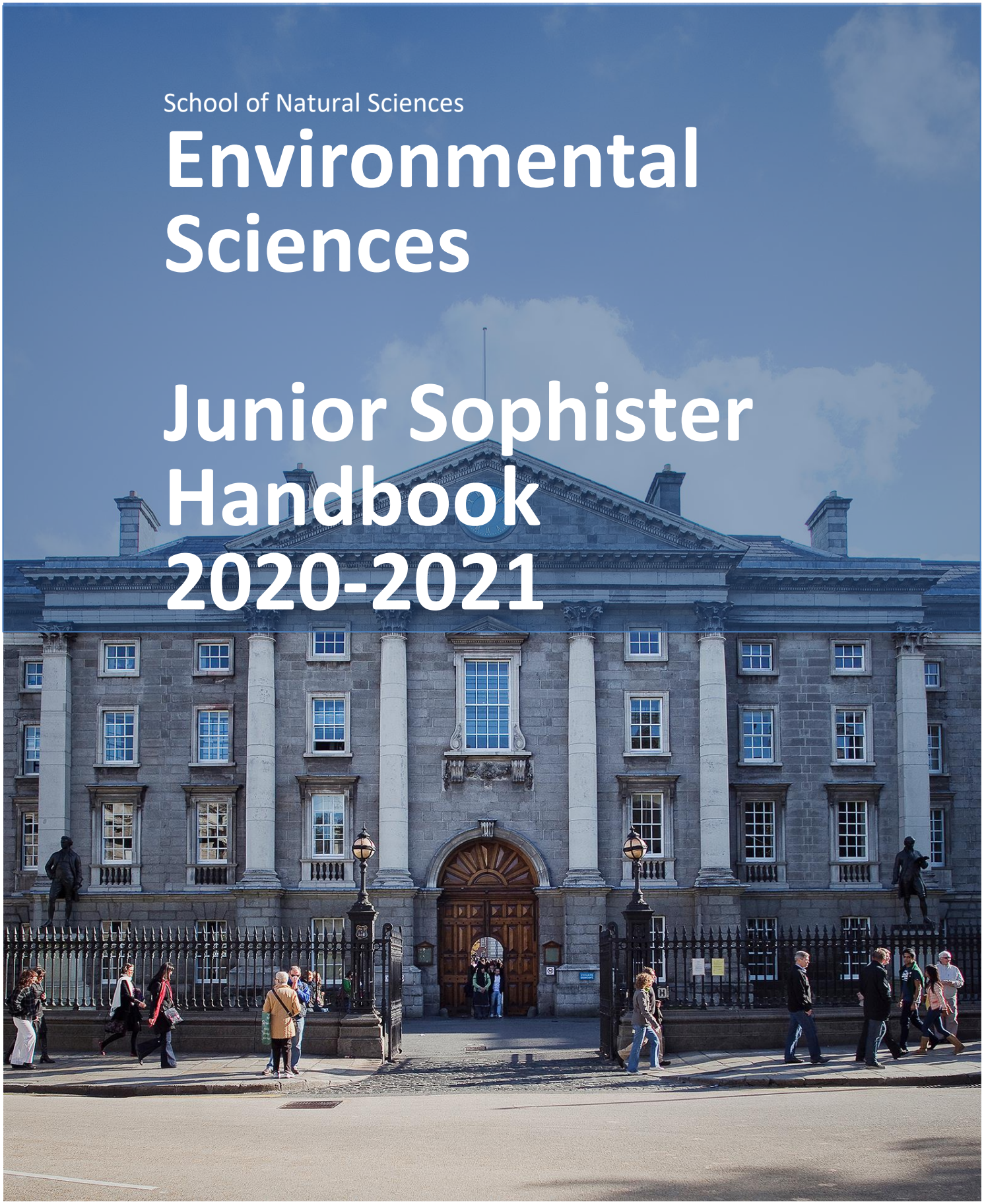
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

School of Natural Sciences

Environmental Sciences

Junior Sophister Handbook 2020-2021



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General Information

A note on this Handbook

This handbook applies to all students taking the Environmental Sciences Programme taught by the School of Natural Sciences. It provides a guide to what is expected of you on this programme, and the academic and personal support available to you. Please download and retain a copy for future reference.

The information provided in this handbook is accurate at time of preparation. Any necessary revisions will be notified to students via email, and will be updated on the Environmental Sciences undergraduate programme website.

Your attention is drawn to the University Calendar Part 1 (the relevant parts of which are available at registration, or from your tutor) and, in particular, sections G & P that outline general rules governing all students progression through College and the Faculty of Science; in addition your attention is drawn to Sections H5/H6 regarding attendance. In the event of any conflict or inconsistency between the General Regulations published in the University Calendar and information contained in course/departmental handbooks, the provisions of the General Regulations will prevail.

COVID-19 (Coronavirus) College Guidelines

Information for students relating to the implementation of government guidelines with respect to the ongoing global COVID-19 (Coronavirus) pandemic can be found on the college website at the (https://www.tcd.ie/about/coronavirus/).

Welcome

Welcome to the Environmental Science Moderatorship Programme! This handbook aims to provide you with a basic overview of the Programme and the courses you will undertake during your Junior Sophister year with us.

Environmental Sciences is by its nature a multidisciplinary academic field, comprising a study of the frequently complex interactions between the biological, chemical and physical components of our environment. The environmental science discipline has evolved over the last numbers of decades as key environmental problems such as climate change, pollution, sustainable development, deforestation and desertification to name a few, have become the focus of scientists, policy makers and the general public. Environmental scientists have training that is similar to other physical or life scientists, but is specifically applied to the environment. A broad scientific knowledge is required which involves a fundamental understanding of the physical and life sciences in addition to economics, law and the social sciences.

The undergraduate degree course offered by the School of Natural Sciences has been designed to provide for the needs of students with an interest in this rapidly developing academic and professional field. The programme comprises specially designed modules plus suitable modules from contributing disciplines. Field study and laboratory skills represent a core component of the programme and these are blended with the theoretical content to provide our graduates with the training required to become highly successful practitioners in this field.

It is important to outline that the approach to teaching and learning has had to change in order to minimise spread of COVID-19, and we realise that this coming year will be strange for many of you. Unfortunately, these arrangements have meant either the cancellation or rescheduling of field work in many cases, and the need to teach on-line for medium to large classes. As the situation and associated restrictions change we will endeavour to keep you fully informed, but please feel free to email me for further information.

We look forward to working with you during your sophister years with us and trust that you will find Environmental Sciences as fascinating and rewarding as we do.

Dr Matthew Saunders
Environmental Science Course Advisor
September 2020

Course objectives and learning outcomes

Our mission is to:

- make you aware of the basic concepts, key challenges and current research developments in Environmental Science;
- enable you to understand the basis of good experimental design;
- teach you to work efficiently and safely in laboratories;
- enable you to become a competent field researcher;
- teach you to critically analyse quantitative data;
- develop your written and oral communication skills;
- develop your skills to work effectively in a group and independently; and
- make you socially aware, particularly in relation to the contribution that Environmental Science makes to society.

On successful completion of this programme, students should be able to:

- identify and describe plant and animal communities and analyse their distribution;
- demonstrate the principles of geochemical cycling in the global context with specific reference to environmental change;
- discuss the principles of hydrology and its relationship with groundwater quality;
- discuss the causes and effects of terrestrial, atmospheric and marine pollution and present day mitigation strategies;
- show a good working knowledge of skills and tools, such as spatial data analysis and statistical techniques, which can be used selectively to address complex problems, or to conduct closely guided research;
- identify, formulate, analyse and suggest reasoned solutions to current environmental problems;
- design an Environmental Impact Assessment for a range of diverse habitats;
- critically assess scientific literature;
- work effectively as an individual, in teams and in multidisciplinary settings; and
- communicate effectively with both the scientific community and with society at large.

Significant emphasis in this Moderatorship is placed on the student acquiring a broad range of laboratory and field skills that are relevant to Environmental Science practitioners. While the delivery of both field and laboratory teaching may be affected by COVID-19 restrictions, some field taught modules may incur travel and/or accommodation costs. While the School makes every effort to keep expenditure for field courses as low as possible, however, it is necessary that students should budget appropriately. For information on financial assistance, contact: Senior Tutor's Office, House No. 27 (stosec@tcd.ie), or your tutor.

Note:
Students receiving local authority grants may be eligible for local authority support. Letters confirming attendance on courses can be obtained from the Course Director.

Please note: If cheques from Local Authorities are not received before the start of the Field Course, students will be required to pay the full amount and will be refunded this amount on receipt of cheques from Local Authorities. You are therefore advised to apply to your local Authority for funding well in advance of the field trips.

The European Credit Transfer System

The European Credit Transfer and Accumulation System is an academic credit system based on the estimated student workload required to achieve the objectives of a module or programme of study. It is designed to enable academic recognition for periods of study to facilitate student mobility and credit accumulation and transfer. The Credits are the recommended credit system for higher education in Ireland and across the European Higher Education Area.

The Credits weighting for a module is a measure of the student input or workload required for that module, based on factors such as the number of contact hours, the number and length of written or verbally presented assessment exercises, class preparation and private study time, laboratory classes, examinations, professional training placements, and so on as appropriate. There is no intrinsic relationship between the credit volume of a module and its level of difficulty.

The European norm for full-time study over one academic year is 60 Credits. The Trinity academic year is 40 weeks from the start of Michaelmas Term to the end of the annual examination period. 1 Credit represents 20-25 hours estimated student input, so a 5-Credit module will be designed to require approximately 120 hours of student input including class contact time and assessments.

Credits are awarded to a student only upon successful completion of the course year. Progression from one year to the next is determined by the course regulations. Students who fail a year of their course will not obtain Credit for that year even if they have passed certain component modules. Exceptions to this rule are one-year and part-year visiting students, who are awarded Credits for individual modules successfully completed.

In addition to the specified contact hours indicated under each module, you are expected to engage in work associated with the module to bring your input up to a total of at least 125 hours for a 5 Credit module.

Course structure

The Sophister Environmental Science Moderatorship Programme consists of 60 European Credit Transfer Systems (ECTS Credits) per year. Junior Sophisters take a total of 40 core Credits, open modules up to 15 Credits and can take up to 10 credits from the Trinity Elective modules depending on the scenario chosen. Some modules are examined entirely by in-course assessment; most are assessed by a combination of in-course assessment and examination. Further details on the assessment breakdown for each module can be found in the module descriptors below.

Core Modules

Core Modules	
Semester 1	**Semester 2**
BOU33108: Plants in the Irish Environment (5 Credits)	BOU33123: Soil Science (5 Credits)
ZOU33010: Fundamentals of Ecology (5 Credits)	GGU33931: Environmental Governance 1 (5 Credits)
ESU33040: Environmental Monitoring (5 Credits)	ZOU33070: Experimental Design and Analysis (5 Credits)
BOU33105: Global Environmental Change (5 Credits)	ESU33003: Desk Study: Key challenges in Environmental Science (5 Credits)

Open Modules (students can choose up to 15 credits from the following modules depending on the selection of Trinity Elective modules)

Open Modules	
Semester 1	**Semester 2**
GSU33003: Ice Age Earth (5 credits)	GLU33009: Hydrology and Groundwater Quality (5 credits)
BOU33100: Plant Physiology (5 Credits)	BOU33121: Field Skills in Plant and Environmental Sciences (5 Credits)
GSU33002: Blue Earth: Understanding the Function of Marine Ecosystems (5 Credits)	BOU33122: Entomology (5 credits)
	ZOU33085: Terrestrial Field Ecology (5 Credits)

Please note: Students are expected to make a contribution towards the transport and accommodation costs of the field components of module ZOU33085, which is usually between €250 – €300 each. Eligible students may apply to the Student Assistance Fund (http://www.tcd.ie/Senior_Tutor/) for financial assistance.

Trinity Electives

Students can choose to take a Trinity Elective module in either Semester 1 or 2 (total of 5 credits) or can take an Elective module in both semesters (10 credits). Further information on the Trinity Electives can be found at https://www.tcd.ie/trinity-electives/electives/)

Core Module Descriptions

BOU33108: PLANTS AND THE IRISH ENVIRONMENT
Course type: Core
Coordinator: Professor Fraser Mitchell
ECTS Credits: 5 Credits
Assessment: 100% Continuous assessment

Description:
This module combines an introduction to the Plant Sciences and Environmental Sciences moderatorships with a series of field-based activities including a residential field-trip during the first week of term (Week 3). There will also be a lecture given during the field trip and three following it on specific aspects of the Irish flora.

Learning outcomes:
- Collect and accurately record various types of data from a range of local habitats using several different methods.
- Identify native species.
- Interpret relationships between plants, and between plants and the physical environment.
- Contrast ecological sampling techniques and assess their relative merits.
- Analyse in detail the natural and cultural landscape.

ZOU33010: FUNDAMENTALS OF ECOLOGY
Course type: Core
Coordinator: Professor Ian Donohue
ECTS Credits: 5
Assessment: 100% Continuous assessment

Description:
This module examines the factors that affect the distribution, growth and survival of plant and animal communities. It describes how organisms interact with their environment and the role that they have in ecosystem and community structure. There is an introduction to the concepts and models that help to explain and predict organism distributions and interactions. The module comprises interrelated components of lectures, practical sessions and fieldwork. It has been designed to provide a foundation to ecological theory and its application.

Learning outcomes:
On successful completion of this module students should be able to:
- Define what we mean by ecology and describe its principles and practice.
- Show a firm methodological and theoretical understanding of the study of the distribution and abundance of species.
- Describe and evaluate unifying concepts of distributions and ecological processes (e.g. feeding strategies, interspecific interactions, etc.).
- Show, through practical exercises, a good approach to project work.
- Show enhanced communication skills through a variety of techniques.

ESU33040: ENVIRONMENTAL MONITORING
Course type: Core
Coordinator: Dr Marcin Penk
ECTS Credits: 5
Assessment: 100% Continuous assessment

Description:
This module covers the tools and sampling approaches, both traditional and novel, used to characterize and monitor the quality of the environment across Europe. Students will be provided with relevant background information to understand the principles and applications of monitoring programmes. Techniques taught encompass the collection and analysis of chemical and biological samples and their application to environmental quality indices. Students will have the opportunity to apply some of these techniques during two field trips (freshwater and marine), and to a range of sample types (water, sediment, invertebrates) in subsequent laboratory sessions. Both field trips will conclude with written reports, detailing student's findings in a scientific format.

Learning Outcomes:
On successful completion of this module you will be able to:

- Explain the tools and sampling approaches used to characterize and monitor the quality of the environment
- Select appropriate procedures for the collection and analysis of environmental samples (chemical and biological samples)
- Carry out a range of analysis procedures in the field and laboratory
- Present and interpret results of chemical/biological analyses and application to relevant environmental quality indices

BOU33105: GLOBAL ENVIRONMENTAL CHANGE

Course type: Core
Coordinator: Professor Michael Williams
ECTS Credits: 5
Assessment: 50% Examination, 50% Continuous assessment

Description:
The global environment is changing more rapidly at present than at any time during the human occupancy of the planet. This module reviews the existence of the changing environment and the predictions for the future.

Learning Outcomes:
On successful completion of this module you will be able to:

- Understand the various elements of current global environmental change and the contribution of the major drivers of these changes.
- Understand the prevailing hypotheses as to the mechanisms and ultimate causes of global environmental change and the extent to which processes operate at different temporal and spatial scales.
- Appreciate the nature of the interactions between environmental change and ecosystem processes.

- Use analytical procedures in the laboratory and field to investigate the impacts of global change.

BOU33123: SOIL SCIENCE
Course type: Core
Coordinator: Professor Matthew Saunders
ECTS Credits: 5
Assessment: 50% Continuous assessment, 50% Examination

Description:
Soils are important for plants as they provide the key resources required for growth and also essential structural support. This module will provide an overview of the fundamental concepts of soil formation and characterisation; how soil characteristics influence plant distribution and productivity through water and nutrient availability; how soil organisms (bacteria, fungi) interact with plants and how soils influence global biogeochemical cycles (carbon and nitrogen). Particular focus will be given to the role of soils in the production of food, fuel and fibre and how sustainable land management practices are required to ensure the long-term health and fertility of soil systems.

Learning outcomes:
On successful completion of this module, students should be able to:
- Describe the nature of soil and the terms used to describe the major physical and chemical characteristics of soil.
- Understand how soils are formed and how they are influenced by natural and anthropogenic processes.
- Compare and contrast the role of soils in plant productivity such as through plant water relations and mineral nutrition.
- Appraise the issues of sustainable soil management and the impacts of intensive land use on soil quality and fertility.
- Demonstrate an understanding of biogeochemical cycling within soil systems and the role of soils in the mitigation of climate change.

GGU33931: ENVIRONMENTAL GOVERNANCE 1
Course type: Core
Coordinator: Professor Rory Rowan
ECTS Credits: 5
Assessment: 100% Continuous assessment
Description:
The “environment” emerged as a new object of concern in the 1960s. Since then, and largely through the work of citizens, scientists, environmental justice movements, and NGOs, many different environmental problems have come to light - from chemical contamination to climate change, from oil spills to plastic-filled oceans. Despite growing awareness of these many forms of environmental degradation and risk, the political and societal response has been far from adequate. How can we explain this? One starting point is to interrogate the contested history and development of environmental politics since the 1960s. What we learn from such an approach is that

there have been radically different ways of framing environmental problems, giving rise to radically different proposals on how to deal with these problems. This historically informed understanding thus invites us to consider how re-framing current environmental problems may help us to orientate society towards a more just and sustainable future.

This module will introduce students to the emergence of environmental politics as a unique field of policy-making, scientific production, and conflict since the 1960s. It will discuss key texts, writers and thinkers, whose work has been instrumental in shaping how we think about the environment, as well as how private, public and civil society actors have responded to environmental problems in recent times.

Learning Outcomes:
On successful completion of this module students will be able to:

- Understand the key developments and debates within modern environmentalism over the past fifty years;
- Identify and discuss the key thinkers and texts that have shaped modern environmental thinking;
- Debate the nature and impact of different environmental policies and initiatives at local, national and global scales;
- Use the critical analytic skills developed through the module to better examine a range of sources including documentary films, government reports, academic papers, and more.

ZOU33070: EXPERIMENTAL DESIGN AND ANALYSIS
Course type: Core
Coordinator: Professor Celia Holland
ECTS Credits: 5
Assessment: 100% Continuous assessment (five assessments – short answer test, data analysis exercise (Part 1), designing an experiment, R test, writing a moderatorship project proposal (Part 2).

Description:
This module will aim to put data collection and analysis in the context of research design and will be an important foundation for the Senior Sophister research project. The module consists of two parts. The emphasis will be practical with a more 'hands on' approach rather than the theory of statistics. Initially students will be taught about experimental design, data collection and sampling and the use of spreadsheets for data entry. This will lead on to preliminary data exploration and issues of normality. Emphasis will be placed upon the importance of visually exploring the data prior to the use of statistical tests. Summary statistics, including measures of centre and spread, skewness, kurtosis, percentiles and boxplots, will be covered. Then the module will move on to explore the concept of hypothesis testing and the need to compare two or more means. This will involve the use of t-tests and analysis of variance. Other types of data will also be introduced including the analysis of

frequencies. The relationship between two variables in the context of regression analysis will also be explored. Finally a data set will be used to bring the entire process together starting with simple data exploration through summary statistics to more complex analyses. The aim of the second part of the module is to address, in more detail, the fundamentals of experimental design and to explore how previous projects were conducted. In addition, students will learn how to write a moderatorship project proposal.

Learning outcomes:
On successful completion of this module, students should be able to:

- Address the fundamentals of experimental design and use hypothesis testing to answer biological questions.
- Appreciate instruments for data collection, and how to explore and analyse data within the context of research design.
- Explore a variety of data sets using graphical and summary techniques.
- Outline the requirements of parametric statistical tests and recognize the applicability of four such tests.
- Learn how to calculate statistical tests by hand and use the statistical package R to explore and analyse data.
- Write a moderatorship project proposal, design an experiment and analyse the findings of a scientific paper in a group setting.

ESU33003 Desk Study: Key challenges in Environmental Science (S2)
Course type: Core
Coordinator: Professor Carla Harper
ECTS Credits: 5
Assessment: 100% Continuous assessment

Description:
Scientific writing is a new language for everyone. The aim of this module is to introduce students to the scientific writing process. Throughout the duration of the semester, students will be presented with a brief overview of the steps involved in reading, publishing, organising, and disseminating research findings; with sufficient experience, this will become easier over time. The goal is to address individual challenges in that process and provide a foundation for success. Students will undertake desk-based research, using scientific literature to synthesise and write an extended essay on a selected topic of interest related to a key challenge in Environmental Science. The finished assessment will be a general-format scientific review article.

Learning outcomes:
On successful completion of this module students should be able to:

- Comprehend the peer-review process for scientific literature
- Find and evaluate (peer-reviewed) scientific literature through academic search engines

- Analyse and differentiate the types of scientific literature, e.g., research articles, reviews, comments, opinions, replies, invited topics
- Understand how to effectively read and comprehend scientific articles
- Structure different types of scientific articles
- Evaluate reference management software tools for individual needs

Indicative Reading List

- Wallisch, P. 2020. How to read a scientific article: The QDAFI method of structured relevant gist. In: *Critical Reading Across the Curriculum. Volume 2: Social and Natural Sciences.* A. Borst, R. DiYanni (Eds.) John Wiley & Sons, Inc. (Hoboken, New Jersey, USA). p. 152–164.
- Machi, L.A., McEvoy, B.T. 2016. *The Literature Review: Six Steps to Success. 3rd Edition.* SAGE Publications Ltd. 188 pp.
- Turbek, S.P., T.M. Chock, K.Donahue, C.A. Havrilla, A.M. Oliverio, S.K. Polutchko, L.G. Shoemaker, L. Vimercati. 2016. Scientific Writing Made Easy: A Step-by-step Guide to Undergraduate Writing in the Biological Sciences. *Bulletin of the Ecological Society of America* 97 (4): 417–426. doi:10.1002/bes2.1258
    - See also 'Additional resources' on p. 425 of Turbek et al. 2016
- Rowland, F. 2002. The peer-review process. *Learned Publishing* 15 (4): 247–258.

Open Module Descriptions

GSU33003: ICE AGE EARTH
Course type: Open
Coordinator: Professor Fraser Mitchell
ECTS Credits: 5
Assessment: 100% Continuous assessment

Description:
The last 2.6 million years of Earth history have witnessed dramatic climatic and environmental changes. This module provides an overview of these major environmental changes, their causes, and their significance for human development. It contrasts 'glacial' and 'interglacial' worlds, examines the nature of the transitions between them, explores some potential causes of change, and illustrates their environmental impacts. In the process, a range of key environmental records are considered, along with the "proxies" used to develop them.

Learning outcomes:

On successful completion of this module students should be able to:

- Explain why global climates have varied dramatically over the last 2.6 million years.
- Describe the spatial and temporal variation in past climate change.
- Describe the long term impact of climate change on ecosystems.
- Describe the techniques used to reconstruct past climates.
- Describe the techniques used to reconstruct past ecosystems.
- Evaluate the contribution of climate and human activity to ecosystem dynamics.
- Relate the relevance to past ecosystem change to current and future ecosystem function

Indicative Reading List

- Bradshaw, R.H.W. & Sykes, M. (2014). *Ecosystem Dynamics: From the Past to the Future.* Wiley Blackwell. 334pp. Located in Botany Library.
- Roberts, N. (2014). *The Holocene. An Environmental history.* (3rd Edition). Wiley Blackwell. 376pp. Located in Botany Library.

BOU33100: PLANT PHYSIOLOGY

Course type: Open
Coordinator: Professor Michael Williams
ECTS Credits: 5
Assessment: 50% Examination, 50% Continuous assessment

Description:
This module covers major biochemical and physiological aspects of photosynthesis, respiration, resource capture and growth at both the cell and whole plant level. Continual assessment for this module will be a mini review on a given subject area relevant to photosynthesis, and an exercise in writing a scientific paper where raw data from a growth study of plants maintained at different light intensities will be supplied.

Learning outcomes:

On successful completion of this module students should be able to:

- Describe how plants perceive light.
- Explain how plants use light as both a source of energy and an environmental signal.
- Describe the various pathways of photosynthesis at the level of the cell and the whole plant.
- Describe the interplay between photosynthesis and respiration in a plant cell.
- Describe the role of light in controlling germination, growth and flowering in higher plants.
- Use up-to-date methodology for measuring photosynthesis in chloroplasts and intact leaves.

Indicative Reading List

- Taiz, L. & Zeiger, L. (2014). *Plant Physiology.* (6th Edition). Sinauer Associates, Massachusetts. 581.1 N12*4

GSU33002: BLUE EARTH: UNDERSTANDING THE FUNCTION OF MARINE ECOSYSTEMS

Course type: Open
Coordinator: Professor Carlos Rocha
ECTS Credits: 5
Assessment: 100% continuous assessment

Description:
Countless exchanges of chemicals happen every millisecond in this reaction vessel that we happen to call Earth. These constrain and receive feedback from the biosphere, controlling the composition of the hydrosphere, the atmosphere and the lithosphere, and set our environmental futures - our ability to survive, develop and evolve as a species. Even though we call it 'Earth', it is the ocean that plays the central role in our

planet's climate system, and marine biogeochemical processes regulate the impact of human activity on the global environment. In addition, the sea supplies a range of ecosystem services without which humanity in its current form could not exist. These include food, energy, transport and trade routes, nutrient and carbon cycling and between 50 and 85% of the oxygen we breathe. Studying marine biogeochemistry provides a working knowledge of how the earth system functions and reacts to human activity, giving a multi-disciplinary view of how life formed, evolved, is sustained and is endangered on Earth. This knowledge provides working insights on how to adapt to climate and environmental change, enhance food production, manage fisheries and aquaculture, mitigate pollution, and innovate by developing new products including drugs and decarbonation technologies. This module will concentrate on the key processes that regulate the climate and marine biology, from ecosystems to cells. The course will cover the biogeochemistry of marine and coastal systems, including coral reefs, estuaries and wetlands, processes regulating the formation and fate of organic matter in the marine environment, and introduce analytical and modelling techniques in marine biogeochemistry. This course will prepare students for related courses field and lab work in Geography, Environmental Sciences and Oceanography.

Learning outcomes:

On successful completion of this module students should be able to:

- Demonstrate a working understanding of the processes that determine the nutrient structure of the ocean and the nutrient makeup of coastal seas.
- Identify the main benthic biogeochemical processes and extract information on mass fluxes from the analysis of nutrient distributions in marine sediments.
- Describe the workings of the marine carbonate system and establish its current state at specific locations by evaluating local CO_2 system data
- Map and interpret oceanographic data using Ocean Data View
- Provide basic interpretations of the current and future whole-system metabolic status of small coastal ecosystems based on nutrient and oxygen data series
- Explain how the understanding of modern marine biogeochemistry is fundamental to our ability to describe the co-evolution of life and chemistry on Earth, past, present and future
- Appraise and advance some of the major current debates around climate and environmental change, from an understanding of marine ecosystem services

Indicative Reading List

- Libes, Susan. 2009. Introduction to Marine Biogeochemistry. 2nd edition. Academic Press, 928 pp. ISBN: 9780120885305; eBook ISBN: 9780080916644
- Open University, 2005. Marine Biogeochemical Cycles, Butterworth-Heinemann, 130 pp. eBook ISBN: 9780080940779

GLU33009: HYDROLOGY AND GROUNDWATER QUALITY
Course type: Open
Coordinator: Professor Catherine Coxon
ECTS Credits: 5
Assessment: 30% Continuous assessment, 70% Examination
Quota: 15 students only can be registered for this module

Description:
This module aims to provide students with an understanding of hydrological processes, following the different pathways of water through the terrestrial part of the hydrological cycle. It also aims to familiarise students with the factors affecting groundwater quality, and to develop an understanding of groundwater quality issues in the context of integrated catchment management.
The hydrology component of this module includes the following topics: the hydrological cycle and catchment water balances; rainfall and evapotranspiration; soil water and hillslope hydrology; river flow; hydrogeology; groundwater – surface water interaction. The groundwater quality component includes groundwater chemistry and natural groundwater quality problems; groundwater quality issues in rural and industrial settings; groundwater vulnerability and protection. The interaction of groundwater and surface water quality is also considered.

This module is taught by a combination of lectures, data practicals and independent reading of research literature provided online on Blackboard. The key information from the lecture presentations is made available on-line. The data practicals include a mixture of formative and summative assessment. These practicals are marked and returned to the students with comments in advance of the exam.

Learning outcomes:
On completion of this module, the student should be able to:

- Evaluate the role of different hydrological pathways in a range of catchment settings
- Carry out calculations relating to catchment water balance, river flow and groundwater movement
- Analyse the factors controlling aquifer hydrochemistry and contaminant transport processes;
- Assess groundwater quality problems in both rural and industrial settings;
- Evaluate groundwater vulnerability to pollution; understand the role of groundwater protection schemes and of integrated catchment management.

BOU33121: FIELD SKILLS IN PLANT AND ENVIRONMENTAL SCIENCE (Canary Islands Field Trip) *The COVID-19 pandemic will affect the delivery of this module.*
Course type: Open
Coordinator: Professor Jane Stout
ECTS Credits: 5
Assessment: 100% Continuous assessment

Description:
This module combines a lecture series with a residential field trip to the Canary Islands. The Canary Islands represent very different environments to Ireland: they have different ecology, different threats and pressures. They also contain highly variable landscapes and there are lots of different types of habitats in small area. In addition, they are home to many endemic species, particularly plants, which are not found anywhere else in the world, and face many man-made environmental challenges. The lecture series explores the geography, flora and fauna of the Canary Islands, as well as the history of the islands, and the impacts that humans have and continue to have on its ecosystems.

Learning outcomes:
On successful completion of this module students should be able to:

- Describe the link between environmental conditions and vegetation community composition and structure (i.e. understand why certain plants grow in different places – what morphological, physiological and ecological traits have evolved for live in particular environments and how are plants affected by human activities?)
- Sample vegetation in the field accurately and representatively in a diversity of natural and anthropogenic ecosystems (i.e. be able to design appropriate sampling according to different habitat types to make ecological assessments)
- Outline what should be in an Environmental Impact Assessment Scoping report and conduct a scoping exercise for a hypothetical development in the Canary islands
- Design, conduct and analyse a field experiment and present the results in both written and oral format
- Demonstrate transferrable field skills including making accurate and appropriate field notes, team work, risk assessment

Indicative Reading List:
Reading lists (journal articles) will be given during lectures and prior to field course.

BOU33122: ENTOMOLOGY
Course type: Optional
Coordinator: Professor Jane Stout
ECTS Credits: 5
Assessment: 50% Continuous assessment, 50% Examination

Description:
There are more species of insects on Earth than any other group of organisms and they are of massive ecological and economic importance. This module will address behavioural, social, ecological and applied aspects of entomology, including their role in delivering ecosystem services (such as biocontrol and pollination), invasive species (such as fire ants and harlequin ladybirds) and conservation (both in Ireland and internationally). The practicals will provide students with the skills for sampling and identification of insects, which will be further enhanced through an individual project.

Learning outcomes:
On successful completion of this module students should be able to:

- Categorise insects according to their key features into the main order groups; know the distinction between insects and other arthropods
- Describe some of the range of behaviours employed by insects for foraging, defending and reproducing
- Develop understanding of the role of insects in ecosystem processes and their interactions with other organisms
- Explain their value as providers of ecosystem services
- Quantify the economic importance of insects (both positive and negative) to humans
- Evaluate the conservation biology of insects at national and international levels

Indicative Reading List
Price PW, Denno RF, Eubanks MD, Finke DL, Kaplan I (2011) Insect Ecology: Behavior, Populations and Communities. Cambridge University Press

ZOU33085: TERRESTRIAL FIELD ECOLOGY
Course type: Open
Coordinator: Professor Yvonne Buckley
ECTS Credits: 5
Assessment: 50% Continuous assessment (based on field course activities and tasks) 50% Examination - 5 day field course plus 10 contact hours

Description:
This two-part module begins with a series of lectures in Hilary Term, which offer an introduction to terrestrial biodiversity and wildlife biology, both globally and regionally. Topics covered will include: assessment of biodiversity from individual, population, community and landscape scales and the importance of foraging ecology, habitat selection, inter- and intra-specific competition, territoriality, dispersion,

population dynamics and regulation for determining diversity and distribution of animals. There will also be a particular focus on the origins, development and current status of the Irish vertebrate fauna.

The lecture series will be complemented, in week 37, by a five day residential field course in Glendalough, Co Wicklow, during which field techniques used for the study of terrestrial ecosystems will be introduced, with an emphasis on habitat and population assessment of mammals, insects and birds and their interactions with plants and the abiotic environment. Field visits will help with an understanding of contrasting habitats and approaches to conservation management. Students will carry out and present a mini-project during the last two days of the course.

In the event of continuing restrictions related to Covid-19 this module will be delivered as either 1) a series of day trips to sites in the Dublin area OR 2) a combination of online teaching and day-trips in the Dublin area OR 3) a combination of online teaching with field activities local to your own location. In all cases you will need to be available for teaching activities during the scheduled week and we will let you know as far in advance as possible which teaching modes will be used.

Learning Outcomes:

On successful completion of this elective, the student will be able to:

- Demonstrate the relationship between determinants of the patterns of terrestrial biodiversity and the practice of wildlife management and conservation
- Recognise and evaluate the main factors influencing the conservation status of species, in particular habitat selection and requirements, population processes and interspecific interactions
- Explain the origin, diversity and status of the current Irish vertebrate fauna.
- census mammals and insects safely using a variety of the most commonly used methods, and birds by sight and song.
- construct habitat maps and appreciate the importance of scale in such maps.
- assess anthropogenic effects on the environment and evaluate some control measures used to minimise them in nature reserves.
- design, conduct and present a small scale field study investigating an ecological question.

Recommended Reading List:

- Primack, Richard B. 2010. **Essentials of Conservation Biology** (5th edition). Publisher– Sinauer Associates, Sunderland, Mass. (ISBN 9780878936403)
- Groom, Martha J., Meffe, G.K. and Carroll, C.R. 2006. **Principles of Conservation Biology** (3rd edition). Publisher– Sinauer Associates, Sunderland, Mass. (ISBN 0878935185)

TRINITY ELECTIVE
Course type: Open
ECTS Credits: 5
Assessment: 100% Continuous assessment

Students are allowed to choose any Trinity Elective modules except for BC BOT

Academic year structure 2020-2021

Academic Calendar Week	Week beginning	2020/21 Academic Year Calendar		Term / Semester
		UG continuing years / PG all years	UG new first years	
1	31-Aug-20	Marking/Results		←Michaelmas Term begins/Semester 1 begins
2	07-Sep-20			
3	14-Sep-20	Appeals		
4	21-Sep-20	Orientation (UG Visiting/Erasmus & PG)		
5	28-Sep-20	Teaching and Learning	Orientation (UG new first years)	←Michaelmas teaching term begins
6	05-Oct-20	Teaching and Learning	Teaching and Learning	
7	12-Oct-20	Teaching and Learning	Teaching and Learning	
8	19-Oct-20	Teaching and Learning	Teaching and Learning	
9	26-Oct-20	Teaching and Learning (Mon, Public Holiday)	Teaching and Learning (Mon, Public Hol)	
10	02-Nov-20	Teaching and Learning	Teaching and Learning	
11	09-Nov-20	Study/Review	Teaching and Learning	
12	16-Nov-20	Teaching and Learning	Teaching and Learning	
13	23-Nov-20	Teaching and Learning	Teaching and Learning	
14	30-Nov-20	Teaching and Learning	Teaching and Learning	
15	07-Dec-20	Teaching and Learning	Teaching and Learning	
16	14-Dec-20	Teaching and Learning	Teaching and Learning	←Michaelmas term ends Sunday 20 December 2020/Semester 1 ends
17	21-Dec-20	Christmas Period - College closed		
18	28-Dec-20	24 December 2020 to 3 January 2021 inclusive		
19	04-Jan-21	Revision	Revision	
20	11-Jan-21	Assessment*	Assessment*	
21	18-Jan-21	Assessment*/ Foundation Scholarship^	Assessment*	←Hilary Term begins
22	25-Jan-21	Marking/Results	Marking/Results	
23	01-Feb-21	Teaching and Learning	Teaching and Learning	←Hilary teaching term begins /Semester 2 begins
24	08-Feb-21	Teaching and Learning	Teaching and Learning	
25	15-Feb-21	Teaching and Learning	Teaching and Learning	
26	22-Feb-21	Teaching and Learning	Teaching and Learning	
27	01-Mar-21	Teaching and Learning	Teaching and Learning	
28	08-Mar-21	Teaching and Learning	Teaching and Learning	
29	15-Mar-21	Study/Review (Wed, Public Holiday)	Study/Review (Wed, Public Holiday)	
30	22-Mar-21	Teaching and Learning	Teaching and Learning	
31	29-Mar-21	Teaching and Learning (Fri, Good Friday)	Teaching and Learning (Fri, Good Friday)	
32	05-Apr-21	Teaching and Learning (Mon, Easter Monday)	Teaching and Learning (Mon, Easter Monday)	
33	12-Apr-21	Teaching and Learning	Teaching and Learning	
34	19-Apr-21	Teaching and Learning	Teaching and Learning	←Hilary Term ends Sunday 25 April 2021
35	26-Apr-21	Trinity Week (Mon, Trinity Monday)	Trinity Week (Mon, Trinity Monday)	←Trinity Term begins
36	03-May-21	Revision (Mon, Public Holiday)	Revision (Mon, Public Holiday)	
37	10-May-21	Assessment*	Assessment*	
38	17-May-21	Assessment*	Assessment*	
39	24-May-21	Marking/Results	Marking/Results	
40	31-May-21	Marking/Results	Marking/Results	←Statutory (Trinity) Term ends Sunday 6 June 2021/Semester 2 ends
41	07-Jun-21	Research (Mon, Public Holiday)	Research (Mon, Public Holiday)	
42	14-Jun-21	Research	Research	
43	21-Jun-21	Research	Research	
44	28-Jun-21	Research	Research	
45	05-Jul-21	Research	Research	
46	12-Jul-21	Research	Research	
47	19-Jul-21	Research	Research	
48	26-Jul-21	Research	Research	
49	02-Aug-21	Research (Mon, Public Holiday)	Research (Mon, Public Holiday)	
50	09-Aug-21	Research	Research	
51	16-Aug-21	Research	Research	
52	23-Aug-21	Research	Research	
* Note: additional/contingency days may be required outside of the formal assessment/reassessment weeks.				
^ Note: it may be necessary to hold some exams in the preceding week.				

The Academic Year Calendar 2020/2021 can be viewed at
https://www.tcd.ie/calendar/academic-year-structure/academic-year-structure.pdf

Assessment and Examinations

Examination dates

- Semester 1 assessment dates commence the week beginning Monday 11th January 2021.
- Semester 2 assessment dates commence the week beginning Monday 10th May 2021.

External Examiner

An external examiner, currently Professor Guy Woodward from Imperial College London (https://www.imperial.ac.uk/people/guy.woodward) moderates the Senior Sophister examinations. It is common practice for external examiners to viva students following the completion of their final examinations. The viva timetable will be available during the examinations.

Module assessment

Junior Sophister modules are assessed by in-course continuous assessment and/or examination. Currently 30% of the overall mark for the moderatorship is carried forward from the Junior Sophister year.

Senior Sophister modules are also assessed by in-course continuous assessment and/or examination. Your final degree classification is based on a combination of marks including continuous assessment, examinations and the submission of a thesis associated with the research project (FBU44000).

You should take care not to engage in plagiarism when completing all assessment exercises: for instance colluding with others to complete a word-processed practical report would be plagiarism unless approval had been sought in advance from the relevant lecturer. For further details it is advised that all students consult the College policy dealing with plagiarism (see section on plagiarism below).

You must indicate on any practical write-ups the name of your Partner(s) and his/her ID number(s).

Submission of continuous assessment material

To avoid any misunderstandings arising in relation to submitting continuous assessments please adhere to the following points as they are absolute:

- In accordance with college policy, all assessments must be submitted via Blackboard. Where this is not possible assignments must be submitted at the appropriate location (usually either the Botany or Zoology Offices, depending upon the module) before the set deadline. Students need to sign-off at the time of submission.
- Assessments left in staff pigeonholes, or handed to other members of staff will not be marked.
- For late submissions there will be a deduction of 5% per day, including weekends. Submissions received more than three days late, without a medical certificate, will not be marked. **ALL LATE SUBMISSIONS MUST BE HANDED IN**

DIRECTLY TO THE RELEVANT OFFICE TO THE EXECUTIVE OFFICER TO BE DATE STAMPED.

- Any alternative arrangements must be approved by the staff member responsible for the assessment, and the relevant Executive Officer notified.
- Please remember it is important to keep all Continuous Assessment exercises when returned to you, until the Court of Examiners has awarded your final mark.

Plagiarism

To ensure that you have a clear understanding of what plagiarism is, how Trinity deals with cases of plagiarism, and how to avoid it, you will find a repository of information at http://tcd-ie.libguides.com/plagiarism.

We ask you to take the following steps:

(i) Visit the online resources to inform yourself about how Trinity deals with plagiarism and how you can avoid it at http://tcd-ie.libguides.com/plagiarism. You should also familiarize yourself with the 2015-16 Calendar entry on plagiarism located on this website and the sanctions which are applied.

(ii) Complete the 'Ready, Steady, Write' online tutorial on plagiarism at http://tcd-ie.libguides.com/plagiarism/ready-steady-write. Completing the tutorial is compulsory for all students.

(iii) Familiarise yourself with the declaration that you will be asked to sign when submitting course work at http://tcd-ie.libguides.com/plagiarism/declaration.

(iv) Contact your College Tutor, your Course Director, or your Lecturer if you are unsure about any aspect of plagiarism.

Ethics

In line with Trinity College Dublin's Policy on Good Research Practice, all research in the School of Natural Sciences (SNS) should be conducted according to the overarching ethical principles of "respect for the individual subject or population, beneficence and the absence of maleficence (research should have the maximum benefit with minimal harm) and justice (all research subjects and populations should be treated fairly and equally)."

All individuals involved in research should facilitate and ensure research is conducted ethically. Ethical conduct in research is a shared responsibility. Primary responsibility rests with the Principal Investigator(s). Ethical responsibilities and legal obligations may overlap. All staff and students conducting research are required to ensure that their research is carried out in compliance with this policy. Ethical review is required before any studies involving human subjects, other living organisms and natural or man-made habitats commence. This requirement applies to staff, postgraduate and undergraduate students and volunteers/interns. Field- and laboratory work cannot commence until review has been completed and/or approval has been gained. **STUDENTS PLANNING TO UNDERTAKE RESEARCH SHOULD COMPLETE THE SNS** Research Ethics Application.

For further details please follow this link: www.naturalscience.tcd.ie/research/ethics

Sophister Essay & Examination Marking Guide

Class	Mark Range	Criteria
I	**90-100**	EXCEPTIONAL ANSWER; This answer will show original thought and a sophisticated insight into the subject, and mastery of the available information on the subject. It should make compelling arguments for any case it is putting forward, and show a rounded view of all sides of the argument. In exam questions, important examples will be supported by attribution to relevant authors, and while not necessarily giving the exact date, should show an awareness of the approximate period. In essays, the referencing will be comprehensive and accurate.
	80-89	OUTSTANDING ANSWER; This answer will show frequent originality of thought and make new connections between pieces of evidence beyond those presented in lectures. There will be evidence of awareness of the background behind the subject area discussed, with evidence of deep understanding of more than one view on any debatable points. It will be written clearly in a style which is easy to follow. In exams, authors of important examples may be provided. In essays all important examples will be referenced accurately.
	70-79	INSIGHTFUL ANSWER; showing a grasp of the full relevance of all module material discussed, and will include one or two examples from wider reading to extend the arguments presented. It should show some original connections of concepts. There will be only minor errors in examples given. All arguments will be entirely logical, and well written. Referencing in exams will be sporadic but referencing should be present and accurate in essays.
II-1	**65-69**	VERY COMPREHENSIVE ANSWER; good understanding of concepts supported by broad knowledge of subject. Notable for synthesis of information rather than originality. Evidence of relevant reading outside lecture notes and module work. Mostly accurate and logical with appropriate examples. Occasionally a lapse in detail.
	60-64	LESS COMPREHENSIVE ANSWER; mostly confined to good recall of module work. Some synthesis of information or ideas. Accurate and logical within a limited scope. Some lapses in detail tolerated. Evidence of reading assigned module literature.
II-2	**55-59**	SOUND BUT INCOMPLETE ANSWER; based on module work alone but suffers from a significant omission, error or misunderstanding. Usually lacks synthesis of information or ideas. Mainly logical and accurate within its limited scope and with lapses in detail.
	50-54	INCOMPLETE ANSWER; suffers from significant omissions, errors and misunderstandings, but still with understanding of main concepts and showing sound knowledge. Several lapses in detail.
III	**45-49**	WEAK ANSWER; limited understanding and knowledge of subject. Serious omissions, errors and misunderstandings, so that answer is no more than adequate.
	40-44	VERY WEAK ANSWER; a poor answer, lacking substance but giving some relevant information. Information given may not be in context or well explained, but will contain passages and words, which indicate a marginally adequate understanding.
F-1	**30-39**	MARGINAL FAIL; inadequate answer, with no substance or understanding, but with a vague knowledge relevant to the question.
F-2	**0-29**	UTTER FAILURE; with little hint of knowledge. Errors serious and absurd. Could also be a trivial response to the misinterpretation of a question.
U.G		Ungraded

Sophister Project & Thesis Marking Guide

Class	Mark Range	Criteria
I	80-100	Exceptional project report showing deep understanding of the topic and literature similar to that expected in a published paper. Clear grasp and expression of the justification for the research, with clear explanation of the importance and implications of the work within the subject area. Methods described with the clarity and detail expected in a published paper, showing sound experimental design. Excellent presentation, analysis and exploration of results focussed on the question asked, using the most appropriate analyses for the question and data. Thoughtful, critical evaluation of the findings, discussed insightfully in their full context within the literature. Excellent presentation of the finished thesis, which contains very few, if any editorial errors.
	70-79	A very good project report showing evidence of wide reading, with clear presentation and thorough analysis of results and an ability to critically evaluate and discuss research findings. Clear indication of some insight and originality. A very competent and well-presented report overall but falling short of excellence in each and every aspect.
II-1	65-69	A very good project report, showing a reasonably wide understanding of the topic and its associated literature, with some indication of how the research adds to the field. Methods described clearly and in sufficient detail for someone to repeat the work, and showing sound experimental design, or the appreciation of how it could have been made sound. Competent analysis of the results and valid and accurate interpretation of the findings. Results presented accurately using appropriate figures and/or tables. Accurate appreciation of any shortcomings of the experimental design and the implications for interpretation. Discussion of the results puts them into some level of context but may not reflect all the implications for the research field.

	60-64	A good project report, showing some understanding of the wider topic and its associated literature, with some indication of the relevance of the research. Methods described clearly, though perhaps not in sufficient detail for someone else to repeat the work. Sound experimental design, or some appreciation of how it could have been made sound. Competent analysis of the results, though perhaps through the use of simpler tests than would be ideal. Accurate presentation of results, though perhaps not with the best choice of graphics. Interpretation of findings mostly valid and accurate. Some appreciation of any major shortcomings in experimental design and the implications for interpretation. Discussion may focus mostly on the findings, with only occasional references to other work, though those contextual references should be present.
II-2	50-59	A moderately weak project report which shows some understanding of the research question, but lacks a strong grasp of the wider research topic or the relevance of the project. Methods mostly described clearly, but there may be lapses in detail. Experimental design may not be entirely sound, and any weakness may be undescribed. Analysis of the results generally sound but may be simple and contain errors such as incorrect statistical reporting or the use of less than ideal graphs. Interpretation of the findings may not be entirely accurate, and shortcomings in the design or analysis unlikely to be taken into account during interpretation, but some level of interpretation of the results must be present. Discussion may focus solely on the findings of the work, and may lack references to other work, though some indication of the relevance of the project should be present. Insufficient attention paid to organisation and presentation of the report.
III	40-49	A weak project showing only limited understanding of the research question, reported without understanding of the wider context or relevance of the project. Methods not complete. Experimental design may contain obvious unrecognised flaws and may not be described completely. Analysis of results simple and may show basic errors. Interpretation of results may be limited or absent. Discussion may be minimal and restricted to the direct findings of the project. General standard of presentation poor.

Fail	20-39	An unsatisfactory or incomplete project report, lacking sections or with little content in some. Very limited understanding of the question or failure to express it at all. Methods may be incomplete, possibly lacking description of experimental design. Results may be incomplete, with poor choice of graphics and / or tables. Analysis of data may be lacking or contain fundamental errors. Interpretation of the results likely to be limited or absent. Discussion restricted to a restatement of results. Very poor overall standard of presentation.
	0-19	An extremely poor project report containing very little substance and showing no real understanding or awareness of the problem. No attempt at a relevant literature review or relevant support from published work. Methods chaotic or incomprehensible. Almost absent or completely absent presentation of results. Any analysis of results incorrect or inappropriate. Clear inability to interpret results in relation to other work or ideas. Very poor overall standard of presentation.

Academic and Personal Issues

Academic Issues

If you experience any academic problems, below are some sources of assistance:

- Module Lecturer and/or coordinator
- Course Director
- Class representatives
- Head of Discipline
- Personal tutor (or any other tutor if you cannot find yours)
- Senior Tutor
- Head of School
- Director of Teaching and Learning (Undergraduate)
- Students' Union Education Officer, (01) 646 8439, Email: education@tcdsu.org

Personal Issues

If you experience any personal problems, below are some sources of assistance:

- Personal tutor (or any other tutor if you cannot find yours)
- Senior Tutor (stosec@tcd.ie)
- Student Counselling Service, 199/200 Pearse Street, College, Email: student-counselling@tcd.ie; (01) 896 1407
- Niteline: (Thursdays to Sundays during term only, 9pm - 2.30am) at 1800 793 793
- Student Health Service, House 47 - Medical Director: Dr David McGrath 01 896 1556; Doctors: Dr Mary Sheridan, Dr Aisling Waters, Dr Niamh Murphy 896 1556; Nurse: Ms Carmel Conway 01 896 1556; Health Promotion Officer: Ms Martina Mullin 01 896 1556; Physiotherapist: Ms Karita Cullen 01 896 1591;

- Welfare Officer, Students' Union, House 6, College (01) 646 8437, Email: welfare@tcdsu.org
- Chaplains; House 27, College: Alan O'Sullivan (Roman Catholic) 896 1260; Hilary Dungan (Church of Ireland) 01 896 1402; Julian Hamilton (Presbyterian) 896 1901; Peter Sexton (Roman Catholic) 01 896 1260
- Disability Services, Mr Declan Treanor, Room 3055, Arts Building (01 896 3111), Email: disab@tcd.ie
- Any student, member of staff or other person with whom you feel able to discuss your problems

Health and Safety

LEGAL BACKGROUND

The University must exercise a "duty of care" to employees and those they supervise. This duty of care is recognised in both criminal and civil law. There is also a duty on everybody to take reasonable care for their own safety and the safety of those around them.

DISCIPLINE SAFETY OFFICERS

Botany - Botany Building , Anatomy Building & Dartry Gardens – Siobhan MacNamee, Siobhan.McNamee@tcd.ie
Environmental Science - Anatomy Building – Mark Kavanagh, kavanamg@tcd.ie
Geography - Museum Building – Terence Dunne, Terence.Dunne@tcd.ie
Geology - Museum Building, TTech Pearse St. – Cora McKenna, mckennc6@tcd.ie
Zoology – Zoology Building – Alison Boyce, aboyce@tcd.ie

CONTRIBUTING DEPARTMENTS

Each of the four disciplines that comprise the School of Natural Sciences (i.e. Botany, Geography, Geology and Zoology) contribute courses to the Environmental Science Moderatorship. Courses will be run in the lecture and laboratory facilities in each Department building. You must make yourself aware of the safety regulations and house rules for each department. You should also become familiar with the department resources available to you, such as libraries, museums and IT facilities. Information can be found on each department web site or by contacting the Chief Technical Officer or Executive Officer.

THE LABORATORY

In formal laboratory exercises will have been risk assessed. You will be under supervision in a controlled environment where all reasonable safety precautions have been considered and all hazards identified. You have a legal obligation to follow the instructions of those in control of the laboratory. You have a duty of care for yourselves and those who may be affected by your actions. This means that your behaviour in the laboratory must be such that you do nothing to place either yourself or other laboratory users at risk. If you do not understand any instructions you **must alert those in control**.

Instrumentation in a laboratory is an area of high risk. . If you have not used an instrument before you will not know the potential dangers it may pose. Do not interfere with any piece of equipment or use it without prior instruction. The staff, both academic and technical, along with the demonstrators, are available to instruct you so always ask to be taken through the use and dangers of any piece of equipment which you have to use.

FIELDWORK

Fieldwork is defined as any practical work carried out in the field by staff or students of the University for the purpose of teaching and/or research. By definition it occurs in places which are not under the control of the University, but where the University is responsible for the safety of its staff and students.

Please note:
Voluntary and Leisure activities are excluded.

Outside of Voluntary and Leisure activities, the Head of Discipline has overall responsibility for health and safety in their area. They are required to ensure that the risk assessment of the fieldwork is made and to ensure that a safe system of work has been established for all staff and students. This duty is frequently delegated to the member of staff organising the fieldwork. The Head of Discipline must ensure that the fieldwork meets the safety criteria of the School, and that accidents are reported and investigated. There is a Department Safety Officer, who is responsible for day-to-day safety matters.

There is a duty on the fieldwork participants to take reasonable care for their own safety and the safety of those affected by them.

Some staff and students may be unable to carry out certain types of fieldwork due to any number of physical or medical conditions and early identification of such problems is essential.

There are a number of forms that must be completed before Laboratory or Fieldwork is undertaken. Please note that it is compulsory for each student to fill these forms in prior to beginning fieldwork. These may include Health Declaration Forms, Code of Conduct Agreement and Risk Assessment. The forms must be returned to the relevant Discipline Safety Officer.

Relevant and suitable protective equipment must be worn. Participants must dress appropriately especially in cold and wet conditions, this is particularly important for modules that include fieldwork activities. When the activity involves the use of boats other than registered ferries appropriate life jackets must be worn.

The School of Natural Sciences has prepared a detailed set of instructions relating to field-work, which can be found at:
http://www.naturalscience.tcd.ie/healthsafety/

FIRE

Fire Prevention

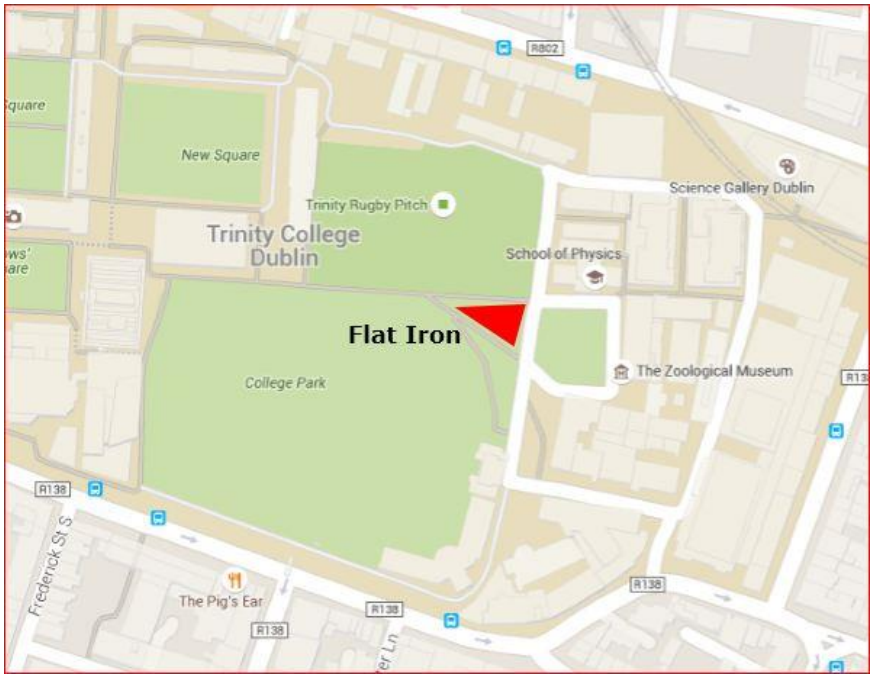
Copies of the College General Fire Notice are displayed in all Departments. Familiarise yourself with the instructions in case of fire. Any defect or potential fire hazards should be reported to the building Fire Warden.
Note the position of fire extinguishers in your working area. Please note you are not permitted to use a fire extinguisher unless you have attended the College's training course.

Before leaving offices or laboratories:-

- ensure that all litter bins do not contain any smouldering materials.
- do not leave litterbins under or near to any combustible items e.g. desks, tables, shelving etc.
- close all filing cabinets and presses.
- switch off and unplug electrical equipment not in use.

In Case of Fire

– There is a fire alarm system in the buildings controlled by all Disciplines. If the alarm bells ring or someone shouts 'fire', all persons in the building must exit as rapidly as possible and assemble at the appropriate assembly point For Botany, Zoology and Centre for the Environment this is located at the Grass triangle ('Flat Iron') at east end of Boardwalk (College Park), designated Fire Point D:



At the assembly point organise yourselves into laboratory or functional groups and the senior person present must take a roll-call. Missing persons must be reported immediately.

Inform the Front Gate Security Officer, emergency no. ext: 1999 (01 896 1999 from mobile) or the 24 hour security no. ext: 1317 (01 896 1317), who will call the fire brigade.

BOMBS/HOAX BOMB CALLS/BOMB WARNINGS

Keep an eye out for suspicious packages at all times. If one is observed report it to the Chief Technical Officer or another staff member. If a bomb is thought to be in the building, procedures essentially follow those employed in the case of fire. Report to

College authorities on ext: 1999/1317 (Front Gate Security Officer & 24 hour Security) who will call the Gardaí.

FIRST AID

First Aid boxes are placed in every laboratory. These boxes contain a range of dressings and bandages for treatment of minor cuts and burns. DO NOT USE AN ITEM WITHOUT SUBSEQUENTLY INFORMING A TECHNICAL OFFICER. This ensures the incident is recorded and the items used are replaced. A list of trained First Aiders is displayed on each first aid cabinet.

REPORT ANY DEFICIENCY OF THE ITEMS IN OR ON THE BOX TO THE RELEVANT CHIEF TECHNICAL OFFICER.

All accidents must be reported to the Safety Officer and entered in the accident book. An accident report form will be completed. Dangerous occurrences (near misses) must also be reported on the appropriate form.

In the event of serious accident or medical emergency requiring the emergency services, quickly report it to the Chief Technical Officer in that building or the senior person present, then call the Front Gate Security Officer ext: 1999/1317 During office hours minor medical assistance can be obtained from the Student Health Service ext: 1556/1591

First Aid may only be carried out by a trained first aid responder. In the field, all staff and demonstrators carry an individual first aid kit. Departmental vehicles carry a more extensive kit. Report all field injuries or illness immediately to the leader of the field trip. You must always adhere to the instructions and directions of the field-leader.

General Information

Central Societies Committee **http://trinitysocieties.ie/**

TCD Environmental Science Society **http://trinitysocieties.ie/society/?socid=34** & Facebook group **https://www.facebook.com/TCDEnvironmentalSociety/**

Dublin University Central Athletics Club DUCAC **http://www.tcd.ie/Sport/student-sport/ducac/?nodeId=94&title=Sports_Clubs**

Trinity College Students Union **https://www.tcdsu.org/**

Trinity College Graduate Students Union **https://www.tcdgsu.ie/**

Key Locations

Academic Registry **https://www.tcd.ie/academicregistry/**

TCD Portal my.tcd.ie

Blackboard **https://tcd.blackboard.com/webapps/login/**

Staff Contacts

Staff	Office location	Ext	Email
Teaching staff			
Prof Yvonne Buckley	Zoology Building	3172	buckleyy@tcd.ie
Prof Marcus Collier	Centre for the Environment	1641	colliema@tcd.ie
Prof Catherine Coxon	Centre for the Environment	2235	cecoxon@tcd.ie
Prof Ian Donohue	Zoology Building	1356	ian.donohue@tcd.ie
Prof Robbie Goodhue	Museum Building	1419	goodhuer@tcd.ie
Prof Carla Harper	Botany Building	1809	charper@tcd.ie
Prof Niamh Harty	Civil Engineering	1302	Niamh.Harty@tcd.ie
Prof Celia Holland	Zoology Building	1096	cholland@tcd.ie
Prof Andrew Jackson	Zoology Building	2278	jackson@tcd.ie
Prof Pepijn Lujckx	Zoology Building	1926	luijckxp@tcd.ie
Prof Nicola Marples	Zoology Building	2527	nmarples@tcd.ie
Prof Jennifer McElwain	Botany Building	2294	jmcelwai@tcd.ie
Prof Fraser Mitchell	Botany Building	1811	fmitchll@tcd.ie
Dr Marcin Penk	Zoology Building		penkm@tcd.ie
Prof John Rochford	Zoology Building	2237	rchfordj@tcd.ie
Prof Rory Rowan	Museum Building		rowanro@tcd.ie
Prof Matthew Saunders	Botany Building	4870	saundem@tcd.ie
Prof Jane Stout	Botany Building	3761	jane.stout@tcd.ie
Prof Steve Waldren	Trinity Botanic Gardens, Dartry	5117	swaldren@tcd.ie
Prof Mike Williams	Botany Building	2421	willimsm@tcd.ie
Technical Staff			
Ms Patricia Coughlan	Botany Building	1275	coughlp@tcd.ie
Mr Mark Kavanagh	Centre for the Environment	1017	kavanamg@tcd.ie
Ms Siobhan McNamee	Botany Building	1309	smcnamee@tcd.ie
Ms Jackie Stone	Centre for the Environment	1275	jstone@tcd.ie
Dr Martyn Linnie	Zoology Building	1679	mlinnie@tcd.ie

Ms Alison Boyce	Zoology Building	3506	aboyce@tcd.ie
Ms Sinead Kelly	Zoology Building	3506	kellys76@tcd.ie

Executive Officers

Ms Mandy Lockhart	Undergraduate Teaching Office, Room 0.2, Botany Building	1274	ZOBOES@tcd.ie
Ms Fiona Moloney	Undergraduate Teaching Office, Zoology Building	1366	ZOBOES@tcd.ie