

Core Modules (40 ECTS)

Environmental Problems in Marine and Freshwater Environments: Contaminants (EOS5103) (5 ECTS)

Marine and freshwater environments have enormous intrinsic value regarding traditional uses (e.g., navigation, fishing, resource sources) together with more recent activities (e.g., mineral, oil, aggregate extraction, and renewable energies). The aim of this module is to provide students with knowledge on the contamination of our marine and freshwater environments and how chemical contaminants compromise the fragile balance of these ecosystems. Students will also learn about the fundamental concepts regarding the introduction of a suite of different contaminants into aquatic systems and how these can set off a series of complex biological and chemical reactions. In addition, the course will consider the important ecological and human risks regarding contamination of marine and freshwater systems, including drinking water supplies.

Environmental Problems in Marine and Freshwater Environments: Methodological Aspects and Applications (EOS5104) (10 ECTS)

This module will provide students with training, technical competencies and critical thinking abilities in laboratory, field and research skills that focus on all aspects of water quality monitoring and management. This will equip participants with expertise in monitoring programme design, quality assurance, data analysis, monitoring and assessment of marine and freshwater (including groundwater) quality with chemical and ecological methods. The programme will also provide opportunities to participate in field workshops. Students will also learn about and get an insight into methodological analytical approaches and suitable instrumental techniques important in marine and freshwater environmental assessment.

Marine and Freshwater Acidification (EOS5107) (5 ECTS)

The CPD in Marine and Freshwater Acidification will equip participants with relevant training in sampling and monitoring of waters and analysis of results. The programme will provide the technical competences to survey and assess acidification of marine, coastal, transitional, fresh, ground and drinking waters. The programme will give opportunities to learn practical skills, acquire data analysis and reporting skills that are in line with training needs identified in the public and private sector in an area of emerging importance associated with climate change.

Literature Review, Project Planning and Proposal (EOS5101) (5 ECTS)

This module requires the student to develop a project plan and literature review relevant to the marine and freshwater environment. Students will formulate a valid research aim, set objectives, and write a synthesis of the research evidence for the topic to be investigated. Students will develop expertise in experimental design and planning, in the written and oral presentation of a research proposal and in how to justify it. Students will produce a clear project plan including the context of their work, list practical steps required to achieve the aims, within a set time frame and make arrangements for regular meetings with their supervisor and stakeholders.

Water Framework Directive (EV5101) (5 ECTS)

This module explores the linkages between the Water Framework Directive (WFD) and conserving biodiversity. It outlines how different EU countries have defined targets such as "good ecological status". Case studies illustrate that increases in the resilience of biodiversity in aquatic ecosystems can be achieved by balancing sustainable water use with the long-term protection of available resources, while recognising limitations to the legislation. Emphasis will be placed on understanding the WFD and connections with other plans and programmes.

Metals in the Environment, Speciation, Bioavailability, Remediation (EOS6102) (5 ECTS)

This module provides students from a wide range of disciplines (e.g., Environmental Science, Microbiology, Oceanography, Earth Sciences, Engineering, Biotechnology, Analytical Chemistry) with key skills for their research studies. The programme will focus on the chemistry of metals in all compartments of the environment and the bioavailability of different species. A suite of analytical instrumental techniques and developments in modern technologies for the determination of metals including speciation in environmental samples will be covered. The course will consist of lectures and case studies examining specific compartments of the environment by experts and participants' presentation/discussion of their own research topic and framework.

Green Lab Principles and Practice (BI5108) (5 ECTS)

This module aims to provide a general overview of key environmental concepts such as climate change, plastic pollution, sustainability, and biodiversity. It will briefly explore how perspectives from psychology, sociology, economics, and the study of ethics and governance provide us with insights into how perception and behaviour influence responses to environmental issues. In addition, the lifecycle of materials, and the environmental impact of the resources and equipment typically used in scientific laboratories will be examined in some detail. These ideas will form the backdrop to a focused study on how the organisation of, and practices in, scientific laboratories can be reformed to reduce their environmental footprint and be established on a more sustainable basis.

Research Project (30 ECTS)

Marine and Freshwater Resources: Monitoring and Management Dissertation Project (EOS5106)

Each student will conduct an individual research project within the area of marine and freshwater resources: monitoring and management. This involves preparing a literature review, identifying knowledge gaps, research questions and hypotheses and writing a final report of the research findings. This offers an opportunity for the students to apply learning from the course content to conduct independent research and original work. This module involves a series of discussions with supervisors and stakeholder and progress reporting to supervisors within agreed timeframes.

Optional Modules

Water Quality (CE6107) (5 ECTS)

The health of the Earth's surface waters is vitally important to humans as we use them for many different purposes including water supply, recreation, disposal of wastewaters, irrigation and energy generation. In addition, they are home to a large proportion of the Earth's plants and animals, many of which are important food sources for humans. The aim of this module is to provide students with knowledge of the factors affecting water quality including natural and manmade stressors of water quality, transport and mixing processes, and the bio-geo-chemical interactions of the water quality cycle. Students will also learn the fundamental theory of water quality modelling so that they will be able to use water quality models in a sensible manner. The primary focus of the module is on rivers.

Global Change (EOS6101) (5 ECTS)

This module 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 is placed on understanding and communicating the basic science behind natural climate cycling (e.g. Milankovitch/ENSO) and more recent anthropogenic forcings (e.g. fossil fuel burning, agricultural practices).

Introduction to Data Analysis Tools for Earth and Ocean studies (EOS610) (5 ECTS)

This module provides students undertaking research in Oceanography, Earth sciences or Environmental projects with some of the key skills they will need for their Masters or PhD project work. These skills include mathematics for scientists, MATLAB and Labview programming, analysis of large oceanographic and earth science data (ODV and GMT) and an introduction to applying these tools to key earth and ocean processes (e.g. tides, seismic waves, climate time series etc). The course will consist of a weekly lecture over the course of the semester which will provide guidance on practical exercises to be completed by the class. Course load is 10 hours per week; 1 hour of lectures, 2 hours of practical, 3 hours for practical assignments and 4 hours of directed reading: 12 x 10 = 120 hours over the semester.

Ecosystem Science (EV507) (5 ECTS)

This module explores how the ecosystem can be assessed from a number of different perspectives including; i.e. geology, hydrology, soils, biodiversity, etc. Emphasis will be placed on understanding the connections between these parameters with a view to producing an overall integrated ecosystem assessment procedure.

Invasive Species & Biodiversity (EV534) (5 ECTS)

This module explores how the local biodiversity can be impacted by a range of invasive species. In particular, this module focuses on the impacts of invasive species on native biodiversity and on the role of humans as vectors of invasive species and minimising the impacts of invasive species. In addition, it outlines the role of planning authorities in supporting resilient ecosystems through invasive species eradication or control programmes. Emphasis will be placed on understanding how invasive species become established and will look at case studies highlighting current thinking on control or eradication measures.

Marine Spatial Planning and Policy (TI6012) (10 ECTS)

This module critically reviews how society has viewed and used the marine environment through history, examines evolving views on how these systems have been valued, evaluates various policies and practices employed in its management, and explores current and future issues that threaten marine system functionality. Students will be introduced to a range of tools used in managing the marine environment, investigate policy and practice suitability at multiple scales, and gain theoretical insights on the emergence of Marine Spatial Planning policies in Ireland and abroad.

Project Management (IE446) (5 ECTS)

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.

Communicating Science and Research (EV5102) (5 ECTS)

Research communication aims to generate support for engaged research, to inform decision making and policy, and engage the general public. This module provides an introduction to research communication and community engagement and enables students to critically engage with different communication methods. This module explores different ways and technologies for communication in relation to different audiences and examines the range of social media tools available and their use in a science communication/public engagement context.

Biodiversity Legislation and Policy (EV515) (5 ECTS)

This module explores how conservation legislation and biodiversity policy can be linked into day to day planning work at a strategic and local level. Emphasis is placed on understanding the connections between national biodiversity actions, species action plans and local biodiversity action plans.

Data Analysis for Sustainability Research (PAB5128) (5 ECTS)

The module will cover the core principles required in the analysis of complex multifactorial quantitative and qualitative datasets, interpretation and communication of the obtained results. This module will cover how to explore and understand the data, how to display the variables, normality of data, how to explore relationships between variables using scatterplot, correlations, linear regressions, associations between the variables and statistical model's development. All practicals are conducted through R or other relevant statistical software.

Applied Data Science with R (CT5163) (5 ECTS)

Using the R programming language and tidyverse libraries for exploratory data analysis, data visualisation, data modelling and data transformation.

Geospatial Analysis and Remote Sensing (PAB5127) (5 ECTS)

This module (1-week Autumn course) provides students (PhD or Masters) from a wide range of disciplines (e.g. Environmental Science, Microbiology, Oceanography, Earth Sciences, Engineering, Biotechnology, Analytical Chemistry) with key skills for their research studies. The programme will focus on the chemistry of metals in all compartment of the environment and the bioavailability of different species. A suite of analytical instrumental techniques and developments in modern technologies for the determination of metals including speciation in environmental samples will be covered. The course will consist of lectures, case studies examining specific compartments of the environment by experts and participants' presentation/discussion of their own research topic and framework.

The Environment and Human Health (EV6101) (5 ECTS)

This module explores the relationships between environment, biodiversity and health. Students become competent in assessing key aspects of environmental quality. Students evaluate linkages between emerging research, policy makers and practitioners at international and European levels to inform evidence-based policy and practice in relation to health and environment.

Legislation for Environmental Scientists (LW3124) (5 ECTS)

This module exposes students to the considerable amount of environmental legislation that exists in Ireland. It encourages students to think about how the legislation is implemented and how it could be used in their future careers. This module will examine the legal aspects of a number of different sources of pollution including water pollution (inland and coastal), air pollution, waste, noise etc. The common law nuisance principles and the rule in Rylands v Fletcher will be examined, as well as recent case law in this area. Relevant domestic legislation (in particular the Water Pollution Act and the Air Pollution Act) as well as EU developments will be considered, particularly from the point of view of monitoring and penalties for breach. At the end of the module, students will have knowledge of the central principles of pollution control law and the structure of the system including the institutional arrangements, the role of the Environmental Protection Agency, and the development of Integrated Pollution Controls. In addition, special attention will be paid to specific topics such as wildlife protection, climate change, eco-system management, and access to information.