



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

School of Natural Sciences and School of Engineering

Environmental Science and Engineering

Junior Sophister Handbook 2023-24

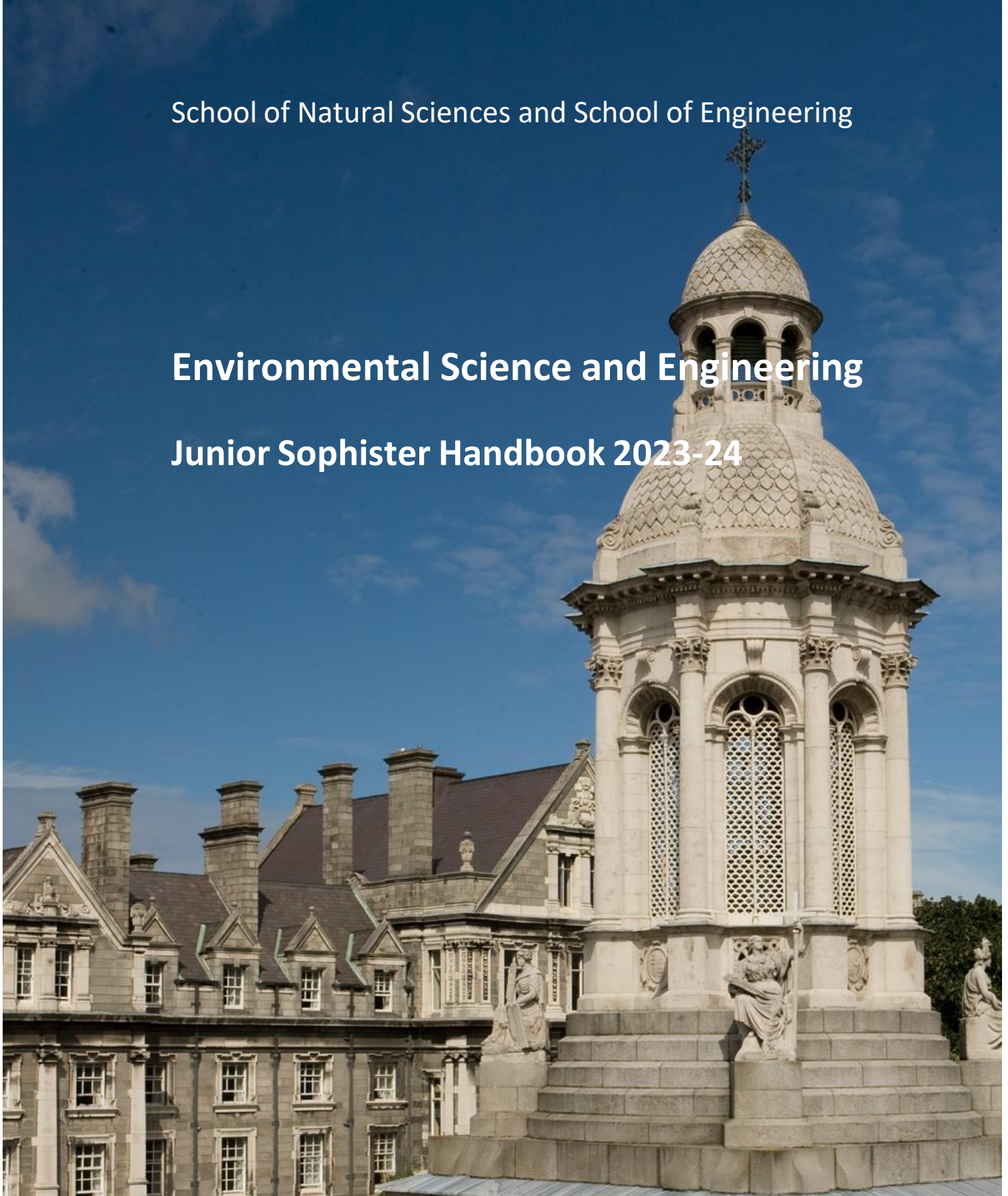


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Statement on General Regulations

All students are encouraged to fully familiarise themselves with colleges rules and general regulations which can be found here:

<https://www.tcd.ie/calendar/undergraduate-studies/general-regulations-and-information.pdf>

Your attention is drawn to the University Calendar Part II (the relevant parts of which are available at registration, or from your tutor) and, in particular, sections that outline general rules governing all students progression and attendance through College. The information provided in this handbook is accurate at the time of preparation. Any necessary revisions will be notified to students via email. 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.

Welcome from Course Directors

Congratulations to you all for completing the Freshman years of the Environmental Science and Engineering Programme and on your successful progression to Sophister years where you will be able to choose modules offering an increasing level of specialism. You will continue to have small cohort dedicated modules for the Environmental Science and Engineering Programme in Process Engineering, Sustainable Energy Cycle and Team Design. These will be complemented by compulsory modules taught through the Schools of Engineering and Natural Sciences on topics such as soil science, environmental monitoring, hydrology and groundwater quality, experimental design and analysis and surveying and geospatial analysis. This year you will also have the opportunity in the first semester to take a “Trinity Elective” of your choice from across a wide range of subject areas taught across different schools in Trinity College. Again, we encourage you to think broadly in your choice of elective and to be adventurous. You will also need to select 3 optional modules (one for the first semester and two for the second semester) from a wide suite of other relevant subjects taught by the School and Natural Science and engineering at Junior Sophister level (see Module descriptors later).

The two ‘sophister’ years offer increasing specialisation in either Applied Environmental Science or Environmental Engineering. Admission to the Master’s level is subject to performance in the Junior Sophister and Senior Sophister years. While there is a strong focus on scientific and technical content and problem solving in the syllabus, personal skills such as communication and teamwork are an integral part of your education. These skills are crucial in promoting an approach to lifelong learning, particularly important in today’s dynamic world. The curriculum is revised on an ongoing basis and we hope that you will find it stimulating and intellectually rewarding. You will be given the opportunity to provide us with considered feedback of your experience during each year of your studies.

Remember, the College has a great deal to offer besides the formal academic programme, including the cultural, recreational and sporting activities of the many student clubs and societies. You are strongly encouraged to participate in the breadth of College life in a balanced way.

Finally, be aware that College offers a wide range of support services. If you are experiencing problems or need to seek advice (personal, financial, health, career or academic), there are a number of sources of help available: these are listed late in this booklet. Do not hesitate to call on these services should the need arise. Each of you has been allocated a tutor, and he/she is an excellent resource to help you with identifying relevant support services. We wish you a successful and enjoyable third year at University.

Professor Jennifer McElwain

Professor Laurence Gill



School of Natural Sciences



School of Engineering

Course Objectives and Learning Outcomes

Environmental Science and Engineering is an integrated undergraduate with postgraduate degree course that aims to train the next generation of graduates who have the competencies, knowledge and experience necessary to design and deploy solutions that protect and improve our environment and human wellbeing, and that work with rather than against the natural world to foster biodiversity, climate action and sustainable use of earth's finite resources. The course will provide students with fundamental grounding in the Natural Sciences and Engineering, and in the applied skills required to develop sustainable solutions for major societal and environmental challenges. The unique combination of Engineering and Natural Sciences modules represents one of the first in Ireland and internationally. Strong emphasis is placed on students acquiring practical laboratory and field skills as well as working in teams.

Learning outcomes:

On completion of the *single honours integrated programme* in **Environmental Engineering** students should be able to:

- LO1: Demonstrate knowledge and understanding of the mathematics, sciences, engineering sciences and technologies underpinning environmental system;
- LO2: Demonstrate an interdisciplinary knowledge and appreciation of the importance and finite nature of Earth's resources and natural capital;
- LO3: Demonstrate deep knowledge and understanding of local to global environmental challenges facing society;
- LO4: Work effectively as an individual, in teams and in multi-disciplinary settings, together with the capacity to undertake lifelong learning;
- LO5: Communicate effectively on engineering activities with the engineering community and with society at large;
- LO6: Identify, formulate, analyse and solve engineering problem;
- LO7: Perform the detailed design of a novel system, component or process using the analysis and interpretation of relevant data;
- LO8: Design and conduct experiments and to apply a range of standard research tools and techniques of enquiry; and
- LO9: Display high ethical standards in the practice of engineering, including the responsibilities of the engineering profession towards people and the environment.

On completion of *year 5 of the integrated Environmental Science and Engineering programme*, **Environmental Engineering** students should be able to meet the following Course Learning Outcomes:

- CLO1. Demonstrate advanced knowledge of the mathematics, sciences, engineering sciences and technologies underpinning Environmental engineering.
- CLO2. Identify, formulate, analyse and solve complex engineering problems.
- CLO3. Perform independently a detailed design of a novel system, component or process by analysing and interpreting relevant data.
- CLO4. Design and conduct experiments and to apply a range of standard and specialised research (or equivalent) tools and techniques of enquiry.
- CLO5: Display high ethical standards in the practice of engineering, including the responsibilities of the engineering profession towards people and the environment as well as demonstrating a wide perception of societal needs and dynamics.
- CLO6: Work effectively as an individual, in teams and in multi-disciplinary settings.

CLO7: Communicate effectively on complex engineering activities with the engineering and environmental science community and with society at large.

CLO8. Engage in lifelong professional development

CLO9. Demonstrate advanced knowledge of specialized areas within environmental engineering.

On completion of the *single honours integrated programme* in **Applied Environmental Science**, students should be able to:

LO1. Demonstrate knowledge and understanding of the mathematics, sciences, engineering sciences and technologies underpinning environmental systems;

LO2. Demonstrate an interdisciplinary knowledge and appreciation of the importance and finite nature of Earth's resources and natural capital;

LO3. Demonstrate deep knowledge and understanding of local to global environmental challenges facing society;

LO4. Work effectively as an individual, in teams and in multi-disciplinary settings, together with the capacity to undertake lifelong learning;

LO5. Communicate effectively on environmental science activities with the environmental science (and engineering) community and with society at large;

LO6. Display advanced knowledge and skill in design, experimentation, data analysis and interpretation to develop and implement real-world solutions for local to global environmental issue;

LO7. Show a deep appreciation of the ethical, political and human rights principles underpinning sustainable development; and

LO8. Demonstrate strong theoretical and technical competence in Environmental Science.

On completion of *year 5 of the integrated Environmental Science and Engineering programme*, **Applied Environmental Science** students should be able to:

CLO1. Demonstrate advanced knowledge and understanding of local to global environmental challenges facing society.

CLO2. Demonstrate advanced interdisciplinary knowledge and appreciation of the importance and finite nature of Earth's resources and natural capital.

CLO3. Make informed and ethical decisions that balance technical, social and environmental considerations.

CLO4. Work effectively as an individual, in teams and in multi-disciplinary settings.

CLO5. Communicate effectively on environmental science activities with the environmental science and environmental engineering community and with society at large.

CLO6. Use advanced knowledge and skill in design, experimentation, data analysis and interpretation to develop and implement real-world solutions for local to global environmental issues and challenges.

CLO7. Demonstrate advanced theoretical and technical competence in Environmental Science through an independent research project.

The European Credit Transfer System

The European Credit Transfer and Accumulation System (ECTS) 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 ECTS is the recommended credit system for higher education in Ireland and across the European Higher Education Area.

The ECTS 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, clinical attendance, 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**. 1 credit represents 20-25 hours estimated student input, so a 10-credit module will be designed to require 200-250 hours of student input including class contact time, assessments and examinations.

ECTS 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 courses. Exceptions to this rule are one-year and part-year visiting students, who are awarded credit for individual modules successfully completed.

Modules and Module Descriptors

Core Modules

Semester 1	Semester 2
BOU33123 – Soil Science (5 ECTS)	GLU33009 – Hydrology and Groundwater Quality (5 ECTS)
ESU33040 – Environmental Monitoring (5 ECTS)	ZOU33070 – Exp. Design and Analysis (5 ECTS)
CEU33A13 – Process Engineering (5 ECTS)	CEU33A10 – Surveying and Geospatial Planning (5 ECTS)
CEU33A14 – Sustainable Energy (5 ECTS)	ESU33006 – Team Design (5 ECTS)*
Trinity Elective (5 ECTS)	

Optional Modules

Semester 1	Semester 2
ZOU33010 Fundamentals of Ecology (5 ECTS)	CEU33A11 Fluids and Environment (5 ECTS)
GSU33003 Ice Age Earth (5 ECTS)	GGU33931 Environmental Governance (5 ECTS)
CEU33A05 Soil Mechanics (5 ECTS)	GGU33915 Globalisation and Geopolitics (5 ECTS)
GLU33002 Blue Earth (5 ECTS)	GGU33018 KARST: Exploring Earths Limestone Landscapes (5 ECTS)
	CEU33A08 Geology for Engineers (5 ECTS)

Semester 1 – Students will have 4 core modules, 1 Trinity Elective and choose 1 optional module.

Semester 2 – Students will have 4 core modules and choose 2 optional modules.

***A field trip to is part of this module and students will be required to pay for this trip.**

Semester 1 - Core

BOU33123: Soil Science

Co-Ordinator:	Dr Matthew Saunders
Other Lecturer(s):	Professor Paul Dowding, Professor Gary Lanigan and Professor Carla Harper
Assessment:	50% Examination, 50% Continuous Assessment
ECTS:	5 credits
Semester:	1

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:

1. Describe the nature of soil and the terms used to describe the major physical and chemical characteristics of soil.
2. Understand how soils are formed and how they are influenced by natural and anthropogenic processes.
3. Compare and contrast the role of soils in plant productivity such as through plant water relations and mineral nutrition.
4. Appraise the issues of sustainable soil management and the impacts of intensive land use on soil quality and fertility.
5. Demonstrate an understanding of biogeochemical cycling within soil systems and the role of soils in the mitigation of climate change.

Indicative Reading:

Foth, HD. (1990). Fundamentals of soil science. Wiley, Chichester.
Hartlemink, AE., McBratney, AB., White, RE. (Eds) (2009). Soil Science, Earthscan, London.
Lal, R. (2006). Encyclopedia of soil science. Taylor and Francis. Oxford.
McLaren, RG., Cameron, KC. (1996). Soil science: sustainable production and environmental protection. Oxford University Press, Oxford.
Weil, RR., Brady, NC. (2016). The nature and properties of soil. Pearson, London.
White, RE. (2006). Principles and practice of soil science: the soil as a natural resource. Blackwell Science, Oxford.

ESU33040: Environmental Monitoring

Co-ordinator: Dr Jeremy (Jay) Piggott
ECTS credits: 5 credits
Assessment: 100% Continuous assessment
Semester: 1

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. Field trips will conclude with a written report, 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

CEU33A13: Process Engineering for Environmental Applications (NEW TBC)

Co-ordinator: Dr Patrick Morrissey and Dr Muhammad Ali
ECTS credits: 5 credits
Assessment: 50% Continuous Assessment, 50% Examination
Semester: 1

Description:

This module aims to develop the students' comprehension of the relevance and usefulness of biological/physico/chemical processes in both natural and engineered water-based systems. Through this module, students will learn how to develop conceptual models and devise numerical solutions to solve typical environmental engineering/science problems. The principles taught in this class have extensive applications in various fields beyond environmental engineering. Therefore, the focus will be on fundamental concepts, stimulating students' critical thinking, promoting discussions, and nurturing creativity to apply these concepts in a wide range of settings.

- **Introduction; Reactor Types, Mass Balances; Reaction Kinetics;**
Reactor Types; Batch Reactor, Continuously Stirred Tank Reactors (CSTR), Plug Flow Reactor (PFR)
Modelling ideal batch, CSTR, and PFR systems at Stead-state
Kinetics of reactions; Reaction order; Concentration dependent; Temperature dependent; Microbial (substrate limited)
- **Flow patterns**
Basics of non-ideal flow
Residence Time Distributions (RTD), Convection

Dispersion Model: Axial dispersion, Correlations, Chemical reaction & dispersion
Compartment Models

Tanks-in-series model: Pulse response & RTD, Chemical conversion

Convection model: Convection model & RTD, Chemical conversion in laminar flow reactors

Self-mixing of a single fluid, mixing of two miscible fluids

- **Biological processes for Environmental Applications**

Oxidation fundamentals

Aeration tank design, sizing and dimensioning

Anaerobic treatment and design

- **Physical processes for Environmental Applications**

Screening, Grit removal

Solid: Liquid Separation Process

Gravity-Based Separation; Coagulation, Flocculation, Sedimentation, Sand Filtration

Membrane Filtration

Adsorption

- **Chemical processes for Environmental Applications**

Disinfection/Chlorination

Ion Exchange

Learning Outcomes:

LO1: Create conceptual models of reactor-based solutions for environmental engineering processes.

LO2: Apply mass-balance principles to simulate process dynamics in engineered systems.

LO3: Demonstrate a thorough understanding of reaction kinetics and how to use them in natural and engineered systems.

LO4: Calculate the reactor size and dimensions needed to treat a flow of contaminated water accurately.

LO5: Develop water quality reactor models for natural processes, such as eutrophication and nitrification, with a focus on improving water quality.

LO6: Develop reactor models for wastewater treatment processes to improve the quality of effluent discharged into the environment.

LO7: Explain the various conceptual flow paths that can be achieved by different combinations and types of reactors in series and/or parallel.

LO8: Identify, formulate and analyse different types of flow regimes that can occur within chemical/process engineering systems, considering their effect on reactor performance.

LO9: Apply the concepts of physicochemical processes to natural and engineered systems to solve problems in environmental engineering.

LO10: Interpret residence time distribution (tracer study) data to determine the degree of mixing in a reactor combination accurately.

Recommended Reading:

Unit Operations and Processes in Environmental Engineering - Reynolds & Richards [CL Engineering]

Wastewater Engineering – Metcalf & Eddy [McGraw-Hill]

Water Quality Modelling – Steven Chapra [McGraw-Hill]

CEEU33A14: Sustainable Energy

Co-ordinator: Dr. Mohammad Reza Ghaani; Dr. Sarah McCormack

ECTS credits: 5 credits

Assessment: 100% Continuous Assessment

Semester: 1

Description:

This module will introduce concepts of energy management and efficiency as well as sustainable energy generation. Energy demand will be detailed sectorally in terms of energy in buildings; transport, agriculture and industry as well as measures for energy reduction and energy efficiency. Introductory lectures on energy generation and conversion will be given followed by topics in renewable energy generation. Renewable energy technologies will include lectures on wind, wave, tidal, biomass, biofuels, geothermal, hydro, solar, waste to energy. Low carbon technologies will be addressed such as nuclear energy, hydrogen, fuel cells. Grid integration and energy storage will be detailed. The future of fossils including clean coal and carbon capture and storage will be discussed.

Learning Outcomes:

LO1. Evaluate and discuss the principle technologies that may be applied to conserve energy in buildings/ industry and transport.

LO2. Explain the different methods of storing mechanical, electrical, chemical, nuclear, and thermal energy

LO3. Evaluate the economic and energy performance of sustainable energy installations

LO4. Compare the various energy forms and sources available on the market today

LO5. Undertake a Life Cycle Assessment (LCA) which captures embodied and operational carbon and resource burdens in the context of sustainability and the circular economy

Recommended Reading:

Sustainable energy systems engineering; P Gevorkian (2007)

Semester 2 - Core

GLU33009: Hydrology and Groundwater Quality

Coordinator: Dr. Eyad Abushandi

ECTS Credits: 5 credits

Assessment: 50% Continuous assessment, 50% Examination

Semester: 2

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.

ZOU33070: Experimental Design and Analysis

Co-ordinator: Dr. Silvia Caldararu

ECTS: 5 ECTS

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).

Semester: 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, the student will be able to:

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

Recommended Reading List:

Ruxton, Graeme D. and Colegrave, Nick. 2011. Experimental design for the life sciences (3rd edition) Publisher – Oxford University Press. Oxford (ISBN 9780199569120).

ESU33006: Team Design

Coordinator: Dr. Peter Moonlight/Dr. Patrick Morrissey

ECTS: 5 ECTS

Assessment: 100% Continuous Assessment

Semester: 2

Description:

Team Design: Environmental Monitoring of Nature Based Solutions is an E3 module that brings together expertise from the Schools of Engineering and Natural Sciences. This module aims to develop the students' understanding of the process of designing and implementing programs to monitor the success of nature-based engineering solutions from both an engineering and environmental point of view. It combines a lecture series and design workshops with a residential field trip to the Lower River Otter Restoration Project in Devon, England. Through the lecture series, students will be introduced to the background and rationale to the project from both an engineering and an environmental point of view. Students will work in groups to develop a plan for monitoring the hydrology and water quality of the scheme. During the field course, students will be introduced to and get hands on experience in ongoing environmental monitoring efforts. Each group will follow established environmental monitoring protocols and be asked to critically evaluate the success of the project with respect to biodiversity and carbon sequestration. The final assessment will be a presentation, aimed at informing the local community of progress at the site to date.

Learning Outcomes:

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

LO1. Develop an understanding of the environmental and legal framework for environmental monitoring

LO2. Demonstrate a rounded knowledge of the process of monitoring nature-based solutions

LO3. Design and critically evaluate a hydrological and water quality monitoring scheme

LO4. Implement an environmental monitoring scheme and analyse the results

LO5. Demonstrate an ability to communicate effectively to a non-academic audience

LO6. Work safely, efficiently, and effectively in a group in the field

Background and documentation for the lower river otter project:

<https://www.lowerotterrestorationproject.co.uk/> Wheater, C.P., Bell, J.R., Cook, P.A. (2011)

Practical Field Ecology: A Project Guide. Wiley Blackwell Shaw, E.M., Beven, K.J., Chappell, N.A., & Lamb, R. (2011). Hydrology in Practice (4th ed.). CRC Press.

<https://doi.org/10.1201/9781315274904> Mihelic, J. R., (1999). Fundamentals of Environmental Engineering

CEU33A10: Surveying and Geo-spatial Planning

Co-ordinator: Dr. Patrick Morrissey

ECTS: 5 ECTS

Assessment: 50% examination, 50% Continuous Assessment

Semester: 2

Description:

Surveying and geo-spatial planning is a single semester module that will help you gain a foundation understanding of the principles of surveying and planning practices, intermediate knowledge of the methods and procedures used on site, and familiarity with a full range of geospatial surveying equipment and tools. This module will give students the ability to plan and manage surveying projects in a wide range of contexts and environments. Students will gain an appreciation of the importance of accuracy and precision when translating detailed plans when setting out any civil engineering project. This will include addressing the challenges faced for surveyors working in different construction environments and consider the impact of spatial design changes during project development. This practical work will be grounded by mathematical theory of analysing for possible errors that may occur in both surveying instrumentation and the methods used for calculating spatial-related data.

The following topics are covered.

• Levelling • Totals Stations • Linear and Angular Measurement • Setting Out • Horizontal & Vertical Curves • Global Positional Systems (GPS) • Geospatial Mapping and Modelling • Remote Sensing

Recommended Reading:

Relevant textbook Uren & Price, Surveying for Engineers, Palgrave Publ. 5 th Ed. Schofield & Breach, Engineering Surveying, 6th Ed. Banister, Raymond & Baker Surveying, Longman Wolf & Ghilani, Elementary Surveying, Prentice Hall Publ.

Semester 1 – Optional

ZOU33010: Fundamentals of Ecology

Coordinator: Dr. Ian Donohue, Dr. Fraser Mitchell, Dr. Jean Williams

ECTS: 5 ECTS

Assessment: 50% examination, 50% Continuous Assessment

Semester: 1

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:

1. Define what we mean by ecology and describe its principles and practice.
2. Show a firm methodological and theoretical understanding of the study of the distribution and abundance of species.
3. Describe and evaluate unifying concepts of distributions and ecological processes (e.g. feeding strategies, interspecific interactions, etc.).
4. Show, through practical exercises, a good approach to project work.
5. Show enhanced communication skills through a variety of techniques.

Recommended Reading List:

Begon, M., Townsend, C.R. & Harper, J.L. (2006) Ecology: from Individuals to Ecosystems. Fourth edition. Blackwell Publishing. Townsend, Begon & Harper (2008) Essentials of Ecology. Third edition. Blackwell Publishing.

GLU33002 Blue Earth

Coordinator: Dr. Carlos Rocha

ECTS: 5 ECTS

Assessment: 100% Continuous Assessment

Semester: 1

Description:

This is an introductory course in marine biogeochemistry. The ocean plays a central role in Earth's climate system, and marine biogeochemical processes regulate the impact of human activity on the global environment. Marine biogeochemistry hence provides a working knowledge of how the earth system functions and reacts to human activity, providing insights into how life formed, evolved, is sustained, and is endangered on Earth. This knowledge provides an understanding of how to adapt to climate and environmental change, enhance food production, manage fisheries and aquaculture, mitigate pollution, and innovate by developing new products including more sustainable food and decarbonation technologies. This module concentrates on the marine biogeochemical phenomena that regulate the earth's climate and control the diversity, distribution, and productivity of marine life. Topics covered include the physical, biological, geological, and chemical processes that control the creation, distribution, and fate of organic matter in the marine environment, the composition of seawater and the atmosphere, and the formation and preservation of marine sediments.

Learning Outcomes:

The course will prepare students for related courses, field and laboratory work in the marine, earth, and environmental sciences and careers in the marine & environmental sector

GSU33003 Blue Earth

Coordinator: Dr. Robin Edwards

ECTS: 5 ECTS

Assessment: 50% examination, 50% Continuous Assessment

Semester: 1

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.

CEU33A05: Soil Mechanics

Coordinator: Dr Brendan O'Kelly

ECTS: 5 ECTS

Assessment: 20% Continuous Assessment, 80% Examination

Semester: 1

Description:

Soil Mechanics provides students with a basic knowledge of fundamental concepts of soil behaviour and gives an introduction into general geotechnical engineering. The module describes the relationship between soils and their geological origins, and demonstrates the significance of the soil's particle-size distribution and mineralogy on its engineering behaviour. Soil description and classification methods are covered. The effects of the compaction process on the engineering properties of soil are discussed, and methods are developed to allow students to design fills. The module explains the principles involved in the flow of water through soils, including methods of analyses and measurement. The important concept of effective stress is described, and examples of its significance in geotechnical engineering are developed. The module discusses the shear strength of soils, its measurement, and presents methods for applying this knowledge in the analysis of short- and long-term bearing capacities for shallow foundations. The module presents elastic methods of analyses for predicting the in-situ stresses induced by surface loading, and the resulting settlements. Methods for analysing the short-term stability of soil slopes are presented. Ground investigation and in-situ testing techniques are described for the development of ground models, and the determination/interpretation of design parameter values.

Module content

• Description and classification of soils • Seepage • Compaction technology • Effective-stress concept and calculation • Ground investigation and in-situ testing • Shear strength • Bearing capacity of shallow foundations • Elastic settlements • Slope stability (undrained condition)

Semester 2 – Optional modules

CEU33A11: Fluids and Environment

Coordinator: Dr Aonghus McNabola

ECTS: 5 ECTS

Assessment: 60% examination, 40% Continuous Assessment

Semester: 2

Description:

Fluids & Environment is a one semester module which provides students with the concepts of hydraulic engineering of fluids in the built environment. The module reviews the relevant aspects of fluid flow developed in 2E5, such as Bernoulli's equation, and the momentum and continuity relationships and demonstrates how these are developed for use in Civil Engineering design. The methods of developing head/discharge relationships for pipe flows which includes for friction loss are formulated. The principals involved in the flow of water in open channels are explained and relationships are developed to allow the estimation of the discharge in open channels and the depth variation behind control structures. The methods used to analyse pipe networks, with and without pumps within the system, are developed. The design of water distribution systems providing an adequate supply of water to consumers is also examined. Finally, the module examines the subject of Urban Drainage, initially comparing combined systems against separate systems. The calculation of hydraulic loads for the network is then demonstrated for both wastewater quantities and also storm water predictions from the analysis of rainfall events. The hydraulic design of the pipe network to these loads is then examined before moving onto the design of Combined Sewer Overflows which are used to relieve the system hydraulically under storm conditions.

Module content:

• Velocity & Discharge Measurement • The Momentum Equation • Energy and Flow of water in pipes • Open channel flow • Pipe network analysis • Pump-Pipe Systems • Pumps • Urban Drainage Systems • Design of Water Distribution Systems

GGU33018 KARST: Exploring Earth's limestone landscapes

Coordinator: Dr Peter Akers

ECTS: 5 ECTS

Assessment: 100% Continuous Assessment

Semester: 1

Description:

This module explores the landscapes known as karst that are found in regions with limestone bedrock. Karst landscapes are known for their scenic mixture of peculiar landforms (including sinkholes, turloughs, and caves), rare ecosystems, and sensitivity to human impacts. Aquifers in karst are a source of water for billions, and proper stewardship of karst requires us to understand how it differs from other, better known landscapes. This is particularly important for Ireland, which has over 40% of its land underlain by limestone. For students interested in protecting Irish water and biodiversity resources, including those at some of Ireland's most distinctive landscapes such as the Burren, this module provides the foundational understanding of karst geomorphology, hydrogeology, and geochemistry for future success when operating in such environments.

GGU33931: Environmental Governance 1

Coordinator: Dr Rory Rowan

ECTS: 5 ECTS

Assessment: 100% Continuous Assessment

Semester: 2

Module Content:

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 been raised - from chemical contamination to climate change, from oil spills to plastic-filled oceans. Despite growing awareness of these many forms of environmental degradation, 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.

CEU33A08 Geology for Engineers

Coordinator: David O'Connell/ Sean Mc Clenaghan

ECTS: 5

Assessment: 100% Examination

Semester: 2

Description:

Geology for Engineers provides an introduction to several areas of Earth Sciences that impact the engineer, including geological materials, earth surface processes, hydrocarbon exploration and production, natural disasters and climate change. Engineers often need to work with geologists. This module will enable the student to operate effectively in such a team by explaining terminology and concepts in the fields stated above. The module also provides the engineer with a natural, regional scale context in which to place site-specific questions. Financial and time pressures on the engineer necessarily force him/her to concentrate on the site-specific aspects of geology, such as the mechanical properties of the ground and the local risk of natural hazards like flooding, subsidence or earthquakes. This module provides examples of how such local-scale phenomena can be better predicted using knowledge of regional-scale geological processes. The student will learn the kind of questions that geologists can answer, allowing him/her to better assess how much time/money to spend on geological investigations for any given project.

GGU33915: Globalisation and Geopolitics

Coordinator: Dr Padraig Carmody

ECTS: 5 ECTS

Assessment: 50% Continuous Assessment, 50% Examination

Semester: 2

This module examines the impacts of globalisation in both the developed and developing world and its relation to geopolitics. Particular emphasis is placed on the theories of geopolitics and globalisation and topics covered include the implications of the rise of China and its international relations in the developing world, "shadow globalisation" – human, arms and drug trafficking and resistance to these processes through social movements, amongst others. The module will be taught through a combination of lectures, and tutorial discussions. Attendance at the tutorials is an integral part of the module. Rather than being a revision exercise, the aim of the tutorials is to elicit a broader understanding of the issues involved by drawing out the social and policy implications of the content of the lectures. Students taking this module will be expected to have undertaken reading in depth prior to each tutorial.

Learning Outcomes:

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

- Analyse the relationships between economic forces, spatial development, geopolitics and the role of the state at different scales of analysis in the developed and developing worlds;
- Judge and critique different perspectives on the nature of the globalisation;
- Comprehend and critique the influence of organisations such as the International Monetary Fund, World Bank and International Non-Governmental Organisations;
- Apprehend the construction and interaction between ethnicity, conflict and terrorism; regionalisation and globalisation;
- Discuss critically the relationship between different types of globalisation "from above" and "below";
- Critically evaluate alternatives to globalisation.

Academic Year Calendar 2023/24

Academic Calendar Week	Week Beginning	2023/24 Academic Year Calendar		Term / Semester
		UG continuing years / PG all years	UG new first years	
1	28-Aug-23	Reassessment * (Semesters 1 & 2 of 2022/23)		←Michaelmas term begins/Semester 1 begins
2	04-Sep-23	Orientation (Postgraduates, Visiting & Erasmus); Marking/Results		
3	11-Sep-23	Teaching and Learning		←Michaelmas teaching term begins
4	18-Sep-23	Teaching and Learning	Orientation (IF UG)	
5	25-Sep-23	Teaching and Learning	Teaching and Learning	
6	02-Oct-23	Teaching and Learning	Teaching and Learning	
7	09-Oct-23	Teaching and Learning	Teaching and Learning	
8	16-Oct-23	Teaching and Learning	Teaching and Learning	
9	23-Oct-23	Study/Review	Study/Review	
10	30-Oct-23	Teaching and Learning (Monday, Public Holiday)	Teaching and Learning (Monday, Public Holiday)	
11	06-Nov-23	Teaching and Learning	Teaching and Learning	
12	13-Nov-23	Teaching and Learning	Teaching and Learning	
13	20-Nov-23	Teaching and Learning	Teaching and Learning	
14	27-Nov-23	Teaching and Learning	Teaching and Learning	
15	04-Dec-23	Revision	Revision	
16	11-Dec-23	Assessment *	Assessment **	←Michaelmas term ends Sunday 17 December 2023/Semester 1 ends
17	18-Dec-23	Christmas Period - College closed	Christmas Period - College closed	
18	25-Dec-23	22 December 2023 to 1 January 2024 inclusive	22 December 2023 to 1 January 2024 inclusive	
19	01-Jan-24			
20	08-Jan-24	Foundation Scholarship Examinations ^	Foundation Scholarship Examinations ^	
21	15-Jan-24	Marking/Results	Marking/Results	←Hilary term begins/Semester 2 begins
22	22-Jan-24	Teaching and Learning	Teaching and Learning	←Hilary teaching term begins
23	29-Jan-24	Teaching and Learning	Teaching and Learning	
24	05-Feb-24	Teaching and Learning (Monday, Public Holiday)	Teaching and Learning (Monday, Public Holiday)	
25	12-Feb-24	Teaching and Learning	Teaching and Learning	
26	19-Feb-24	Teaching and Learning	Teaching and Learning	
27	26-Feb-24	Teaching and Learning	Teaching and Learning	
28	04-Mar-24	Study/Review	Study/Review	
29	11-Mar-24	Teaching and Learning	Teaching and Learning	
30	18-Mar-24	Teaching and Learning (Monday, Public Holiday)	Teaching and Learning (Monday, Public Holiday)	
31	25-Mar-24	Teaching and Learning (Friday, Good Friday)	Teaching and Learning (Friday, Good Friday)	
32	01-Apr-24	Teaching and Learning (Monday, Easter Monday)	Teaching and Learning (Monday, Easter Monday)	
33	08-Apr-24	Teaching and Learning	Teaching and Learning	
34	15-Apr-24	Revision	Revision	←Hilary term ends Sunday 21 April 2024
35	22-Apr-24	Trinity Week (Monday, Trinity Monday)	Trinity Week (Monday, Trinity Monday)	←Trinity Term begins
36	29-Apr-24	Assessment *	Assessment *	
37	06-May-24	Marking/Results (Monday, Public Holiday)	Marking/Results (Monday, Public Holiday)	
38	13-May-24	Marking/Results	Marking/Results	
39	20-May-24	Marking/Results	Marking/Results	
40	27-May-24	Research	Research	←Trinity Term ends Sunday 2 June 2024/Semester 2 ends
41	03-Jun-24	Research (Monday, Public Holiday)	Research (Monday, Public Holiday)	
42	10-Jun-24	Research	Research	
43	17-Jun-24	Research	Research	
44	24-Jun-24	Research	Research	
45	01-Jul-24	Research	Research	
46	08-Jul-24	Research	Research	
47	15-Jul-24	Research	Research	
48	22-Jul-24	Research	Research	
49	29-Jul-24	Research	Research	
50	05-Aug-24	Research (Monday, Public Holiday)	Research (Monday, Public Holiday)	
51	12-Aug-24	Research	Research	
52	19-Aug-24	Research	Research	

* Note: additional/contingency days may be required outside of the formal assessment/assessment weeks.
 ** Note: it may be necessary to hold a small number of IF examinations/assessments outside of semester 1.
 ^ Note: it may be necessary to hold some examinations/assessments in the preceding week.

The academic year structure can be found below:

<https://www.tcd.ie/calendar/>

Assessment and Examination

Examination Dates 2023/24:

- Semester 1 assessment dates commence the week beginning 11th December 2023.
- Semester 2 assessment dates commence the week beginning 29th April 2024.

Assessment across both the undergraduate and postgraduate elements of the course will be carried out by a variety of different methods as exemplified below:

- Conventional end of term exams
- Laboratory practicals
- Marked tutorials
- Reflective diaries
- Group design projects
- Team based assessment
- Independent research project (year 5)

Conduct of examinations and submission of assessed work

The below is taken from the College Calendar, Part II, pages 35-37, 39 and is edited to include information specific to progression in Environmental Science and Engineering.

34 . Programmes have discretion to utilise a broad range of assessment practices that are programme focussed, equip students to apply their learning in contexts beyond the University and assess the graduate attributes appropriately throughout the programme. An assessment component is a discrete unit of assessment, e.g. an examination paper, an essay, an oral/aural examination, practical, field trip, professional placement, or performance which contributes a defined weighting to the overall assessment for a module. Programmes must make available to students details of the assessment components, together with their weightings, for each module, including details of penalties applying for late submission.

35. Students are entitled to receive feedback on submitted coursework in line with the Return of Coursework Policy. See www.tcd.ie/teaching-learning/academic-policies.

36. There are formal University assessment sessions following the end of teaching term in semester one (in Michaelmas term) and following the end of teaching term in semester two (in Trinity term). Students are assessed at the end of semester one in all modules that are taught only in semester one and at the end of semester two in all year-long modules and all modules that are taught only in semester two. There is one reassessment session which is held at the beginning of Michaelmas term. Students are assessed in all failed modules from both semesters during the reassessment session.

The University reserves the right to amend assessment methods and the timetable for assessments for any reason and at any stage during the academic year. All teaching and assessments are subject to public health advice and guidance as and when issued.

37. The dates of these formal assessment sessions are given in the Calendar PART I - ALMANACK. Examinations should be confined to these sessions. However, if and when approved by the University Council, certain courses, normally professional, are permitted to hold examinations outside of the standard academic year structure. The University Council may also approve additional contingency dates on which to hold examinations outside of the standard academic year structure.

38. Examination timetables are published four weeks in advance of the formal start date of each assessment period on the my.tcd.ie portal. The College reserves the right to alter the published time and date of an examination in exceptional circumstances. Students should ensure that they are available for examinations for the duration of the relevant formal assessment session and approved contingency dates as stated in the Calendar PART I - ALMANACK.

39. No notice is required of intention to take an end-of-semester examination or to sit for reassessment in the course for which students have registered.¹ The onus lies on each student to establish the dates, times, mode and venue of examinations by consulting the relevant timetable on the my.tcd.ie portal. No timetable or reminder will be sent to individual students by any office.

40. Except as provided for below, candidates for examination are forbidden during an examination to do or to attempt to do, any of the following: to have in their possession or consult or use any books, 23 papers, notes, memoranda, mobile phones, electronic devices, or written or electronic material of any nature, or to copy from or exchange information with other persons, or in any way to make use of any information improperly obtained.

41. Where the examination is of such a nature that materials are provided to the candidates, or where the candidates are allowed by the rules of that examination to have materials in their possession, then candidates may only make use of such materials, and the general prohibition above continues to apply in respect of any and all other materials.

42. Where candidates have the prior written permission of the examiner(s), of the Senior Lecturer, or of the Disability Officer, to have materials in their possession during an examination, then candidates may only make use of such materials, and the general prohibition above continues to apply in respect of any and all other materials.

43. Candidates may be allowed to bring personal belongings to examination venues upon condition that such belongings are stored in designated areas. Candidates must ensure that they store their belongings accordingly and must not return to them until they have finished their examinations and are leaving the venue.

44. Any breach of this regulation is regarded as a major offence for which a student may be expelled from the University (see §4 under CONDUCT AND COLLEGE REGULATIONS).

45. Students must not leave the examination before the time specified for the examination has elapsed, except by leave of the invigilator.

46. The College has approved the practice of anonymous marking for undergraduate examinations at the formal assessment and reassessment sessions.

47. All undergraduate results are published by student number. The results for assessments completed in semester one are provisional until moderated by the court of examiners in Trinity term. The end of year or degree result moderated by the court of examiners must be returned and recorded on the student record.

48. Students are required to complete the assessment components for each module as prescribed by the programme regulations. See Assessment: procedures for the non-submission of course work and absence from examinations at www.tcd.ie/teaching-learning/academicpolicies.

49. Students are not permitted to repeat successfully completed assessments or examinations in order to improve their performance.

50. The Board of the College reserves the right to exclude from the College, on the recommendation of the University Council, students whose academic progress is unsatisfactory

51. Students who are unable to complete such assessment components necessary to complete a module or modules at the end of the appropriate semester due to certified illness, disability, or other grave cause beyond their control may seek, through their tutor, permission from the Senior Lecturer to present at the reassessment session. Where certified illness, disability, or other grave cause beyond their control prevents a student from completing at the reassessment

session they may seek, through their tutor, permission from the Senior Lecturer to repeat the year.

52. Students who may be prevented from sitting an examination or examinations (or any part thereof) due to illness should seek, through their tutor, permission from the Senior Lecturer in advance of the assessment session to defer the examination(s) to the reassessment session. Students who have commenced the assessment session, and are prevented from completing the session due to illness should seek, through their tutor, permission to defer the outstanding examination(s)/assessment(s) to the reassessment session. In cases where the assessment session has commenced, requests to defer the outstanding examination(s) on medical grounds, should be submitted by the tutor to the relevant school/departmental/course office. If non-medical grounds are stated, such deferral requests should be made to the Senior Lecturer, as normal.

53. Where such permission is sought, it must be appropriately evidenced: (a) For illness: medical certificates must state that the student is unfit to sit examinations/ complete assessments and specify the date(s) of the illness and the date(s) on which the student is not fit to sit examinations/complete assessments. Medical certificates must be submitted to the student's tutor within three days of the beginning of the period of absence from the assessment/examination. (b) For other grave cause: appropriate evidence must be submitted to the student's tutor within three days of the beginning of the period of absence from the assessment/examination.

54. Where illness occurs during the writing of an examination paper, it should be reported immediately to the chief invigilator. The student will then be escorted to the College Health Centre. Every effort will be made to assist the student to complete the writing of the examination paper.

55. Where an examination/assessment has been completed, retrospective withdrawal will not be granted by the Senior Lecturer nor will medical certificates be accepted in explanation for poor performance.

56. If protracted illness prevents a student from taking the prescribed assessment components, so that they cannot rise into the next class, they may withdraw from College for a period of convalescence, provided that appropriate medical certificates are submitted to the Senior Lecturer. If the student returns to College in the succeeding academic year they must normally register for the year in full in order to fulfil the requirements of their class. See §26 on fitness to study and §28 fitness to practise, if relevant.

57. Where the effects of a disability prevent a student from taking the prescribed assessment components, so that they cannot rise into the next class, the Senior Lecturer may permit the student to withdraw from College for a period of time provided that appropriate evidence has been submitted to the Disability Service. If they return to College in the succeeding academic year they must normally register for the year in full in order to fulfil the requirements of their class.

58. The nature of nonstandard examination accommodations, and their appropriateness for individual students, will be approved by the Senior Lecturer in line with the Council-approved policy on reasonable accommodations. Any reports provided by the College's Disability Service, Health Service or Student Counselling Service will be strictly confidential.

Access to Scripts and other assessed work

All students have a right to discuss their examination and assessment performance with the appropriate members of staff. This right is basic to the educational process. Students are entitled to view their scripts and other assessments when discussing their performance. For work completed during semester one, students should note that all results are provisional until moderated by the court of examiners in Trinity term. In Trinity term, students' performance cannot be discussed with them until after the publication of the end-year results.

Written assessment components and assessment components which are recorded by various means (e.g. video, audio) are retained by schools and departments for thirteen months from the date of the meeting of the court of examiners which moderates the results in question and may not be available for consultation after this time period.

Re-check/re-mark of examination scripts and other assessed work

Having received information about their final results at the court of examiners in Trinity term and having discussed these and their performance with the Director of Teaching and Learning (Undergraduate) or the head of discipline and/or the appropriate staff, students may ask that their results be reconsidered if they have reason to believe:

- (a) that the grade is incorrect because of an error in calculation of results;
- (b) that the examination paper or other assessment specific to the student's course contained questions on subjects which were not part of the course prescribed for the examination or other assessment; or
- (c) that bias was shown by an examiner in marking.

- In the case of (a) above, the request should be made through the student's tutor to the Director of Teaching and Learning (Undergraduate) or course director as appropriate.
- In the case of (b) and/or (c) above, the request should be made through the student's tutor to the Senior Lecturer. In submitting such a case for reconsideration of results, students should state under which of (b) and/or (c) the request is being made.
- Requests for re-check or re-mark should be made as soon as possible after discussion of results and performance and no later than twelve months from the date of the meeting of the court of examiners which moderated the marks in question.
- Once a result has been formally published following the court of examiners it cannot be amended without the permission of the Senior Lecturer.
- Any student who makes a request for re-check or re-mark that could have implications for their degree result is advised not to proceed with degree conferral until the outcome of the request has been confirmed.

Academic Progress (Specific to Environmental Science and Engineering)

Year 1-4:

Progression regulations Year 1 to Year 4 are standard (grade of 40 per cent or more to progress). However in order to be eligible to undertake an industry internship or international exchange in Year 4, students must achieve a threshold grade of 60 per cent at the end of Year 3. Students who don't achieve 60 per cent in Year 3 may still progress to Year 4 with a grade of 40 per cent or above but they must take a capstone module in Year 4 and spend the full year in Trinity.

Year 5:

Progression will be an annual basis. Progression from Year 4 to Year 5 will require a minimum overall mark of 60% for the combined Junior Sophister and Senior Sophister years (on a 30:70 basis) at the annual assessment session of the B.Sc. degree year.

In year 5, students will be able to carry failed modules from semester to semester. Progression through year 5 leading to the final awards of M.A.I. (St.) and Master in Applied Environmental Science depending on the route chosen, requires a 50% pass grade for award of pass degree on the results of student's continuous assessment and examinations. The award of distinction degree shall require at least 70 per cent in both examinations and the dissertation and at least 70 per cent in the final credit weighted average.

Book Prizes

A prize of a book token to the value of €13 is awarded to candidates who obtain a standard equivalent to an overall first class honors grade (70% and above) at the first attempt of the semester 1 and semester 2 assessment. Book Prizes will be available for collection in November of the following academic year from the Academic Registry. These prizes are issued in the form of book tokens and can be redeemed at Hodges Figgis and Co. Ltd.

Attendance:

All students should enter into residence in or near Dublin and must begin attendance at the College not later than the first day of teaching term, and may not go out of residence before the last day of teaching term, unless they have previously obtained permission from the Senior Lecturer through their tutor. Students must attend College during the teaching term. They must take part fully in the academic work of their class throughout the period of their course. Lecture timetables are published through my.tcd.ie and on school or department notice-boards before the beginning of Michaelmas teaching term. The onus lies on students to inform themselves of the dates, times and venues of their lectures and other forms of teaching by consulting these timetables. The requirements for attendance at lectures and tutorials vary between the different faculties, schools and departments. Attendance is compulsory for Junior Freshmen in all subjects. The school, department or course office, whichever is relevant, publishes its requirements for attendance at lectures and tutorials on notice-boards, and/or in handbooks and elsewhere, as appropriate.

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 <https://libguides.tcd.ie/academic-integrity>

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 <https://libguides.tcd.ie/academic-integrity>. You should also familiarize yourself with the 2021/22 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 <https://libguides.tcd.ie/academic-integrity/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 <https://libguides.tcd.ie/academic-integrity/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. For field work, ethical consideration needs to be given to the disturbance of species and habitats that may not be subject of your particular study, ethical considerations also need to apply to access to private land. 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

Marking

	Criteria
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 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. 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
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
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.

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.
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.
30-39	MARGINAL FAIL; inadequate answer, with no substance or understanding, but with a vague knowledge relevant to the question.
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.

Student Supports

Trinity College provides a wide range of [personal and academic supports](#) for its students.

Your Tutor:

All registered full-degree undergraduate students are allocated a Tutor when starting in College. Your Tutor is a member of the academic staff who is appointed to look after the general welfare and development of all students in their care.

You should see your tutor whenever you have a question or are worried or concerned about any aspect of College life or your personal life, in particular if it is affecting your academic work. Everything you say to your tutor is in strict confidence. Unless you give them permission to do so, they will not give any information to anybody else, whether inside College or outside (not to your parents/family for example).

Your Tutor can help you only if they know you are facing difficulties, so if you are worried about anything go and see your Tutor before things get out of hand. Whilst your Tutor may not be able to solve the underlying problem, they can help you find the best way to limit the impact of your situation on your College work. Tutors can help with academic advice, changing course, withdrawing from College, exam regulations, financial assistance and personal advice. If you cannot find your own tutor, you can contact the Senior Tutor (tel: 01 896 2551). Senior Tutor's website: <https://www.tcd.ie/seniortutor/>

Student Counselling Service:

While Trinity implements its phased reopening, the SCS continues to offer services by telephone and video call. Please email student-counselling@tcd.ie to request an appointment. Emergency consults are available weekdays.

The student Counselling Service, 3rd Floor, 7 – 9 Leinster Street, College.

Tel: 01 896 1407

Email: student-counselling@tcd.ie

Please check the website for more up to date information:

http://www.tcd.ie/Student_Counselling

College Health Service

The College Health Service has changed the way it operates in order to minimize risk to our students and staff during this time of national crisis

To ensure your safety we have restricted access. Do not attend College Health without an appointment, appointments can be made over the phone.

Opening hours: between 9.30-12.00 and 14.00-16.00

The Health Centre is situated on Trinity Campus in House 47, a residential block adjacent to the rugby pitch.

Tel: 01 896 1591 or 01 896 1556

Web: <https://www.tcd.ie/collegehealth/>

Chaplaincy

The chaplains are representatives of the main Christian Churches in Ireland who work together as a team, sharing both the college chapel and the chaplaincy in House 27 for their work and worship.

Steve Brunn (Anglican Chaplain): brunns@tcd.ie; tel: 01 896 1402

Julian Hamilton (Methodist Chaplain): julian.hamilton@tcd.ie; tel: 01 896 1901

Alan O'Sullivan (Catholic Chaplain): aeosulli@tcd.ie; tel: 01 896 1260

Peter Sexton (Catholic Chaplain): sextonpe@tcd.ie; tel: 01 896 1260

Web: <https://www.tcd.ie/Chaplaincy/>

Trinity Disability Service

Disability Services, Declan Treanor

Room 2054, Arts Building

Email: askds@tcd.ie

Tel: 01 896 3111

Web: <https://www.tcd.ie/disability/>

Niteline

A confidential student support line run by students for students which is open every night of term from 9pm to 2.30am.

Tel: 1800 793 793

Web: <https://niteline.ie/>

Students' Union Welfare Officer

House 6, College

Email: welfare@tcdsu.org

Web: <https://www.tcdsu.org/welfare>

Undergraduate Programming Centre

The Programming Centre is available to all Computer Engineering students free of charge. The centre operates as a drop-in service where you can get help with any problems you might have with programming in your courses. For further information, please visit <http://www.scss.tcd.ie/ugpc/>.

Student Learning Development

Student Learning Development provides learning support to help students reach their academic potential. They run workshops, have extensive online resources and provide individual consultations. To find out more, visit their website at <https://student-learning.tcd.ie/>.

Student 2 student (S2S)

S2S offers trained Peer Supporters for any student in the College who would like to talk confidentially with another student, or just to meet a friendly face for a chat. The service is free and available to everyone. To contact a Peer Supporter you can email student2student@tcd.ie.

Web: <https://student2student.tcd.ie/peer-support/>.

Trinity Careers Service

As a Trinity College Dublin student you have access to information, support and guidance from the professional team of expert Careers Consultants throughout your time at Trinity. The support offered includes 'next step' career guidance appointments, CV and LinkedIn profile clinics and practice interviews.

Web: <https://www.tcd.ie/Careers/>.

Co-curricular activities

Trinity College has a significant number of diverse student societies which are governed by the Central Societies Committee. They provide information on the societies including how to get involved and even how to start your own society. See <http://trinitysocieties.ie/> for more details. Students are encouraged to get involved. Trinity College also has a huge range of sports clubs which are governed by the Dublin University Athletic Club (DUCAC). [Dublin University Central Athletic Club - Trinity Sport - Trinity College Dublin \(tcd.ie\)](http://www.ducac.ie/) for more details.

Trinity College Students' Union

The Trinity College Students' Union (TCDSU) is run for students by students. TCDSU represents students at college level, fight for students' rights, look after students' needs, and are here for students to have a shoulder to cry on or as a friend to chat with over a cup of tea. Students of Trinity College are automatically members of TCDSU. It has information on accommodation, jobs, campaigns, as well as information pertaining to education and welfare.

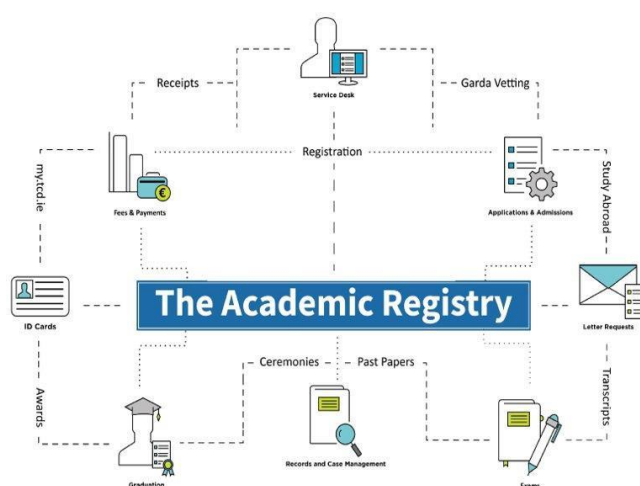
For more information see: <https://www.tcdsu.org/>.

Postgraduate Advisory Service

The Postgraduate Advisory Service offers free, independent, and confidential support, guidance and advocacy to registered postgraduate students. They are here to provide support on any matter that may impact upon your time as a postgraduate at Trinity.

Some of the most common issues students come to PAS to discuss include: study-related stress or worry; concerns about academic progress; supervisor-relationship concerns; extensions and going off-books; queries regarding regulations and academic appeals; bullying; plagiarism and disciplinary cases, financial assistance.

Academic Registry



The Academic Registry can help with queries on Applications & Admissions, Registration, ID Cards, Letter requests, Fees & Payments, Exams, Graduation, Fees & Payments. The Academic Registry is located in the Watts Building.

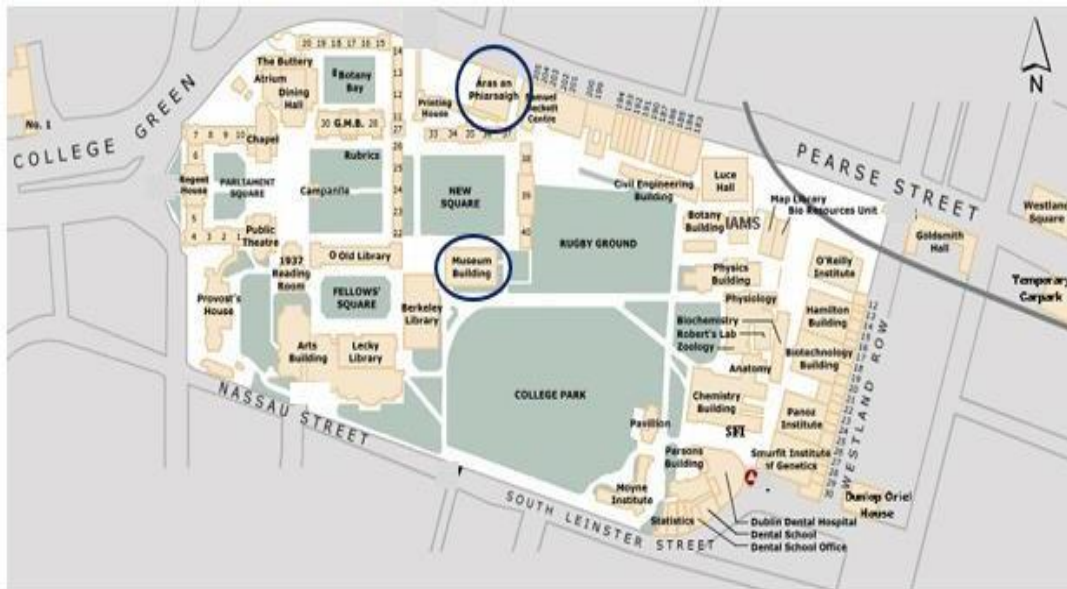
Telephone: 01 896 4500

Email: academic.registry@tcd.ie

Webchat: [Academic Registry Webchat - Academic Registry - Trinity College Dublin \(tcd.ie\)](#)

Website: <https://www.tcd.ie/academicregistry/>

Key Campus Locations



[Interactive College Map](#)

[College Maps : Trinity College Dublin \(tcd.ie\)](http://College Maps : Trinity College Dublin (tcd.ie))

General Information

Emergency Procedure

In the event of an+ emergency, **dial Security Services on extension 1999**

Security Services provide a 24-hour service to the college community, 365 days a year. They are the liaison to the Fire, Garda and Ambulance services and all staff and students are advised to always telephone extension 1999 (+353 1 896 1999) in case of an emergency.

Should you require any emergency or rescue services on campus, you must contact Security Services. This includes chemical spills, personal injury or first aid assistance.

It is recommended that all students save at least one emergency contact in their phone under ICE (In Case of Emergency).

Data Protection

Trinity College Dublin uses personal data relating to students for a variety of purposes. We are careful to comply with our obligations under data protection laws and we have prepared this short guide to ensure you understand how we obtain, use and disclose student data in the course of performing University functions and services. The guidance note is intended to supplement the University's Data Protection Policy.

Further information can be found below:

[Information Compliance : Trinity College Dublin \(tcd.ie\)](https://www.tcd.ie/information-compliance)

Staff Contacts

Staff	Email
Professor Jennifer McElwain – Course Director, Botany Building	jmcelwai@tcd.ie
Professor Laurence Gill – Course Director, Museum Building	Laurence.Gill@tcd.ie
Asst. Prof. Matthew Saunders – Soil Science	saundem@tcd.ie
Asst. Prof. Jeremey (Jay) Piggott – Environmental Monitoring	piggotjj@tcd.ie
Asst. Prof. Patrick Morrissey – Process Engineering and Surveying and Geo- Spatial Planning, Team Design	morrisp5@tcd.ie
Asst. Prof. Muhammad Ali – Process Engineering	muhammad.ali@tcd.ie
Assoc. Prof. Sarah McCormack – Sustainable Energy	Sarah.McCormack@tcd.ie
Asst. Prof. Mohammad Reza Ghaani – Sustainable Energy	Mohammad.ghaani@tcd.ie
Dr. Eyad Abushandi – Hydrology and Groundwater Quality	e.abushandi@tcd.ie
Asst. Prof. Silvia Caldararu – Experimental Design and Analysis	caldaras@tcd.ie
Asst. Prof. Peter Moonlight – Team Design	moonligp@tcd.ie
School of Natural Sciences – James Higgins (School Manager)	SchoolofNaturalSciences@tcd.ie
School of Engineering	engineering@tcd.ie
Emma Leahy – Executive Officer – Room 4.29 Aras an Phiarsaigh	envscieng@tcd.ie