine Zoology
(Semester:5 Optional)

Module Details

Title Short:	Marine Zoology APPROVED
Language of Instruction:	English

Module Code:	ZO319

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	6 programme(s)

Module Owner:	ANNE MARIE POWER

Module Discipline:	ZO - Zoology

Module Description:	This module studies deep-sea environments and explores marine diversity patterns and explanations for these patterns.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Identify the major groups of cnidarians commonly associated with seamounts and submarine canyons.
LO2	Describe the biology of seamount and submarine canyon communities.
LO3	Review the importance of designated deep-water marine protected areas.
LO4	Define a community and community structure.
LO5	Quantify species diversity.
LO6	Identify trends in marine community structure (i.e., species diversity and trophic structure), hypotheses to explain these trends, and arguments that weigh up the relative merits of these hypotheses.
LO7	Define an ecological niche.
LO8	Define the relationship between area and species richness and apply this relationship to real conservation problems.

ZO320: Concepts in Population & Community Ecology (Semester:6 Optional)

Module Details

Title Short:	Concepts in Population & Community Ecology APPROVED
Language of Instruction:	English

Module Code:	ZO320

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	6 programme(s)

Module Owner:	ANNE MARIE POWER

Module Discipline:	ZO - Zoology

Module Description:	This module will cover the basics of animal population ecology and community ecology. It will focus on population level characteristics in animals (including density, dispersal and how populations grow or decline) and interactions between organisms of the same or different species populations.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Explain population structure including spatial structure, density and dispersal, genetic and age structure
LO2	Describe population growth in a variety of circumstances; also regulation of population growth & its applications in sustainable harvesting
LO3	Discuss life history strategies and provide case studies for all of the above
LO4	Describe interactions between different species including competition, predation, mutualisms, facilitation
LO5	Describe communities which are in equilibrium or disturbed; and recovery from disturbance through the process of succession
LO6	Carry out practical techniques in ecological zoology including calculations of population and community metrics, plotting results, making labelled drawings etc.

ZO414: Advanced Zoology Topics
(Semester:8 Optional)

Module Details

Title Short:	Advanced Zoology Topics APPROVED
Language of Instruction:	English

Module Code:	ZO414

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2017-18 (01-09-17 – 31-08-18)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	LOUISE ALLCOCK

Module Discipline:	ZO - Zoology

Module Description:	This module will provide an opportunity to read about and reflect on advanced topics in Zoology. A reading list of books covering a broad range of important and/or current topics in the Discipline will be provided. Important ideas, concepts and/or arguments in the literature will be examined through a written paper at the end of semester II.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Summarize the main findings and arguments from scientific books.
LO2	Critically evaluate and discuss this material.
LO3	Synthesise and communicate this material in a written essay.

ZO415: Biometry
(Semester:7 Optional)

Module Details

Title Short:	Biometry APPROVED

Module Code:	ZO415

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	COLIN LAWTON

Module Discipline:	ZO - Zoology

Module Description:	This module introduces statistics, as used by experimental biologists, covering both the basic principles on which Biometry is based and the common tests that should be familiar to all biological scientists. Students are empowered to analyse and interpret data from their own final year research projects as well as understand the statistics used in the literature they read. The course is taught through worked examples, using statistical computer packages and pen and paper calculations.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Consider data analysis at the experimental design stage of their project
LO2	Derive hypotheses that can be tested statistically
LO3	Choose and conduct an appropriate statistical test to analyse their data
LO4	Interpret the test, and successfully accept/reject the appropriate hypothesis
LO5	Conduct statistical tests using SPSS, or similar statistical package

ZO416: Integrative Zoology
(Semester:8 Optional)

Module Details

Title Short:	Integrative Zoology APPROVED

Module Code:	ZO416

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 2

Module Delivered in	1 programme(s)

Module Owner:	LOUISE ALLCOCK

Module Discipline:	ZO - Zoology

Module Description:	The module will deal with various topics and concepts in contemporary animal sciences. It will take the form of 6 weekly discussion sessions that will be moderated by a lecturer, with the students being the main contributors. Each meeting will be prepared in advance, based on a given reading list, and the students will write a short report on the topic and the discussion to be submitted within a week of the discussion.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Summarize literature and prepare a topic for discussion
LO2	Debate a scientific topic
LO3	Write a synopsis of a scientific discussion
LO4	Approach a biological problem from an integrative point of view

ZO417: Marine & Coastal Ecology
(Semester:7 Optional)

Module Details

Title Short:	Marine & Coastal Ecology APPROVED
Language of Instruction:	English

Module Code:	ZO417

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1

Module Delivered in	3 programme(s)

Module Owner:	ANNE MARIE POWER

Module Discipline:	ZO - Zoology

Module Description:	Covers advanced concepts in marine and coastal ecology including the impacts of climate change and fisheries in marine and coastal habitats, biologging and biotelemetry, jellyfish ecology and marine litter

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Understand the basics of sustainable yield models in fisheries and their underlying assumptions; Give examples of different reasons for fish stock collapses
LO2	Describe stock assessments, explain how these feed into Total Allowable Catch (TAC) & explain the EU Management Structures including practices on discards.
LO3	Know about stock identification methods including the strengths and weakness of different approaches
LO4	Present and discuss evidence for long term trends in the ecological impacts of global warming
LO5	Explain the utility and drawbacks associated with Bioclimate Envelope Models
LO6	Examine biophysical modelling in global warming
LO7	Discuss the ecosystem services provided by gelatinous zooplankton in marine systems according to the four categories of the Millennium Ecosystem Assessment.
LO8	Discuss jellyfish abundance in relation to climate change, overfishing and invasive species.
LO9	Describe differences between biologging and biotelemetry and be able to discuss the different types of devices, their applications and attachment protocols (inc. ethics and licencing).
LO10	Discuss importance of biologging & biotelemetry in revolutionising our understanding of our oceans.
LO11	Describe the sources and impacts of marine litter as an environmental, economic and health concern.

ZO418: Phylogenetics & Conservation (Semester:7 Optional)

Module Details

Title Short:	Phylogenetics & Conservation APPROVED
Language of Instruction:	English

Module Code:	ZO418

ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)

Teaching Period:	Semester 1 and Semester 2

Module Delivered in	4 programme(s)

Module Owner:	GRACE PATRICIA MCCORMACK

Module Discipline:	ZO - Zoology

Module Description:	There are many threats to flora and fauna due to human impacts including an increase in numbers of invasive species and decline of habitat. This module will describe the impacts of invasive species, discuss pest management and how native species can be protected as well as explain phylogenetic methodology and how it can be applied to assessing biodiversity and defining units of conservation.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Discuss what is meant by 'species' and explain speceis concepts.
LO2	Explain phylogenetic methodology and describe how it is used in conservation.
LO3	Discuss the biology and conservation of marine mammals
LO4	Discuss the impact of invasive species
LO5	Explain how pest management is performed and how native species can be protected

ZO419: Practical Skills in Zoology
(Semester:7 Optional)

Module Details

Title Short:	Practical Skills in Zoology APPROVED
Module Code:	ZO419
ECTS Credits:	5

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	COLIN LAWTON
Module Discipline:	ZO - Zoology
Module Description:	A laboratory and field based module, which covers key practical skills in various areas within Zoology. These skills will prepare students for the experimental work they will be doing in their final year project as well as covering a variety of techniques that will be of use to them in their subsequent careers.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	conduct experimental research in the field in a range of ecosystems using scientific methodology based on sound experimental design
LO2	display a knowledge of health and safety risks in a variety of field scenarios and take necessary precautions to reduce the risks to a satisfactory level
LO3	carry out laboratory experiments using sophisticated techniques and producing quality reliable results
LO4	analyse and interpret data using statistical methods, and display the data using appropriate graphs and tables
LO5	produce detailed reports on experimental work following scientific conventions

ZO423: Final Year Project in Zoology
(Semester:7 Optional)

Module Details

Title Short:	Final Year Project in Zoology APPROVED
Module Code:	ZO423
ECTS Credits:	15

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 1
Module Delivered in	1 programme(s)
Module Owner:	COLIN LAWTON
Module Discipline:	ZO - Zoology
Module Description:	This is an independent project in which the student conducts an experiment or series of experiments to investigate and test a scientific hypothesis under the supervision of a member of staff in Zoology. The project may be field or laboratory-based (or a combination of the two) but will culminate in a written thesis, which incorporates a literature review and an experimental write-up following scientific convention

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	read and critically appraise scientific literature and place their own work within the context of previously conducted scientific research
LO2	devise hypotheses and design experiments which are repeatable and fully test the hypotheses under investigation
LO3	conduct experimental work in a diligent fashion to obtain high quality data
LO4	analyse data using statistical analyses and display data appropriately within a thesis
LO5	draw conclusions and make recommendations for future research in the study area
LO6	present their data orally in a short seminar justifying the work conducted, detailing the methodologies used, and presenting and discussing results

ZO425: Literature Review (Semester:8 Optional)

Module Details

Title Short:	Literature Review APPROVED
Module Code:	ZO425
ECTS Credits:	10

NFQ Level:	8	**EQF Level:**	6	**EHEA Level:**	First Cycle

Valid From:	2015-16 (01-09-15 – 31-08-16)
Teaching Period:	Semester 2
Module Delivered in	1 programme(s)
Module Owner:	COLIN LAWTON
Module Discipline:	ZO - Zoology
Module Description:	This module will ask students to do an independent literature review on one particular topic in Zoology. A number of different topics will be available for selection and students will be asked to choose one topic. Students will have to independently search for literature on the topic using the library and various public databases and to write an extensive (approx. 4000 words) review providing an overview of the subject.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	use the library and public databases to search for scientific literature
LO2	recognize relevant and discard irrelevant information in original research papers
LO3	summarize and synthesize current knowledge on a defined topic by reference to the primary literature
LO4	present his/her findings in a well-structured and coherently argued review-style essay