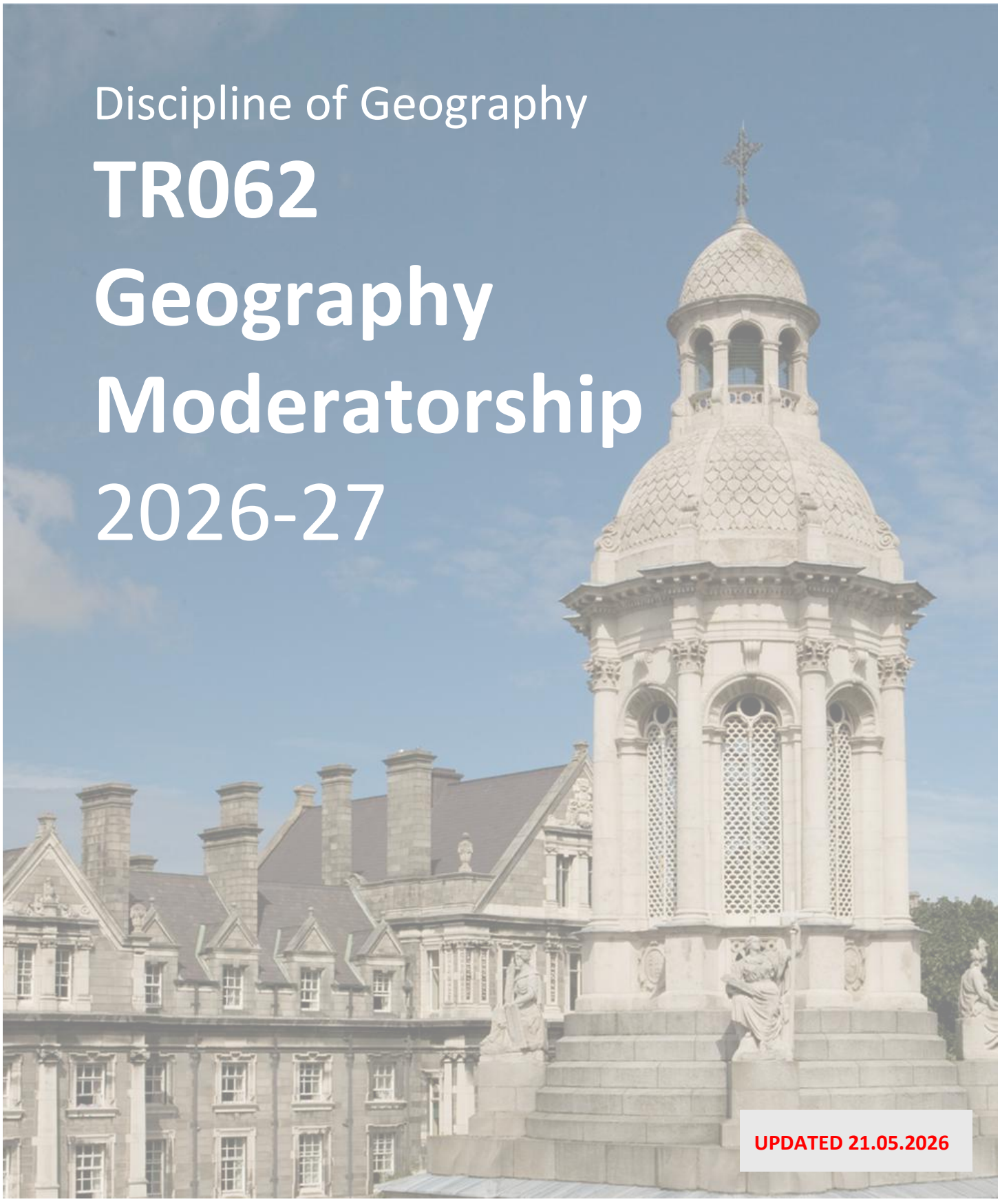
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin



Discipline of Geography

# TR062 Geography Moderatorship 2026-27

**UPDATED 21.05.2026**

**IMPORTANT NOTE:**

Although the information in this handbook is correct at the time of production, the precise content of the course is subject to change. While every effort will be made to give due notice of major changes, the School Office reserves the right to suspend, alter or initiate courses, timetables, examinations and regulations at any time.

In the event of any conflict or inconsistency between the General Regulations published in the University Calendar and information contained in this course handbook, the provisions of the General Regulations will prevail: https://www.tcd.ie/calendar/undergraduate-studies/

# Table of Contents


Welcome ..... 8

Welcome message from the Geography Moderatorship coordinator ..... 11

TR062: Geography and Geoscience - BA Mod in SCIENCE (GEOGRAPHY) ..... 12

Geography Moderatorship Learning Outcomes ..... 12

TR062 Geography Junior Sophister Programme ..... 14

Junior Sophister Programme Structure ..... 15

TR062 Geography Senior Sophister Programme ..... 17

Geography Sophister Programme Structure ..... 18

Description of ECTS system ..... 19

Module Selection ..... 20

Trinity Electives ..... 20

Facilities, Conduct and Safety ..... 22

General Information ..... 22

Laboratories ..... 22

GIS Computer Room ..... 23

The Freeman Library (Geography) ..... 23

Other Discipline Related Facilities (Geology) ..... 24

Safety ..... 24

Emergencies ..... 24

Laboratory Safety ..... 25

Fieldwork Safety ..... 25

Fire Safety ..... 26
First Aid ..... 26
Erasmus ..... 28
Attendance requirements ..... 30
Assessment Regulations ..... 31
Examinations ..... 32
Late Submissions and Extensions for Module Assignments ..... 32
Academic Integrity Policy ..... 34
Guidance on the use of AI and Generative-AI in College ..... 35
Artificial Intelligence (AI) ..... 35
Prizes, awards and scholarships ..... 38
Foundation Scholarship Examination ..... 38
Prizes ..... 38
HAUGHTON PRIZE IN GEOGRAPHY ..... 38
DES GILMOR PRIZE IN GEOGRAPHY ..... 38
Beyond a Geography Degree ..... 39
Careers for Geography Graduates ..... 39
Research Opportunities ..... 39
Contact Details ..... 41
Junior Sophister Modules ..... 42
BOU33123 Soil Science (5 Credits) ..... 42
GGU33002 Residential Field Course (10 Credits) ..... 44

GGU33003 Residential Field Course (10 Credits) ..... 46
GGU33011 Earth's Climate Past, Present and Future (5 Credits) ..... 48
GGU33014 Research Frontiers in Geography (5 Credits) ..... 49
GGU33019 Economy, Finance, and Space (5 credits) ..... 51
GGU33020 Research Skills and Data Analysis in Geomorphology 1 (5 Credits) ..... 53
GGU33021 Research Skills and Data Analysis in Geomorphology 2 (5 Credits) ..... 55
GGU33928 Advanced Research Methods in Geography 1 (5 Credits) ..... 59
GGU33931 Environmental Governance 1 (5 Credits) ..... 61
GGU33933 Geographical Information: Data & Tools (5 Credits) ..... 63
GGU33937 Urban Economic Structure & Regeneration (5 credits) ..... 64
GGU33939 Exploring the Sustainable City (5 Credits) ..... 65
GLU33002 Blue Earth: Understanding the Function of Marine Ecosystems (5 Credits) ..... 67
GLU33004 The Crystal World (5 Credits) ..... 69
GLU33005 Volcanism and Magmatism (5 Credits) ..... 71
GLU33007 Earth Resources for a Critical Future (5 Credits) ..... 73
GLU33009 Hydrology and Groundwater Quality (5 Credits) ..... 75
GSU33003 Ice Age Earth (5 Credits) ..... **Error! Bookmark not defined.**
Senior Sophister Modules ..... 77
GGU44901 Natural Hazards (5 credits) ..... 79
GGU44902 Karst Landscapes (5 Credits) ..... 81
GGU44903 Carbon and Climate (5 credits) ..... 83
GGU44927 Environmental Governance 2 (5 Credits) ..... **Error! Bookmark not defined.**

GGU44933 GIS and Remote Sensing Applications in Geography (5 Credits) ..... 85
GGU44936 Globalisation and African Development (5 Credits) ..... 87
GGU44968 Historical Geography (10 Credits) ..... 89
GGU44976 Glaciers and Glaciation ..... 90
GGU44978 Finance and Climate Justice (10 credits) ..... 92
GGU44979 Living on the Edge: Estuaries and Coasts (5 Credits) ..... 96
GLU44006 Carbonates: from the Atomic to Planetary Scale (5 Credits) ..... 98
GLU44009 Geoscience for a Sustainable Planet (5 Credits) ..... 100
GLU44011 Palaeoceanography and Palaeoclimatology (5 Credits) ..... 102
GLU44012 Raw Materials in Building (5 Credits) ..... 104
Graduate Attributes ..... 105
Why are the Graduate Attributes important? ..... 106
How will I develop these Graduate Attributes? ..... 106
Important Information ..... 107
Student Services ..... 107
Trinity Tutorial Service (Undergraduate Students) ..... 107
Opening Hours and Appointments ..... 108
What is a Tutor? ..... 108
When should I go to see my Tutor? ..... 108
Disability Services ..... 108
Student Learning Development ..... 109
College Health Service ..... 109

Student Counselling ..... 110

Student Life ..... 110

Academic Registry ..... 110

Student Accommodation ..... 111

Appendix 1 ..... 112

# Welcome

Dear all,

As we look ahead to a new academic year, a very warm welcome to you all on behalf of all staff and students at Trinity Geography! As I write this welcome note, the world we are living in and the planet we call home is increasingly characterised by instability, the product of both fast and slow violence that wends its way across diverse places, landscapes and spatial scales.

Every day we are confronted in media, social media, and within the communities we live, with the never-ending and splintered outcomes of a polycrisis in environmental, societal, economic, and political systems: from storms, floods and uncontrollable fires to reactionary political shifts at domestic and global scales, from housing crises and widening urban inequalities, anti-migration politics, to the revanchist attacks on bodily autonomy and the rights of gender minorities. The impacts of this polycrisis are immediate, while its roots are both deep and relational. To acquire the critical skills to understand, and act, on these shits, it seems that there has never been a more appropriate time to delve into the study of Geography.

Geography is unique in offering a way of thinking about complex human-environment systems at different scales, from global to local, from milliseconds to millennia. It is an integrative subject with an international outlook and openness to interdisciplinary collaboration – and this requires a high degree of collaborative spirit, empathy, and collegiality.

Within Trinity, there have also been many new developments, including a number of climate change related initiatives alongside many new research initiatives in Geography towards achieving just transitions into a more socially, economically, and politically equitable future.

You name it, Geographers are sure to be contributing to the discussions around all those topics and more in and beyond Trinity, making the links between local and global processes. We are uniquely placed to know and understand what that means and what actions are needed to understand, act, and, ultimately, meet those challenges through recognising the connectivity

between human and physical/environmental systems and their variability across space and time.

Trinity Geography is currently placed in the top 100 Geography Departments globally. We aim most of all to challenge students intellectually, to foster and maintain world-class research and teaching in a supportive and collegial atmosphere. We teach and research across the discipline from development theory to glacial modelling, and from environmental and climate change to the workings of urban governance, Geopolitical restructuring, political economy and social geographies of identity, place and belonging. Our research and publications feed into global academic networks, policymaking think tanks, and organisations that put our thinking into practice. We communicate via journals, books, research films, and many other platforms in our digitally connected world. Whether the challenge is international development, urban regeneration, globalisation, climate change, sea level rise, or flooding, as geographers, we recognise that solutions can only be place specific. New technologies are continuously offering novel ways of interrogating the spatially diverse human-environment relations that are the focus of our discipline.

It is perhaps not surprising that geographers are in high demand within the employment sector: you will find our graduates within public, private, educational, as well as charitable sectors, as leaders in multi-national organisations or as individual actors or entrepreneurs. They are known for their critical analytical interdisciplinary skills and knowledge, precisely what is required by those who make it their ambition to address critical societal challenges in a world that is rapidly changing.

We are very proud of our students, our dedicated team of staff, and the programmes that bring us together. Our modules form critical elements of the College's Sustainability and E3 (Environment, Engineering, Emerging Technologies) visions and we concentrate on providing high quality education through research-led teaching delivered by staff who are leaders in their respective fields.

In this handbook, you find an introduction to our staff and a description of all the modules we plan to deliver into the coming academic year, as well as critical information around assessment and progression through Geography.

Note that our modules contribute to both the Joint Honours and Science pathways into the subject, so please **always check with your programme / course office on the credit requirements for your chosen pathway and check with them on the regulations that are intended to ensure its effective implementation.** You will find a wealth of information on Trinity College's website, and we are in the process of updating our Geography webpage, so keep a close eye on that, too. We are delighted that you are considering or continuing studying with us in Geography in Trinity. We hope that you find the information in this handbook useful, and that you enjoy your time in Geography.



**Dr Cian O'Callaghan**

*Head of Geography*

## Welcome message from the Geography Moderatorship coordinator

Welcome to your Sophister years in TR062!

The Geography stream in TR062 offers breadth and depth across the physical and social sciences. As TR062 Geographers, you will study Earth surface processes such as coastal erosion, wetlands restoration, sediment transport, and environmental and land-surface change. You'll also investigate Earth's climate system and interactions between land, climate, and sea. Through modules shared with the Discipline of Geology you'll have the opportunity to learn more about how the Earth itself functions as a system and how Earth's history shapes our world today. As Geographers you will also explore how humans influence, and are influenced by, the natural world.

This handbook provides you with a broad overview of the TR062 Geography program. Here you will find details on core module requirements as well as modules available to you as potential open selections. **Always make sure to check that you are meeting credit requirements for the program.** If you are even uncertain about your module selections or credit load, we in TR062 are always happy to help answer questions.

This handbook is also where you will find information on all regulations in the Discipline of Geography, including details on assessment and progression. You'll also find information on rules surrounding late work, exams, ERASMUS/study abroad, and more.

We hope you'll enjoy your time in TR062 Geography and look forward to getting to know you all in the coming months.



**Dr. Margaret Jackson**

*TR062 Geography Coordinator*

# TR062: Geography and Geoscience - BA Mod in SCIENCE (GEOGRAPHY)

Geography is fundamentally interdisciplinary. It encompasses very different ways of knowing, from the natural and social sciences and the humanities. A major intellectual task within the subject is to encompass this diversity of contexts and the different types of knowledge that are characteristic of the study of the Earth's physical environments, human societies and the interactions between the two. Geographers can take a global view but are able to inter-relate global and local perspectives. Geographers are aware of the relevance of geographical concepts, techniques and expertise to problem solving, wealth creation, poverty reduction and improving the quality of life and well-being. This is currently relevant in the context of climate change, urban and rural planning, hazard assessment, sustainability and environmental management.

## Geography Moderatorship Learning Outcomes

On successful completion of your Geography degree, you will be able to:

- Demonstrate a coherent geographical understanding of trends, processes and impacts which shape global environments and/or societies at different spatial and temporal scales.
- Demonstrate an understanding of Geography as an academic discipline, including awareness of its theories, concepts, history, methods, processes and principal subfields.
- Apply geographical thought creatively, critically and appropriately to specific spaces, places and/or environments.
- Demonstrate competence in the use of the diversity of techniques and approaches involved in collecting and analysing geographical information.
- Critically reflect on the accuracy, precision and uncertainty of research data

- Demonstrate critical insight of the complexity of the reciprocal relationships between physical and human environments.
- Recognise, evaluate and synthesize various views, arguments and sources of knowledge pertinent to solving environmental and social problems.
- Resolve geographical questions by ethical means, applying evidence-based knowledge and appropriate research techniques, including those associated with field work.
- Communicate geographical perspectives and knowledge effectively to specialist and non-specialist audiences using appropriately selected written, oral and visual means.
- Contribute effectively as a member or leader of diverse teams working in geographical or multidisciplinary contexts.

# TR062 Geography Junior Sophister Programme

The Junior Sophister programme comprises **40 credits of mandatory core modules**, which includes a 10 credit Residential field course that may be taken either in semester 1 or semester 2.

**Pathway A** is designed for students taking the **Residential Field Course in Semester 1**, while **Pathway B** is designed for those taking the **Residential Field Course in Semester 2**.

Students are also required to select an additional 20 credits of open modules. Of these 20 credits, at least 5 credits (one module) must be drawn from the Trinity Elective modules. A student may choose to take an additional 5 credit module from the Trinity Electives but cannot take both modules in the same Semester.

## Junior Sophister Programme Structure - Pathway A

| **TR062 Geography<br>Junior Sophister Year<br>Pathway A** | |
|---|---|
| **Semester 1**<br>*30 Credits* | **Semester 2**<br>*30 Credits* |
| **CORE MODULES (40 Credits)**<br>*20 credits each semester* | |
| GGU33002 Residential Field Course 1 (10 Credits)* | GGU33011 Earth's Climate Past, Present and Future (5 Credits) |
| GGU33933 Geographical Information: Data & Tools (5 Credits) | GGU33021 Research Skills and Data Analysis in Geomorphology 2 (5 Credits) |
| ***and EITHER*** | GGU33928 Advanced Research Methods in Geography 1 (5 Credits) |
| BOU33123 Soil Science (5 Credits) | GLU33009 Hydrology and Groundwater Quality (5 Credits) |
| ***OR*** | |
| GGU33014 Research Frontiers in Geography (5 Credits) | |
| **TRINITY ELECTIVE (5 CREDITS) + THREE OPEN MODULES (15 CREDITS)** | |
| Trinity Elective (5 Credits) | Trinity Elective (5 Credits) |
| GGU33020 Research Skills and Data Analysis in Geomorphology 1 (5 Credits) | GGU33019 Economy, Finance & Space (5 credits) |
| GGU33937 Urban Economic Structure & Regeneration (5 credits) | GGU33915 Globalisation and Geopolitics (5 credits) |
| GGU33939 Exploring the Sustainable City (5 Credits) | GGU33931 Environmental Governance 1 (5 Credits) |
| GLU33002 Blue Earth: Understanding the Function of Marine Ecosystems (5 Credits) | GLU33005 Volcanism and Magmatism (5 Credits) |
| GLU33004 The Crystal World (5 Credits) | GLU33007 Earth Resources for a Critical Future (5 Credits) |

## Junior Sophister Programme Structure - Pathway B

| **TR062 Geography<br>Junior Sophister Year<br>Pathway B** | |
|---|---|
| **Semester 1**<br>*30 Credits* | **Semester 2**<br>*30 Credits* |
| **CORE MODULES (40 Credits)**<br>*20 credits each semester* | |
| BOU33123 Soil Science (5 Credits) | GGU33003 Residential Field Course 2 (10 Credits)* |
| GGU33014 Research Frontiers in Geography (5 Credits) | GGU33928 Advanced Research Methods in Geography 1 (5 Credits) |
| GGU33020 Research Skills and Data Analysis in Geomorphology 1 (5 Credits) | ***and EITHER*** |
| GGU33933 Geographical Information: Data & Tools (5 Credits) | GGU33011 Earth's Climate Past, Present and Future (5 Credits) |
| | ***OR*** |
| | GLU33009 Hydrology and Groundwater Quality (5 Credits) |
| **TRINITY ELECTIVE (5 CREDITS) + THREE OPEN MODULES (15 CREDITS)** | |
| Trinity Elective (5 Credits) | Trinity Elective (5 Credits) |
| GGU33937 Urban Economic Structure & Regeneration (5 credits) | GGU33019 Economy, Finance & Space (5 credits) |
| GGU33939 Exploring the Sustainable City (5 Credits) | GGU33021 Research Skills and Data Analysis in Geomorphology 2 (5 Credits) |
| GLU33002 Blue Earth: Understanding the Function of Marine Ecosystems (5 Credits) | GGU33915 Globalisation and Geopolitics (5 credits) |
| GLU33004 The Crystal World (5 Credits) | GGU33931 Environmental Governance 1 (5 Credits) |
| | GLU33005 Volcanism and Magmatism (5 Credits) |
| | GLU33007 Earth Resources for a Critical Future (5 Credits) |

**IMPORTANT NOTE:** **Junior sophister modules are subject to change.**

# TR062 Geography Senior Sophister Programme

The Senior Sophister programme comprises **25 credits of mandatory core modules** that are taken by TR062 Geoscience students. Students are required to select an additional 35 credits of open modules, ensuring that a minimum of 15 credits are chosen in semester 1 and 20 credits in semester 2. Module selection may be limited by prerequisites or quotas.

## Geography Sophister Programme Structure

| **TR062 Geography<br>Senior Sophister Year** | |
|---|---|
| **Semester 1**<br>*30 Credits* | **Semester 2**<br>*30 Credits* |
| **MANDATORY MODULES (25 Credits)** | |
| GGU44930 Geography Capstone Project (20 Credits) | |
| GGU44933 GIS and Remote Sensing Applications in Geography (5 Credits) | |
| **OPTIONAL MODULES (35 Credits)** | |
| BOU44111 Restoration Ecology and Rewilding (5 Credits) | GGU44902 Karst Landscapes (5 Credits) |
| GGU44901 Natural Hazards (5 credits) | GGU44936 Globalisation and African Development (5 Credits) |
| GGU44903 Carbon and Climate (5 credits) | GGU44968 Historical Geography (10 Credits) |
| GGU44976 Glaciers & Glaciation (5 credits) | GGU44977 Environmental Governance 2 (5 Credits) |
| GGU44978 Finance and Climate Justice (10 credits) | GGU44979 Living on the Edge: Estuaries and Coasts (5 Credits) |
| GLU44009 Geoscience for a Sustainable Planet (5 credits) | GLU44011 Palaeoceanography and Palaeoclimatology (5 Credits) |
| GLU44012 Raw Materials in Building (5 Credits) | |

**IMPORTANT NOTE:** **Senior sophister modules are subject to change.**

# Description of ECTS 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. Within Undergraduate courses 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. Within Postgraduate courses 1 credit represents 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 programme year. Progression from one year to the next is determined by the programme regulations. Students who fail a year of their programme will not obtain credit for that year even if they have passed certain components. Exceptions to this rule are one-year and part-year visiting students, who are awarded credit for individual modules successfully completed.

# Module Selection

The module selection form will be shared with students between July and August. Students should note that due timetable constraints Open Modules may delivered via a blended learning approach involving face to face and online teaching for some open modules.

Enrolment in core and open modules is processed via the TR062 Office, while the enrolment in Trinity Electives is processed via Online Module Enrolment (OME), as outlined in the following section.

## Trinity Electives

The Trinity Electives are a unique feature of your Trinity Education. They are stand alone, College-wide 5 credit modules. They cover a broad range of topics in the arts, humanities, sciences, health and social science, and technology. They are designed to allow students to study topics outside of their core discipline and thus provide breadth in their education. Depending on your moderatorship, you will choose a combination of Trinity Electives and Open Modules as described in this handbook.

### Choosing your Trinity Elective

The choice of Trinity Elective is student driven. Almost all Trinity Electives are open to all students. However, students of some moderatorships may be precluded from taking certain Trinity Electives. The list of exemptions is outlined in the Trinity Electives webpage: https://www.tcd.ie/trinity-electives/

Selection of Trinity Electives will be made through online enrolment after publication of examination results and allocation of moderatorship places. You will be asked to list your choice(s) of Trinity Elective on a first come first served basis via **Online Module Enrolment (OME)**.

The Trinity Electives website provides full details of each of the Trinity Electives. A list of the Trinity Electives can be found at https://www.tcd.ie/trinity-electives/

You need to think carefully about your choice of Trinity Elective as the semester in which you take it (Semester 1, Semester 2) will affect your choice of Open Modules. That is: taking one Trinity Elective in the first semester, restricts you to the open modules in Option 1; taking one Trinity Elective in the second semester, restricts you to the open modules in Option 2.

# Facilities, Conduct and Safety

## General Information

The Disciplines of Geography and Geology are both primarily located in the Museum Building. Each discipline has several dedicated facilities that may be used by undergraduate and postgraduate students for teaching, research, and project work.

For general or technical enquiries, please contact the Chief Technical Officer, Elaine Treacy (treacyel@tcd.ie).

Capstone students must submit an SNS Technical Support Request: UG and Taught PG Capstone/Dissertation Projects form. A link to this form is available from the Chief Technical Officer, Elaine Treacy

The facilities located in the Museum Building are as follows:

## Laboratories

The **Geology Teaching Laboratories** (Petrology Lab, Palaeontology Lab, Microscopy Lab) are the primary teaching laboratories in the Discipline of Geology. The laboratories are mainly used for lectures and non-hazardous lab work involving geological hand specimens, maps, and thin sections.

The **Geology Technical Laboratory** houses our very own in-house geological thin section sample preparation facility. It also acts as a hub for Discipline of Geology fieldtrip equipment collection and returns.

The **Geomorphology Laboratory** is the primary teaching laboratory within the discipline of Geography. The laboratory is mainly used for soil and sediment based work as well as non-hazardous chemical work.

The **Palynology Laboratories** are reserved for work that requires the use of hazardous chemicals.

The **Particle Size Analysis (PSA) Laboratory** houses our particle size analysis (PSA) instrument; The Malvern Mastersizer 3000. Anyone required to use this instrument will be given full training in its operation in advance of work commencing.

## GIS Computer Room

The GIS computer room (Room 0.17, Museum Building) in the School of Natural Sciences (SNS) is a dedicated space equipped with 11 high-powered computers for Geographic Information Systems (GIS), image processing, and geospatial data analysis. The room is available for use by staff, postgraduate, and undergraduate students engaged in projects requiring GIS software and technology. Priority is given to undergraduate students completing their capstone work.

## The Freeman Library (Geography)

The Freeman Library is located off the main concourse of the Museum Building. It is the Discipline of Geography's own archive and book collection built on the initial efforts of Walter Freeman, who brought much geographical enthusiasm to Trinity when he arrived there from Edinburgh in 1936. He bequeathed the collection to Trinity Geography and it has been supplemented ever since. It provides a wide range of materials useful for coursework and a quiet working environment. In addition to course related texts, reference books, bibliographies, periodicals, pamphlets, maps, postgraduate theses and undergraduate dissertations.

In 2020, however, the Faculty and College decided not to continue to support the part-time archivist who had been keeping the archive catalogued and safe – thus we now rely on our students to ensure all materials remain in place and are kept safe.

To this end, membership of the library is open to all those reading geography. Enquiries concerning the use the Freeman Library should also be addressed to geography@tcd.ie .

Library opening hours are subject to change but generally follow the pattern of 9.00 a.m. - 6.00 p.m. Mondays to Friday during term time. The Library is accessed by use of student/staff cards and we ask all users to be mindful of the flexible use of the space (occasional bookings for teaching and seminars etc) and to not use the library for study after hours. Notices will be

placed on the door to let students know any changes in the opening hours. Books or other materials may not be borrowed. If students need help in finding information, locating books or using databases please do not hesitate to contact geography@tcd.ie.

## Other Discipline Related Facilities (Geology)

The Discipline of Geology has a variety of other analytical and sample preparation laboratories and facilities including but not limited to, rock crushing, mineral separation, scanning electron microscope (SEM), x-ray fluorescence spectroscopy (XRF), etc. These facilities are located at various locations both on and off the main Trinity College campus. Find more at https://www.tcd.ie/geology/research/research-facilities/.

## Safety

The School of Natural Sciences in conjunction with the College Safety Office and under the Safety, Health and Welfare at Work Act 2005 is a safe working environment which keeps its members safe and protected across all its teaching and research activities.

All School members must read and agree to abide by the School Safety Statement and where appropriate the Fieldwork Safety Manual.

Safety Statement, Fieldwork Manual and Risk Assessments, are available at https://www.tcd.ie/naturalscience/health-and-safety/.

Students will be given class based or one to one instruction on health, safety and welfare.

More general information is available from the University Safety Office at https://www.tcd.ie/safetyoffice/

## Emergencies

Situations which may require emergency response include:

- Fire

- Emergency evacuation due to bomb alerts, gas leaks, chemical spills, biological or radioactive incidents
- Serious accident and injury
- Natural disaster
- Off-site incidents
- Power failure

In the event of an emergency, contact the college Emergency number Ext 1999 (from an internal line) or 01 896 1999 (from a mobile). You should give your name, location and the nature of the emergency. If necessary, you can evacuate the building by using one of the break-glass units.

## Laboratory Safety

Laboratory protocols exist for each of the laboratories within the Museum Building. The Laboratory protocol must be signed off before using any of the laboratories. Any new experimental or project work taking place in any of the laboratories will require a Laboratory Risk Assessment to be completed before the work can begin. Assessments need to be approved by your Supervisor and in some cases the Head of Discipline before the work can commence.

More information can be fount at: https://www.tcd.ie/naturalscience/health-and-safety/

## Fieldwork Safety

Fieldwork is an important part of both Geography and Geology research and teaching. Any staff member, postdoctoral researcher, postgraduate student or undergraduate student must read the School of Natural Sciences Fieldwork Manual (https://www.tcd.ie/naturalscience/health-and-safety/) prior to undertaking fieldwork.

Capstone projects: undergraduate students must initially discuss the proposed fieldwork with their academic supervisor and obtain their consent prior to undertaking any fieldwork.

A Fieldwork Risk Assessment must be undertaken before embarking on any fieldwork. The risk assessment must be approved by your Supervisor and in some cases the Head of Discipline before the fieldwork can commence.

## Fire Safety

The SNS Fire Wardens for the Museum Building  are Sarah Carty, Maura Morgan, James Canavan and Elaine Treacy. However, individuals are responsible for checking the fire precautions in their work areas. Any defects or potential fire hazards should be reported to the Discipline Fire Wardens or to the Chief Technical Officer immediately.

Within your work area, note the position of the nearest fire extinguishers and note the position of the nearest fire exit. Under no circumstances should fire doors be wedged or left open. The curtailment of fire spread is dependent on fire doors being kept shut.

When the fire alarm sounds within the building, stop whatever function you are engaged in and leave it in a safe condition. Leave the building by one of the exits. Proceed to the appropriate assembly point for your area. You should ensure to lock your office/lab door behind you when you leave. The assembly point for the museum building is Fellows Square, located outside the arts building.

If you discover a fire, raise the alarm by using one of the break glass units, leave the building, closing or locking all doors behind you, notify the security centre by calling Ext 1999 or 01 8961999 and report to your assembly point.

## First Aid

If a student is injured or falls ill during a class, laboratory practical or fieldtrip, the person in charge must be informed immediately. First Aid Kits are located in the Administration Office, Geology Technical Laboratory, Geomorphology Laboratory, Basement Laboratory and Freeman Library.

The First Aid Kits contain a range of dressings and bandages for treatment of minor cuts and burns as well as eyewash solution. If you use any items from the First Aid Kits, please inform a Safety or Technical Officer so the items can be replaced.

Staff trained in First Aid in the Museum Building: Elaine Treacy (Room 1.13),James Canavan (Room B8) and Mary O'Shea (Room 0.12A).

All accidents must be reported to the Safety Officer, Mary O Shea (osheam21@tcd.ie) An accident report form will be completed for each incident. If an injury requires a doctor or nurse, the college health centre number is Ext 1556 (from an internal line) or 01 896 1556

# Erasmus

Students may study abroad in their Junior Sophister year.

Students to be nominated for an Erasmus exchange and mobility grant will be selected on the basis of their overall Junior Fresh grade and a 600-word statement relating to their suitability for an exchange, to be submitted to the Study Abroad Coordinator by the last day of Michaelmas term in their Senior Fresh year.

For details of the Department's exchange partnerships see the College website.

**Modules and ECTS for Erasmus/Study Abroad students**

You must ensure you have completed your module choice form correctly. Students who are away for one semester only, must ensure that their module information and ECTS are correct for Trinity modules at the usual time:

1. For a full year abroad, email the Geography Office to ensure you are exempted from any compulsory modules.
2. 2. For a student away for either Semester 1 or Semester 2 only, check your my.tcd.ie student account. Contact the Geography Office if your module codes or ECTS for your home semester are incorrect.

This information generates your end of year Coursework and Examination requirements.

**IMPORTANT NOTE:**

If you wish to embark on study abroad and wish to (and are eligible to, given your Programme pathway) carry out your capstone / dissertation project in Geography, **you must ensure that you contact the Geography Office (geography@tcd.ie) as soon as you know that you may be away** and ask to be enrolled 'remotely' on the module that allows you to be allocated a supervisor for your final year project while you are away.

This will also provide you with access to information for the necessary dissertation/capstone preparation you should embark on.

All students wishing to study abroad must agree a Teaching Contract with Geography's Study Abroad Co-ordinator, Dr Mark Hennessy – mhnnessy@tcd.ie.

# Attendance requirements

All students are required to attend College in person during the teaching term and fully participate in the academic work of their class throughout the course period.

Timetables are published through my.tcd.ie before the beginning of the teaching term. It is the responsibility of students to inform themselves of the dates, times, and venues of their lectures and other forms of teaching by consulting these timetables.

Attendance at all lectures, tutorials, and practical sessions is compulsory for students in the TR062 Geography and Geoscience programme.

Students who are unable to attend due to illness or other unavoidable circumstances are required to notify the relevant lecturer and submit a medical certificate or other appropriate documentation to the TR062 Office.

Students reported as Non-Satisfactory in the Michaelmas and Hilary terms may be refused permission to take their annual examinations and may be required by the Senior Lecturer to repeat the year.

Further details of procedures for reporting a student as non-satisfactory are given on the College website at https://www.tcd.ie/academicregistry/student-cases/.

# Assessment Regulations

**Undergraduate Progression and Awards Regulations**

**Reassessment - Regulation 8:**

- Same progression regulations, including compensation, for assessments relating to semesters 1 & 2 and to reassessment.
- Automatic right to reassessment for a student who has achieved a fail grade in any of their modules and is not eligible for compensation.
- Students (in all years) should only be required to re-sit examinations or re-submit coursework for failed modules or components thereof.
- Students are not permitted to present for reassessment in any module for which they have achieved a pass grade, in order to improve their academic performance.
- Rescheduled exams within the session will no longer be permitted.
- Different reassessment modalities permitted.
- No capping of marks

**Repetition of a year: Regulation 7**

- Students are not permitted to repeat any academic year more than once and may not repeat more than two academic years within a programme.
- Repetition of a year is in full, i.e., all modules and all assessment components
- A student's academic record on their transcript will show clearly the time lost through repetition of a year.
- There will be an option to repeat a year on an 'off-books' basis.

**Degree award calculation - Regulation 5:**

- The final moderatorship results are calculated as a weighted average of the overall result for the Junior and Senior Sophister examination results.

Full Progression and Awards regulations can be found via the following:
https://www.tcd.ie/teaching-learning/academic-affairs/ug-prog-award-regs/index.php

## Examinations

The regulations governing examinations are set out in the College Calendar. Examination timetables are published in advance of the dates of examinations. Please check the examinations office website for more details: https://www.tcd.ie/academicregistry/exams/.

Students must ensure that they are available for the duration of the examinations period as presented in the College Calendar: http://www.tcd.ie/calendar/.

It is the student's responsibility to establish the dates, times and venues of examinations. No reminders will be sent to students.

The Discipline employs anonymous marking where practically possible. Results will be published by student number.

## Late Submissions and Extensions for Module Assignments

Developing effective time management strategies and taking personal responsibility for learning is a key skill that students need to master in order to succeed at university and beyond. All students enrolled in modules delivered by the School of Natural Sciences are required to be well prepared for their continuous assignment work, and to submit their work on time and by the deadlines communicated to them by their module coordinator.

Students should note that for some modules it is not possible to grant an extension on coursework due to assignment structure and timing, this will however be clearly communicated by the module coordinator. In addition, no extensions can be given for requests arising from a lack of organisation of work around other activities, or a lack of planning on the student's part. All students must allow time for contingencies in their planning when completing assignments

If students experience truly exceptional and unforeseen circumstances that affect their ability to submit work on time, they are asked to contact their module coordinator via email in the

first instance and as soon as the issue arises. The student's tutor should also be copied in on this initial email request, and all students are strongly encouraged to also approach their tutor for assistance and support in addressing any underlying reasons that are contributing to their extension request.

Extensions for module assignments and acceptance of late submissions will only be granted when supported by verified evidence of exceptional and unforeseen circumstances at the discretion of the module coordinator. If students submit work late without having been granted an extension by their module coordinator, the following reduction to the mark for the assignment will apply:

- For submissions up to three days late: 5% per day including weekends.
- Submissions received more than three days late (including weekends), without a pre-agreed extension, a medical certificate or documented evidence of significant extenuating circumstances, will not be marked.

The registered time of submission will be the time recorded on email or Blackboard for the submission.

Students experiencing difficulties staying on top of their work on medical or other grounds should contact their tutor as soon as their concern arises. Further information can be found in part II of the College Calendar (General Regulations 45).

## Flexible Assessment Deadlines

As part of the new Late Submission of Assessments (Extensions) Policy, students who have reasonable accommodations that specify "flexible assessment deadlines" as part of their Learning Educational Needs Summary (LENS) report are entitled to a one-week extension for all their assessments.

This means that:

- These students have an extension of one-week for submission of assessments related to all modules for which they are registered. This extension will automatically be applied

by your module coordinator or lecturer in Blackboard Ultra so students do not need to provide any additional documentation in support of it. **N.B.** This automatic extension only applies to students who have a reasonable accommodation that specifies "flexible assessment deadlines" as part of their Learning Educational Needs Summary (LENS) report.

- Please note that submissions beyond the one-week extension, even if Blackboard allows you to upload the assessment, may be subject to penalties or not accepted at all.
- For group assessments, any due date accommodation granted to a group member applies to the entire group. If you are a member of a group and have a reasonable accommodation that specifies "flexible assessment deadlines" as part of your Learning Educational Needs Summary (LENS) report, the group as a whole will have a one-week extension to the submission deadline for the group assessment if it is practical to accommodate it. The other members of the group will be notified that, in accordance with the policy, they have an extension for submission of the group assessment, but no further information will be provided in accordance with GDPR legislation.
- If a one-week extension is **not possible,** the module coordinator or lecturer will be in touch with the student/s as needed to inform them that no extension is possible and/or to discuss alternative arrangements.

Students who have any questions about the deadline or need clarification can contact their module coordinator or lecturer.

## Academic Integrity Policy

Trinity College Dublin, the University of Dublin, is committed to upholding academic integrity, and recognises that it underpins all aspects of university life, including all activities relating to research, learning, assessment, and scholarship.

Trinity therefore considers academic misconduct to be serious and academically fraudulent and an offence against academic integrity that is subject to the Trinity procedures in cases of suspected misconduct.

The Academic Integrity Policy (https://www.tcd.ie/media/tcd/about/policies/pdfs/academic/Academic-Integrity-Policy.pdf) should be read in conjunction with (and is subject to) the University Calendar, Part II on Academic Integrity (This policy replaces the Plagiarism Policy).

**Other sources of information are available:**

- https://www.tcd.ie/calendar/undergraduate-studies/
- https://libguides.tcd.ie/academic-integrity
- https://www.tcd.ie/teaching-learning/academic-affairs/academic-integrity/

## Guidance on the use of AI and Generative-AI in College

The advent of commonly available artificial intelligence tools are disruptive in both positive and negative ways. Before using them in your studies it is important that you familiarise yourself with College policies on its use. Unless otherwise instructed for particular modules or assessments, **the default expectation would be that you do not submit AI generated content as an attempt at an assessment**.

Below is some basic overview of the College policy on AI and GenAI. This has been taken from the more detailed policy which is informative and wide ranging. You are expected to have read and familiarised yourself with this policy.

https://www.tcd.ie/academicpractice/resources/generative_ai/

### Artificial Intelligence (AI)

Artificial intelligence is generally understood to be a set of technologies that enable computers to perform a variety of functions usually perceived as requiring human intelligence – for example, understanding speech, recognising objects in images, composing written answers and problem reasoning. A more formal definition of an AI system from the European Union AI Act (2024) is:

**...a machine-based system designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments[.] (EU AI Act 2024)**

### *Generative Artificial Intelligence (GenAI)*

Generative AI is the sub-area of AI, involving AI systems which generate content — for example, human dialogue, speech, images and video. GenAI systems are capable of generating such content based on a user's request or instruction. More formally, GenAI is defined by UNESCO **as "an artificial intelligence (AI) technology that automatically generates content in response to prompts written in natural-language conversational interfaces" (UNESCO 2023).**

### *AI and GenAI in Trinity*

As Ireland's leading university and as a world leader in AI research, Trinity recognises that AI and GenAI offer new opportunities for teaching, learning, assessment and research. We also recognise that these technologies present challenges and risks, including to academic integrity, ethics, privacy, impartiality, intellectual property and sustainability.

Acknowledging these opportunities and challenges, Trinity commits to supporting the opportunity for students and staff to become AI literate and fluent, thereby helping them to navigate and respond to the challenges and risks of AI and GenAI in order to harness the potential of (Gen)AI to enhance teaching, learning, assessment and research – and to be prepared for future challenges as these technologies evolve. We also commit to providing ongoing resources and guidance to support students and staff to use AI and GenAI in ways that are appropriate, responsible and ethical – and to ensure that academic integrity is maintained in its usage.

College aspires to develop best practice guidelines in this area. In addition to the resources and supports that College provides and recognising that appropriate uses of AI and GenAI tools vary across academic disciplines, Schools will have some flexibility to customise their own discipline-

specific practices in line with this institutional statement, other institutional policies as they develop, and national and international regulation. The College goal is to enable overall consistency in the regulation of GenAI usage, while also respecting where disciplines or degree programmes require specific restrictions in GenAI usage in assessment preparation and execution.

Thus, where disciplines or degree programmes wish to refine specific regulations on student use of GenAI for learning, general as well as programme-specific regulations should be communicated in the relevant discipline/degree programme handbook.

Such regulation could range from how student GenAI usage is acknowledged or cited within student assessment submissions, to prohibition of GenAI usage in the production of student assessment submissions.

**IMPORTANT NOTE:** If any additional restrictions on the use of Generative Artificial Intelligence (GenAI) apply to a particular module, these will be stated in the module description on Blackboard or communicated to students by module coordinators.

# Prizes, awards and scholarships

## Foundation Scholarship Examination

## Prizes

### HAUGHTON PRIZE IN GEOGRAPHY

This prize, established in 1989 from funds subscribed to honour Joseph P. Haughton, Fellow emeritus and formerly Professor of Geography, is awarded to the best student of geography in the Junior Sophister year as nominated by the annual departmental examiners' meeting. Value, €305.

### DES GILMOR PRIZE IN GEOGRAPHY

The 'Des Gilmor best undergraduate dissertation prize' of €100 is awarded to the best undergraduate dissertation in Geography.

# Beyond a Geography Degree

## Careers for Geography Graduates

Trinity College geography graduates are to be found in almost every branch of employment. These include teaching at all levels, research in industry, semi-state bodies and academic institutions; planning and development in the civil service, local government and overseas development agencies.

Graduates of the Department are also found in industry, marketing, property management, housing management and research, banking, accountancy, advertising, journalism, publishing, librarianship, television, agriculture, soil surveying, meteorology, hydrology and tourism.

The breadth of the subject enables geographers to be more adaptable to cyclical variations in employment opportunities than the graduates of many narrower specialisms. Moreover, the integrating nature of geography has become a major asset in a world of constant change in which many employers seek adaptability and flexibility, rather than narrow technical knowledge which is soon outdated.

## Research Opportunities

Geography has a thriving postgraduate community with students engaged in PhD research in both human and physical geography. Further research information is available on the Geography website: https://www.tcd.ie/geography/research/.

The School of Natural Sciences also runs taught M.Sc. programmes. These one-year courses comprise 60 ECTS of specialist taught modules followed by an independent research project worth 30 ECTS. Two of these masters programmes may be of particular interest to Geography graduates:

**The Masters in Development Practice (MDP)** is a one year interdisciplinary degree programme consisting of twelve academic modules across four intersecting disciplines—health, natural, social, and management sciences combined with cross-sectoral field training, professional

work-based placements, and a research based dissertation. It blends theory and practice, science, and social science to further international development solutions. It is part of a global network under the remit of the United Nations Sustainable Development Solutions Network headquartered in Columbia University in New York.

**The Masters in Smart and Sustainable Cities** is a one year Masters focused on the intersection between 'smart' and 'sustainable' solutions to the urban challenges of today and tomorrow. The programme, which is the first dedicated programme of its kind, provides students with an in-depth understanding of smart and sustainable cities, using (a) the tools of urban geography and planning to examine the spatial formation of smart cities; (b) methods in engineering and computer science to analyze the functions and applications of smart technologies, and (c) insights from ecology to explore the environmental impact of both ‘smart-city projects’ and wider transformations of contemporary cities.

Further course details including admission requirements and applications process can be obtained from the Postgraduate Prospectus on the Graduate Studies website or via the School of Natural Sciences.

# Contact Details

| Staff Name | Role/Title | Contact |
|---|---|---|
| **Dr. Cian O'Callaghan** | Head of Discipline of Geography | ocallac8@tcd.ie |
| **Dr. Sean Mc Clenaghan** | TR062 Geography and Geoscience Course Director | mcclens@tcd.ie |
| **Dr. Margaret Jackson** | TR062 Geography Moderatorship Coordinator | margaret.jackson@tcd.ie |
| **TR062 Executive Officer** | TR062 Executive Officer | tr062admin@tcd.ie |
| **Dr. Pete Akers** | TR062 Geography Moderatorship Exams Coordinator | pete.akers@tcd.ie |
| **Dr. Mark Hennessy** | TR062 Geography Moderatorship Erasmus Coordinator | mhnnessy@tcd.ie |
| **Dr. Elaine Treacy** | Chief Technical Officer | treacyel@tcd.ie |

# Junior Sophister Modules

**IMPORTANT NOTE:** Please note that the information provided in this section serves as a general guide to what is expected in the modules. Changes may occur, and any updates or modifications will be communicated appropriately by the Module Coordinators.

## BOU33123 Soil Science (5 Credits)

**Module Coordinator: Dr Matthew Saunders (saundem@tcd.ie)**

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 will 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.

**Prerequisites:** None

**Assessment**: Course work (50%); end of semester examination (50%).

**Recommend Reading List:**

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.

# GGU33002 Residential Field Course (10 Credits)

**Module Co-ordinator: Dr Mary Bourke (bourkem4@tcd.ie)**

**Note:** You must select **EITHER** GGU33002 **OR** GGU33003 (**you may not select both**).

This module will run during Reading Week in Semester 1. **Note that the airfare cost is not included in the field trip cost and must be covered by the student**

**Outline:** This field trip will introduce students to specific examples that illustrate the interplay between human society and the environment in an overseas location (e.g., Mallorca). During the trip, key themes will be explored on set days, with student introduced to specific geographical research skills that will allow them to gain confidence in carrying out their own independent geographical research project. These skills include a range of transferrable skills (team working, project framing, planning, execution, and data analysis) alongside specific human and physical geography data acquisition methods and techniques, such as may be required for capstone projects. Prior to departure, students will be issued with background materials to familiarise themselves with the geographical setting and its human and physical environmental past and present. Detailed information on travel and accommodation will be issued prior to the trip. Students are expected to attend briefing sessions prior to travel as requested. These sessions will provide information on the general field setting, the logistics, ethical, and health and safety considerations of taking part. Several module themes will be introduced that will be explored further during the trip.

**Learning Outcomes:**

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

- Critically and responsibly engage with a number of geographical (societal and environmental) challenges explored during the trip
- Confidently deploy a number of key human geography research methods
- Confidently deploy a number of key physical geography research methods

- Draw on specific examples at the field site to explore the interconnectedness between the physical and human environment
- Critically reflect on, and assess, ethical and health and safety risks involved in conducting geographical research projects
- Clearly and concisely communicate the findings of field based geographical research

**Assessment:** Course work: field project plan and write up (100%)

# GGU33003 Residential Field Course (10 Credits)

**Module Co-ordinator: Dr Mary Bourke (bourkem4@tcd.ie)**

**Note:** You must select **EITHER** GGU33002 **OR** GGU33003 (**you may not select both**).

This module will run during Reading Week in Semester 2. **Food and travel costs to and from the Field Course must be covered by the student.**

**Outline:** This field trip will introduce students to specific examples that illustrate the interplay between human society and the environment in an Irish setting. During the trip, key themes will be explored on set days, with student introduced to specific geographical research skills that will allow them to gain confidence in carrying out their own independent geographical research project. These skills include a range of transferrable skills (team working, project framing, planning, execution, and data analysis) alongside specific human and physical geography data acquisition methods and techniques, such as may be required for capstone projects. Prior to departure, students will be issued with background materials to familiarise themselves with the geographical setting and its human and physical environmental past and present. Detailed information on travel and accommodation will be issued prior to the trip. Students are expected to attend briefing sessions as requested in which the general field setting, and several themes will be introduced that will be explored in depth during the trip. These sessions will also take students through the logistics, ethical, and health and safety considerations of taking part.

**Learning Outcomes:**

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

- Critically and responsibly engage with a number of geographical (societal and environmental) challenges explored during the trip
- Confidently deploy a number of key human geography research methods
- Confidently deploy a number of key physical geography research methods

- Draw on specific examples at the field site to explore the interconnectedness between the physical and human environment
- Critically reflect on, and assess, ethical and health and safety risks involved in conducting geographical research projects
- Clearly and concisely communicate the findings of field based geographical research

**Assessment:** Course work: field project plan and write up (100%)

# GGU33011 Earth's Climate Past, Present and Future (5 Credits)

**Module Coordinator: Dr Margaret Jackson (margaret.jackson@tcd.ie)**

In this module we will investigate Earth's climate system, how it operates, and how it changes over time (and why). In doing so we will explore not only the climate we observe today, but also how climate has changed in the past. With this understanding in hand, we will go on to examine projections for future climate change and what impact these potential changes may have on our lives and communities. This module will use readings, activities, and discussion to explore the mechanisms that influence climate over time, in the past, present, and future.

**Learning outcomes:**

On successful completion of this module students will:

- Describe what is meant by the term 'greenhouse effect'.
- Understand how Earth's climate system operates today.
- Discuss natural climate variability and the potential mechanisms that impact this variability through time..
- Understand how Earth's climate has changed through time, and the evidence used to reconstruct past change.
- Understand how Earth's climate has changed through time, and the evidence used to reconstruct past change
- Evaluate the evidence for 'anthropogenic' climate change.
- Understand future climate projections, such as those written by the IPCC, and how they are produced
- Evaluate how quantitative climate science relates to and impacts societal response.

**Prerequisites:** None

**Assessment**: Course work (100%)

# GGU33014 Research Frontiers in Geography (5 Credits)

**Module Coordinator: Prof. Anna Davies (daviesa@tcd.ie)**

This module is highly recommended to anyone wishing to consider carrying out a capstone project in Geography.

The aim of this module is to help students refine their ability to understand and interpret research from across geography. It is also designed to assist students in developing evidence-based opinions about this research and finally, to assist them in identifying how they can help to push research frontiers through their own research. Following introductory lectures on the research process, including publication and presentation, the module will comprise a series of invited talks with speakers presenting a recently published paper/chapter/report and then take questions from the class with respect to the research process and findings. Students will critically analyse each presentation with respect to the core elements of the research process: problem identification, existing state of knowledge, methodology, results, and conclusions to form Part I of their Research Frontiers workbook. They will be required to read the published paper and provide a synopsis of the differences between the oral presentation and written publication. Part II provides space for students to reflect on the different styles of presentation they have encountered and identify successful communication strategies.

**Learning outcomes:**

On successful completion of this module students will:

- Comprehend and report on research presented both orally and in primary literature.
- Identify the aims and/or hypotheses in research studies and identify the research methods employed to address them.
- Interpret results of research in the context of the wider subject area.
- Interpret representations of data and results in the context of the research presented.
- Assess and evaluate the conclusions of the research presented.

- Summarise scientific studies in language and style suitable for consumption by a wide audience
- Critically reflect on the benefits and limitations of research communication approaches

**Prerequisites**: none

**Assessment**: Continuous assessment (100%)

**Key Texts:**


- Gomez, B. and Jones, J.P. (2010) *Research methods in Geography: A critical introduction*. Wiley: London
- Hoggart, K., Lees, L. and Davies, (2014) A.R. *Researching Human Geography*
- Montello, D. and Sutton, P. (2013*) An introduction to scientific research methods in geography & environmental studies*. Sage: London
- Strunk, W. and White, E.B. (2000) *The Elements of Style*. Pearson

# GGU33019 Economy, Finance, and Space (5 credits)

**Module Coordinator: Dr Martin Sokol (sokolm@tcd.ie)**

Why do some economies grow faster than others? Why is there so much inequality? Why do economies crash? What is the role of finance in contemporary capitalism? Is economic growth sustainable? What policy options are there to shape our economic systems? These are some of the questions explored by this module. To help address them, Economy, Finance & Space provides students with key insights into economic and financial geography. It highlights the ways in which economic and financial processes both shape, and are shaped by, space. In particular, the module focuses on understanding how uneven development occurs, alongside exploring questions of how social inequalities arise and what causes economic and financial crises. In addition to this, the impacts of economic and financial processes on the environment and the climate crisis are considered. In doing so, the module engages with fundamental challenges facing contemporary societies and explores policy options to address them. Students will gain a solid grounding in a number of theoretical approaches, concepts and debates pertaining to the economy, finance & space; will explore economic and financial processes in the real world through case studies from a range of different contexts, including those in the Western capitalist core and (semi-)peripheries of post-socialist Eastern Europe; and will debate policy options for the future.

**Learning Outcomes:**

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

- Comprehend and explain key concepts and theoretical approaches in economic and financial geography.
- Discuss and critically evaluate these concepts and theoretical approaches.
- Apply these concepts and approaches to real world economic and financial processes.
- Describe and discuss key challenges facing contemporary capitalist economies, their causes and consequences.

- Critically reflect on, and discuss, policy options for overcoming inequality and uneven development in the contemporary world.

**Prerequisites:** None

**Assessment:** 100% Assessment

**Key Texts:**


- Aoyama, Y., J.T. Murphy and S. Hanson (2010) *Key Concepts in Economic Geography*. London: Sage.
- Coe, N,M., P. F. Kelly, and H. W. C. Yeung (2019) *Economic Geography: A Contemporary Introduction (3rd Edition)*. Wiley-Blackwell.
- Dicken, P. (2014) *Global Shift* (7th Edition). London: Sage.
- Hall, S. (2017) *Global Finance: Places, Spaces and People*. London: Sage.
- Harvey, D. (2010) *The Enigma of Capital and the Crises of Capitalism*. London: Profile Books.
- Hudson, R. (2005) *Economic Geographies: Circuits, Flows and Spaces*. London: Sage.
- Knox-Hayes, J. and D. Wójcik (Eds.) (2021) *Routledge Handbook on Financial Geography*. New York: Routledge.
- MacKinnon, D. and A. Cumbers (2018) *An Introduction to Economic Geography: Globalisation, Uneven Development and Place* (2nd edition). London: Routledge.
- Martin, R. (Ed.) (1999) *Money and the Space Economy*. Chichester: John Wiley & Sons.
- Martin, R. and J. Pollard (Eds.) (2017) *Handbook on the Geographies of Money and Finance.* Cheltenham: Edward Elgar.
- Pike, A., A. Rodriguez-Pose and J. Tomaney (2017) *Local and Regional Development (2nd edition)*. London and New York: Routledge.
- Leyshon, A., R. Lee, L. McDowell and P. Sunley (Eds.) (2011) *The SAGE Handbook of Economic Geography*. London: Sage.
- Sokol, M. (2011) *Economic Geographies of Globalisation: A short Introduction*. Cheltenham: Edward Elgar.

# GGU33020 Research Skills and Data Analysis in Geomorphology 1 (5 Credits)

**Module Coordinator: Dr Margaret Jackson (margaret.jackson@tcd.ie)**

Earth's surface is constantly changing. Understanding how and why these changes occur is a key skill for those across the Earth Sciences, from physical and human geographers to geo- and environmental scientists. Being able to communicate one's observations and understanding of our planet's surface is likewise a crucial competency. In this module, we will take a wide-angle view of Earth-surface forms and processes and use these concepts as our gateway to exploring and practicing key skills in the field. These skills include the use, interpretation, and creation of topographic and geomorphic maps. We will also investigate methods used to date earth surface landforms and processes. This module relies heavily on hands-on activity and skill practice in addition to traditional classroom lectures and discussion.

This module also introduces key skills for students undertaking independent Capstone projects in their fourth year and is a natural lead-in to the module 'Research Skills and Data Analysis in Geomorphology 2' in semester 2.

**Learning Outcomes:**

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

- Describe and discuss 'geomorphology' as a discipline.
- Discuss large-scale geomorphic processes.
- Understand how to interpret and use topographic maps.
- Understand how to interpret and use geomorphic maps.
- Evaluate geochronologic methods and their suitability for answering/addressing specific questions in geomorphology and Earth-surface processes.
- Make basic interpretations and categorisations of landforms and landform assemblages.
- Create simple geomorphic maps to address specific needs or challenges.

**Prerequisites:** None

**Assessment**: Course work (100%).

**Key Texts:**

Geomorphology: the mechanics and chemistry of landscapes. 1st Ed. R.S. Anderson &S.P. Anderson. 2010.

# GGU33021 Research Skills and Data Analysis in Geomorphology 2 (5 Credits)

**Module Coordinator: Prof Iris Möller (moelleri@tcd.ie)**

Earth's surface is constantly changing. Understanding how and why these changes occur is a key skill for those across the Earth Sciences, from physical and human geographers to geo- and environmental scientists. This module focuses on the role of water in the evolution of Earth's landscape. Though investigating Water-driven processes and sediment transport, students will gain first-hand experience in constructing simple models to help them estimate the rate and magnitude of surface processes. Students will also practice sediment classification, quantitative problem solving, and map making. This module relies heavily on hands-on activity and skills practice in addition to traditional classroom lectures and discussion.

This module also introduces key skills for students undertaking independent Capstone projects in their fourth year and is a natural continuation of the module 'Research Skills and Data Analysis in Geomorphology 1' in Semester 1.

**Learning Outcomes:**

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

- Discuss the importance of water in shaping landscapes.
- Understand fluvial or coastal processes.*
- Understand primary means and consequences of weathering, sediment transport, and deposition.
- Discuss the influence of humans on landscapes.
- Break down larger problems into 'back of the envelope' calculations to solve.
- Construct simple theoretical models to aid in problem solving.
- Recognise the steps required to 'build' a research project, including method development and selection.

**Note that the focus in this module may alter year-on-year between these depending on teaching staff availability.*

**Prerequisites:** None

**Assessment**: Course work (100%).

**Key Texts:**

Anderson, R.S., Anderson, S.P. (2010) *Geomorphology: the mechanics and chemistry of landscapes*. 1st Ed.

# GGU33915 Globalisation and Geopolitics (5 credits)

**Module Coordinator: Professor Pádraig Carmody (carmodyp@tcd.ie)**

It is now frequently said that the world is experiencing a "poly-crisis": climate change and disruption, conflict, poverty, political instability and others. How do we explain the emergence of intersecting crises? This module explores this issue by examining the interactions and intersections between geopolitics and globalisation. Globalisation and geopolitics are being reconfigured by the changing nature of domestic and international politics and other meta-trends such as the rise of emerging powers. This module examines the nature and impacts of globalisation and geopolitics around the world with special attention to the nature and drivers of increased interconnection, climate change, conflict, and "shadow globalisation", amongst others. Particular emphasis is placed the systemic nature of global crises, the rise of BRICS (Brazil, Russia, India, China and South Africa) and their international relations in the developing world. It also explores current resistance to the globalisation and geopolitics through social movements both in the developed and developing world.

**Learning Outcomes:**

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

- Analyse the relationships between economic forces, spatial development 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 and geopolitics;
- Discuss critically the relationship between different types of globalisation and the influence of emerging powers;
- Understand geopolitical drivers of conflict;
- Critically evaluate alternatives to globalisation and current models and modalities of geopolitics.

**Pre-requisites:** None

**Assessment:** 2-hour examination (50%) Answer 2Q/6. Three short response papers (50%).

**Some Suggested Texts:**


- Harvey, D. (2011) *The Enigma of Capital*. London: Profile Books.
- Parr, A. (2014) *The Wrath of Capital: Neoliberalism and Climate Change Politics*. New York, NY: Columbia University Press.
- Farell, H. and A. Newman (2023) Underground Empire: How the US weaponised the world economy. London: Allen and Lane.
- Hung, HF. (2022) *The Clash of Empires*. Cambridge: Cambridge University Press.
- Stunkel, 0. (2016) *Post-Western World*. Cambridge: Polity.
- Agnew, J. (2018) *Globalisation and Sovereignty: Beyond the Territorial Trap* (2nd edition). London: Rowman and Littlefield.

# GGU33928 Advanced Research Methods in Geography 1 (5 Credits)

**Module Coordinator: Professor Iris Möller (moelleri@tcd.ie)**

The objective of this module is to develop further the research skills of students, in order that they will be well-equipped to plan and carry out an independent research project, which they may be required or opt to do in the form of a dissertation going from their JS to SS year. The module focuses on approaches to solving geographic problems, through topics such as conducting literature reviews, research project design, and presentation skills, and how to address questions of ethics, integrity, professionalism, philosophy in research. In addition to classes, students on this module are also expected to attend research seminars in the School, and more broadly in College, in particular (although not exclusively) those of relevance to Geography.

The assessment for this module comprises several components, including critical literature reviews of key research areas relating to Geography, and the writing and presentation of a research proposal. For dissertation preparation regulations specific to Erasmus students, see page 5.

**Learning Outcomes:**

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

- Develop a research plan for a Geography dissertation;
- Communicate geographic ideas and results effectively in written and oral form;
- Evaluate the strengths and weaknesses of complementary and competing methodological approaches and research techniques commonly used by geographers;
- Develop a basis for informed opinions about the important intellectual and methodological debates in Geography.

**Prerequisites:** None

**Assessment:** Course work (100%)

**Key Texts:**


- Clifford, N. & Valentine, G. (2003) *Key methods in geography*. London: Sage
- Cloke, P., Crang, P. & Goodwin, M. (2004) *Practising Human Geography* Arnold: London
- Knight, P.G. & Parsons, A.J. (2013) *How to do your Dissertation in Geography and Related Disciplines*
- Montello, D. R. & Sutton, P.C. (2006) *An Introduction to Scientific Research Methods in Geography*

# GGU33931 Environmental Governance 1 (5 Credits)

**Module Coordinator: Dr Rory Rowan (rowanro@tcd.ie)**

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 policymaking, 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.

**Prerequisites:** None

**Assessment**: Course work (100%).

**Key Texts:**

- Cronon, W. (ed.) (1996) *Uncommon Ground: Toward Reinventing Nature*. New York: Norton.
- Dawson, A. (2024) *Environmentalism from Below: How Global People's Movements ate Leading the Fight for or Planet.* New York: Haymarket Books.
- Dryzek, J. S. (2013) *The Politics of the Earth: Environmental Discourses.* Oxford: Oxford University Press.
- Merchant, C. (1990) *The Death of Nature*: *Women*, *Ecology, and the Scientific Revolution*. HarperCollins.
- Nixon, R. (2011) *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press.
- Smith, N. (2010) *Uneven Development: Nature, Capital and Production of Space*. Athens, GA: University of Georgia Press.

# GGU33933 Geographical Information: Data & Tools (5 Credits)

**Module Coordinator: Dr John Connolly (john.connolly@tcd.ie)**

**Note:** It is highly recommended that students purchase a windows-based laptop/PC for working in Geography. In the 3rd and 4th year ArcGIS Pro will be used and this only runs on PC (i.e. it does not work on Macs). ArcGIS Pro is available on campus computers.

This module explores how to identify, create, manage and use geographic data and geographical information systems (GIS). The aim is to teach students about how data is constructed, used, found, and utilised by geographic researchers within ESRI's ArcGIS Pro environment. The module will enable students to: interpret maps; find and evaluate data; organise, manipulate and analyse data; create projects and maps using GIS; identify how geographic data construction and analysis differs from typical quantitative approaches. **This module is a prerequisite to GGU44933.**

**Learning Outcomes:**

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

- Explain the concepts and theories that underpin GIS and outline their application to the real world;
- Enable students to identify, create, manage and use geographic data and a GIS
- Demonstrate technical proficiency in the use of an industry standard GIS software package;
- Apply GIS technologies in for geospatial problem-solving in Geography;
- Design, implement and present the results from a project using GIS technologies.

**Pre-requisites:** None

**Assessment:** 100% continuous assessment

**Key Texts:**

Longley et al. (2011) *Geographic Information Systems & Science.* 3rd Edition. Wiley: NJ
Heywood et al. (2011) *An Introduction to Geographical Information Systems.* 4th Edition. Prentice Hall: NJ

# GGU33937 Urban Economic Structure & Regeneration (5 credits)

**Module Coordinator: Dr Cian O'Callaghan (ocallac8@tcd.ie)**

This module introduces you to some key themes, concepts, and debates in urban geography. In particular it will focus on the concept of urban regeneration. The module first considers the historic development of urbanisation, the transition to urban-based economies, and the development of urban studies. It then focusses specifically on the urban impacts of globalisation, in particular how cities in the developed world have managed the shift from industrialism to post-industrialism. Finally, the module examines regeneration from a number of perspectives. Particular attention will be given to the circular nature of processes of urban growth and decline and how regeneration efforts include and exclude particular social groups and identities.

**Learning Outcomes:**

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

- Demonstrate a thorough understanding of the processes underlying changing urban economic form and the concurrent shift in the cultural life of cities
- Have a detailed knowledge of the varied character of urban regeneration policies, their function and effectiveness.
- Demonstrate a knowledge of key concepts in urban geography and be able to apply them to real world situations

**Prerequisites:** None

**Assessment:** Blog post + additional component (50%) & 2-hour examination (50%) answering 2 questions from 4.

**Key Texts:**

- Jonas, A. E., McCann, E., & Thomas, M. (2015) *Urban geography: a critical introduction*. Oxford: John Wiley & Sons.
- MacLaran, A. & Kelly, S. (Eds.) (2014) *Neoliberal Urban Policy and the Transformation of the City: Reshaping Dublin*. London: Palgrave Macmillan.

# GGU33939 Exploring the Sustainable City (5 Credits)

**Module Coordinator: Dr Federico Cugurullo (cugurulf@tcd.ie)**

What will the city of the future look like? To what extent are our models of city-making sustainable? Is the road that we are taking leading us towards an environmental utopia in which societies will grow in balance with nature, or are we paving the way for the collapse of our civilization?

These are the key questions that will drive our exploration of the different ways through which, today, sustainable urban development is understood and practiced across the world.

In this highly interdisciplinary module, we are going to use the tools of geography to examine the most critical socio-environmental issues faced by cities (climate change, consumption, happiness, environmental degradation, etc.), and discuss both the theory and practice of urban sustainability.

Using case studies from different continents, we will explore projects for eco-cities and smart cities, and evaluate their sustainability performance. We will also draw upon urban history and political philosophy to learn how the ideal city was imagined in past, and use this knowledge to foresee what urban futures alleged smart-eco cities are shaping.

Each session will be designed to stimulate interaction and will require curiosity and imagination. This module is more than a review of how urban sustainability is understood and practiced, and you will be asked to design, present and discuss practical plans of action to sustain urban living in the 21st century and beyond.

**Learning Outcomes:**

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

- Demonstrate knowledge of key debates relating to theories and practices of sustainable urban development
- Show understanding of the different meanings of urban sustainability across geographical spaces

- Undertake analysis of complex, incomplete or contradictory areas of knowledge in relation to contemporary urban challenges
- Critically evaluate urban agendas from a sustainability perspective
- Design and evaluate strategies for sustainable urban development.

**Prerequisites:** None

**Assessment:** 100% Assessment

**Key Texts:**

- Evans et al. (2016) *The Experimental City*. London: Routledge.
- James P. (2015) *Urban Sustainability in Theory and Practice*. London: Routledge.
- Karvonen, A., Cugurullo, F., Caprotti, F. (2019) *Inside Smart Cities*. London: Routledge.

# GLU33002 Blue Earth: Understanding the Function of Marine Ecosystems (5 Credits)

**Module Coordinator: Prof Carlos Rocha (rochac@tcd.ie)**

This introductory course in marine biogeochemistry explores the ocean's central role in Earth's climate system and its regulation of human impact on the global environment. It provides insights into the functioning of the Earth system and its reactions to human activity, shedding light on the formation, evolution, sustenance, and endangerment of life on Earth. This knowledge informs adaptation to climate and environmental change, supporting sustainable food production, fisheries, aquaculture, and pollution mitigation.

The programme explores marine biogeochemical phenomena that influence the Earth's climate and marine life diversity, distribution, and productivity. It covers physical, biological, geological, and chemical processes that control organic matter creation, distribution, and fate in the marine environment, seawater and atmosphere composition, and marine sediment formation and preservation. It prepares students for related courses, fieldwork, laboratory work, and careers in marine and environmental sectors.

**Learning outcomes:**

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

**LO1:** Demonstrate a working understanding of the processes that determine seawater composition

**LO2:** Analyse oceanographic data to understand physical, chemical, and biological processes in the ocean

**LO3:** Generate global estimates of biogeochemically important ocean fluxes using publicly available data

**LO4:** Explain how our understanding of modern marine biogeochemistry is crucial to describe the co-evolution of life and chemistry on Earth, from the past to the future

**Prerequisites:** This is an introductory course on marine biogeochemistry. Even if there are no formal pre-requisites for attendance, familiarity with foundation level biology and chemistry, basic numeracy and an elementary knowledge of algebra and calculus will greatly facilitate learning**.**

**Assessment**: 100% in course

**Recommended Reading list:**

Libes, Susan. 2009. Introduction to Marine Biogeochemistry. 2nd edition. Academic Press, 928 pp. ISBN: 9780120885305; eBook ISBN: 9780080916644

Middelburg, Jack J. 2019. Marine Carbon Biogeochemistry – A primer for Earth System Scientists (Open Access).

Open University, 2005. Marine Biogeochemical Cycles, Butterworth-Heinemann, 130 pp. eBook ISBN: 9780080940779

# GLU33004 The Crystal World (5 Credits)

**Module Coordinator: Dr Juan Diego Rodriguez-Blanco (j.d.rodriguez-blanco@tcd.ie)**

Minerals are solid chemical compounds that occur naturally but sometimes can also be synthesised in the laboratory. They are the fundamental building blocks of rocks, also a major component of all soils, and are needed as raw materials because they are the ultimate source of many essential elements used in industrial processes. This module provides an overview of the main characteristics of minerals from a chemical and structural point of view, as well as their formation and transformation process and the factors affecting their crystallisation and chemical variability. It also focuses on the identification and characterisation of the 10-top rock-forming minerals using the petrographic microscope.

**Learning outcomes:**

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

**LO1**: Describe the meaning of the terms “mineral”, “crystal”, “amorphous material”, “unit cell”, “isomorph”, “polymorph”, “solid-solution”, “zoning”, “twinning” and outline their key characteristics.

**LO2**: Recognize that minerals are crystalline chemical compounds made up of atoms linked together by very different chemical bond types, resulting in solids with very different geometries and physicochemical properties.

**LO3**: Explain what the most abundant rock-forming minerals in nature are, their composition and cite examples of the important characteristics of the silicate and non-silicate rock-forming minerals.

**LO4**: Evaluate the contribution of mineral sciences to modern society and cite examples of the role that minerals play in Earth sciences, technology and humankind.

**LO5**: Recognise the structural (polymorphism) and chemical (solid-solution) variabilities of minerals, as well as the main mechanisms of formation and transformation of minerals.

**LO6**: Describe the characteristic physical properties that we use to identify minerals (crystal shape, color, luster, and hardness) and the most important techniques used for mineral analysis and characterisation.

**LO7**: Identify the 10 most important rock-forming minerals under the petrographic microscope and describe their most important optical properties.

**Prerequisites:** None

**Assessment**: Course work (50%); end of semester examination (50%).

# GLU33005 Volcanism and Magmatism (5 Credits)

**Module Coordinator: Dr Emma Tomlinson (tomlinse@tcd.ie)**

This module explores the origin, evolution and emplacement of magmas and the effect of magmatic and volcanic processes on society and the environment. The module provides an overview of the most important igneous rocks at a range of scales (tectonic setting, outcrop, hand specimen and thin section) through investigations of thin section and hand samples, videos and analogue experiments.

**Learning outcomes:**

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

**LO1:** Recognise common magmatic rocks in hand specimen and under the microscope.

**LO2:** Know how to classify igneous and pyroclastic rocks.

**LO3:** Understand the processes involved in the generation of magmas.

**LO4:** Outline the various tectonic regimes in which igneous rocks form.

**LO5:** Understand the processes that lead to compositional change in magmas.

**LO6:** Recognise mineral textures and be able to use them to infer magmatic conditions and processes.

**LO7:** Understand the processes that control volcanic eruption style.

**LO8:** Understand the hazards posed by volcanic eruptions and the impact of volcanism on society and the environment.

**LO9:** Appreciate the mineral and energy resources associated with volcanic and magmatic activity.

**Prerequisites**: GLU33004, The Crystal World

**Assessment**: Coursework (60%); end of semester examination (40%)

**Recommended Reading List:**

Gill, R. (2010) Igneous rocks and processes – a practical guide.

# GLU33007 Earth Resources for a Critical Future (5 Credits)

**Module Coordinator: Dr Sean Mc Clenaghan (mcclens@tcd.ie)**

Decarbonization of society's energy infrastructure will involve a significant shift from fossil fuel extraction to the mining of "energy minerals" for the fabrication of green energy infrastructure. This module introduces students to a wide range of mineral deposits with an emphasis placed on raw materials critical to energy conservation, transport, and infrastructure. Students will gain a broad understanding of earth resources and important occurrences of mineral deposits in the Earth's Crust. The students will become familiar with the environments in which various ore resources and critical elements form as well as the implications for exploration, assessment and recovery of critical raw materials for a decarbonized society. Raw materials will be practically studied through thin section petrography, advanced micro-analysis, hand specimens and exploration drill core as well as field excursions to local mineral deposits in Ireland. Assessment of mineralization based on mineralogy and geochemistry, presence of known critical elements, precious metals and deleterious elements are addressed throughout the module.

Upon successful completion of this module students will be able to assess mineralization and identify favourable terranes for the concentration of critical raw materials. Students will also be able to analyse economic factors controlling the viability of raw materials and devise strategies for the exploration and recovery of a mineral resource.

**Learning Outcomes:**

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

**LO1:** Assessment of specimens for commodity-bearing minerals and interpretation of mineral deposit setting.

**LO2:** Interpretation and mapping of mineralization in drill core and in outcrop.

**LO3:** Assessment of resource potential for various terranes from the interpretation of geological data.

**LO4:** Recognition and communication of the role of metal resources in society and a carbon neutral future.

**Prerequisites:** None

**Assessment**: Course work (40%); end of semester examination (60%).

# GLU33009 Hydrology and Groundwater Quality (5 Credits)

**Module Coordinator: Dr Alex Cabral (alex.cabral@tcd.ie)**

This module examines hydrology and hydrogeology within the Earth system, focusing on how water moves, interacts, and evolves across terrestrial and coastal environments from the catchment to the global scale. It integrates surface water and groundwater processes, linking physical hydrology with water quality and biogeochemical dynamics under environmental change.

The module combines fundamental hydrogeological concepts with applied perspectives on groundwater-surface water interactions, tracer approaches, and water quality challenges. Emphasis is placed on understanding groundwater systems within an integrated catchment management framework, including issues of vulnerability, protection, and the role of groundwater in climate-driven change.

**Learning Outcomes:**

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

**LO1:** Evaluate the role of different hydrological pathways in a range of terrestrial and coastal catchment settings.

**LO2:** Carry out calculations relating to catchment water balance, river flow, surface water processes, and groundwater movement.

**LO3:** Analyse the factors controlling aquifer hydrochemistry, contaminant transport processes, and groundwater pathways using geochemical tracers.

**LO4:** Assess groundwater quality problems in rural, urban, industrial, and coastal environments.

**LO5:** Evaluate groundwater vulnerability to pollution and assess the role of groundwater protection schemes and integrated catchment management under a changing climate.

**Prerequisites:** None

**Assessment**: Course work (50%); end of semester examination (50%).

**Recommended Reading List:**

Various hydrology and hydrogeology textbooks are available in the College Library to support the lecture material. A selection of peer reviewed journal articles is provided on Blackboard.

# Senior Sophister Modules

**IMPORTANT NOTE:** Please note that the information provided in this section serves as a general guide to what is expected in the modules. Changes may occur, and any updates or modifications will be communicated appropriately by the Module Coordinators.

## BOU44111 Restoration Ecology and Rewilding (5 Credits)

**Module Coordinator: Marcus Collier**

Restoration ecology, like conservation biology, is a 'crisis' discipline, having emerged as a scientific response to the ecological damage caused by human activities. Restoration ecology has many positive outcomes but has also a lot of controversy. Re-wilding and novel ecosystems are new, daring and controversial areas within restoration ecology making it difficult to know how and when to intervene. This module will introduce you to the challenges and opportunities, failings and fallacies of the complex world of restoration ecology and the work of restoration ecologists. It will look at how re-wilding could be the best nature-based solution and how novel ecosystems could be the worst. As the discipline struggles to include social sciences, politics and economics, this module will draw on case studies of restoration globally that will challenge students to rethink ecology and ecosystems in the Anthropocene.

Students will also visit an abandoned industrial landscape and look at the after-use and restoration processes.

**Learning Outcomes:**

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

**LO1:** Understand the principals of restoration ecology as they apply in a modern context

**LO2:** Comprehend the nuanced nature of restoring ecosystems and habitats as well as re-introducing species in practice

**LO3:** Carry out restoration case study analysis

**LO4:** Understand the complex relationship between ecology, social values and policies

**LO5:** Evaluate the success of restored ecosystems and species

**Prerequisites:** None. Places on this module may be limited.

**Assessment**: Course work (50%), end of semester examination (50%)

**Indicative Reading:**

Aronson, J, Milton, S.J., & Blignaut, J. Eds. (2007) Restoring Natural Capital. Island Press

Hobbs, R. J., Higgs, E. S. & Hall, C. M. Eds. (2013) Novel Ecosystems. Wiley

Marris, E. (2011) Rambunctious Garden. Bloomsbury

Monbiot, G.(2015) Feral. Penguin

# GGU44901 Natural Hazards (5 credits)

**Module Coordinator: Prof. Mary Bourke (bourkem4@tcd.ie)**

Short-lived, high magnitude extreme events, from meteorite impacts, to volcanic eruptions, fire, and storms, have shaped the surface of the earth throughout its geological history. Increasing population densities in critical locations on our planet (e.g. cities at the foot of volcanoes, on tectonic fault lines, and at the coast) and human impacts on the environment at the local, regional and global scale, however, have altered the likelihood and magnitude of certain types of natural hazards. This has brought the vulnerability of societies to natural hazards into sharp focus over recent decades. In October 2020, the UN Office on Disaster Risk Reduction (UNDRR) reported that, over the past two decades, 1.23 million people had lost their lives in a total of 7,348 'disaster events' that had been recorded globally (with floods (40% of occurrences), storms (28%), earthquakes (8%), and extreme temperatures (6%) as the four most impactful types of hazard).

In our efforts to reduce the human and economic impact of such events, an understanding of the reasons for their occurrence, their spatial and temporal variability, the degree to which they are 'natural' as opposed to 'anthropogenic' as well as past and potential future societal responses to such events is critical.

This module will address the above aspects beginning with an introduction to 'natural' hazards and general concepts or risk and vulnerability. The introductory lectures are then followed by lectures, targeted reading and discussion groups. Finally, we will explore case studies highlighting past, present, and potential future societal solutions for the mitigation of the impact of natural hazards with guest speakers bringing an applied natural hazard and risk management perspective to this module.

**Learning Outcomes:**

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

- Have a basic understanding of the physical processes involved in a number of different natural hazards.
- Understand the role of natural hazards in the wider context of landform and ecosystem dynamics.
- Appreciate and critically evaluate the role of humans in how we understand, describe, and assess natural hazards.
- Understand the potential links between a number of natural hazards and climate change.
- Understand and assess the difference between hazard, risk, and vulnerability.
- Apply the source-pathway-receptor model to the study of natural hazards in particular settings/contexts.
- Critically evaluate different strategies for the management of natural hazards.
- Discuss the impacts of glaciers on communities and cultures.

**Prerequisites:** 'Spaceship Earth' (JF) and 'Physical Geography: Dynamic Earth' (SF) are helpful but not necessary

**Assessment:** To be announced

# GGU44902 Karst Landscapes (5 Credits)

**Module Coordinator: Dr Pete Akers (pete.akers@tcd.ie)**

The dissolution of limestone and other carbonate bedrocks produces unusual landscapes dominated by underground drainage. Globally, these carbonate rocks underlie 12–20% of the Earth's land surface that support a quarter of the world population. When these bedrocks are exposed at the surface, dissolution carves a distinctive topography known as karst. Karst landscapes are known for their scenic mixture of peculiar landforms which include sinkholes, disappearing streams, turloughs, and caves. Karst and limestone aquifers are an important source of domestic and industrial water for billions, and the distinct hydrology of karst produces unique ecosystems and high biodiversity. However, the environmental properties that set karst apart from other landscapes also make it vulnerable to human mismanagement and pollution. Proper stewardship of limestone landscapes requires us to understand how they differ from other, better known landscapes, and 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 karstic geomorphology, hydrogeology, and geochemistry for future success when operating in such environments.

**Learning Outcomes:**

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

- Explain the major and minor environmental processes specific to limestone that produce karst landscapes.
- Identify the primary landforms associated with global karst landscapes.
- Distinguish and compare the unique characteristics of karst relative to other landscapes and environments.
- Develop a focused understanding of Irish karst landscapes and compare Irish karst to karst from elsewhere in the world.

- Hypothesize and discuss how karst landscapes have affected human societies in Ireland and around the world.
- Consider how modern human societies impact karst resources and environments and recommend how these impacts can be lessened.

**Prerequisites:** None

**Assessment:** 100% Continuous assessment of two exams (mid-term and end-of-term) consisting of MCQ, short answer, and short essay, and small in-class activities.

# GGU44903 Carbon and Climate (5 credits)

**Module Coordinator: Dr Margaret Jackson (margaret.jackson@tcd.ie)**

**Prerequisites: None**

When it comes to the stability of life on Earth, one might say that the carbon cycle can be more dangerous than an asteroid. Today, as humans add ever increasing amounts of carbon to our atmosphere and global temperatures rise in turn, rapid anthropogenic climate change places stress on ecosystems and human infrastructure alike. But to truly understand the role of carbon in our world we must look to our past. We can examine how the Earth has responded to past carbon cycle change, and look to these periods for lessons for both our present and our potential future. This module will focus on Earth's carbon cycle today, and will contextualise changes in our modern carbon and climate systems through comparisons with carbon-cycle change in Earth's past (both its causes and consequences). Students will gain understanding of the science of carbon and its links to the climate system. Students will also learn more about the wider research process through readings which highlight the process of scientific debate and discovery.

**Learning Outcomes:**

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

- Understand the elements and functions of Earth's carbon cycle.
- Explain the role of carbon dioxide in Earth's climate.
- Discuss the role of carbon dioxide in past Earth events.
- Contextualise Earth's modern climate – and the rate of modern climate change - in terms of Earth history.
- Discuss how researchers study Earth's history and climate.
- Practice strategies for critical reading and thought.
- Discuss the evolution of scientific thought using discrete examples.

**Prerequisites:** None.

**Assessment:** 100% Continuous assessment (weekly reading discussion, mini quizzes, larger quizzes). Re-assessment will involve a written activity to complete based on module materials.

# GGU44933 GIS and Remote Sensing Applications in Geography (5 Credits)

**Module Coordinator: Dr John Connolly (john.connolly@tcd.ie)**

**Note:** Places on this module are limited by computer laboratory spaces available (currently 28). It is highly recommended that students purchase a windows-based laptop/PC for working in Geography. In the 3rd and 4th year ArcGIS Pro will be used and this **only** runs on PC (i.e. **it does not work on Macs**). ArcGIS Pro **is** available on campus computers.

Remote Sensing and Geographical Information Systems (GIS) allow a wide range of environmental and human phenomena to be explored across space and time. The ability to detect and map change within the human and physical/environmental sub-systems at a range of scales has the power to inform science, policy, and planning and often becomes essential when scaling up observations / theories derived within a particular place or at a particular time. In this module, students will learn the theory behind Remote Sensing techniques, exploring a range of web-based and stand-alone methods for interrogating geo-spatial data. They will be encouraged to do so critically and will gain an understanding of uncertainties and the relative merits of different sources of Earth Observation (EO) information, with particular emphasis placed on resolution and accuracy, both spatially, temporally, and in the spectral domain. The module is a practical module that takes place in the computer labs, however students' will be required to work in their own time to complete the module. This requires access to a MS Windows-based computer (i.e. not a Mac).

**Learning Outcomes:**

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

- Explain the concepts behind remote sensing and Earth Observation and the importance and relevance of geospatial information to a range of Geographical problems
- Critically evaluate the importance of and difference between resolution, scale, and accuracy within geospatial data

- Demonstrate use of EO data and software to derive accurate classified maps, vegetation indices and interpret images.
- Critically evaluate the appropriateness of different remote sensing platforms for a range of research questions
- Use GIS software to analyse geospatial data and explore the relationships between multiple geo-spatial datasets
- Select data of appropriate resolution, scale and accuracy for specific research questions
- Communicate the outputs of GIS/Remote Sensing projects succinctly and effectively and by using correct technical and scientific terminology

**Pre-requisite:** GGU33933

**Assessment:** 100% continuous assessment

**Key Texts:**

- Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2008). *Remote Sensing and image interpretation*. (many editions). Wiley, London
- Jones, H. G. and Vaughan, R. A. (2010). *Remote Sensing of vegetation*. Oxford University Press.
- Emery, W. & Camps, A. (2017) *Introduction to Satellite Remote Sensing. Atmosphere, Ocean, Land and Cryosphere Applications*. London: Elsevier.
- Campbell, J. B. & Wynne, R. H. (2011). Introduction to Remote Sensing. Guildford Press.

A list of recommended reading materials, standards, manuals, best practice documents is provided in throughout the module.

# GGU44936 Globalisation and African Development (5 Credits)

**Module Coordinator: Professor Pádraig Carmody (carmodyp@tcd.ie)**

This module explores the nature and impacts of globalisation in Africa. Particular attention is paid to the geography of HIV/AIDS, gender and development, China's rising role in the continent, oil politics and the so called "resource curse" or paradox of plenty that Africa is the most resource rich continent in the world but also the poorest. Other topics covered included gender and the mobile phone revolution.

**Learning Outcomes:**

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

- Discuss critically the historical evolution of Africa's incorporation into the global political economy;
- Judge and critique different perspectives on the nature of the globalization in Africa;
- Critically evaluate the influence of organizations such as the International Monetary Fund, World Bank and International Non-Governmental Organisations in Africa;
- Apprehend the construction and interaction between issues such ethnicity, conflict and terrorism; regionalisation and globalization and gender and development;
- Interrogate the geography and evolution of HIV/AIDS in Africa and its causal factors;
- Independently evaluate broader literatures on development in Africa.

**Prerequisites**: None

**Assessment:** 2-hour examination (50%) Answer 2Q/6. Three short response papers (50%).

**Some Key Suggested Texts:**

- Maathai, W. (2010) *The Challenge for Africa*. London: Arrow books.
- Rotberg, R. (2013) *Africa Emerges*. Cambridge: Polity.
- Cotula, L. (2013) *The Great African Land Grab*. New York, NY: Zed.
- Burgis, T. (2015) *The Looting Machine: Warlords, Tycoons and the Systematic Theft of Africa's Wealth.* London: Harper Collins.

- Hern, E. (2023) *Explaining Successes in Africa: Things Don't Always Fall Apart*. Boulder: Lynne Rienner.

# GGU44968 Historical Geography (10 Credits)

**Module Coordinator: Dr Mark Hennessy (mhnnessy@tcd.ie)**

This module presents an overview of the historical geography of Ireland from the earliest evidence of human settlement in the Mesolithic through to c.1840 A.D. Throughout the module developments in Ireland are set within appropriate comparative and theoretical contexts. The principal topics explored are settlement, land use and agriculture, the changing environment (including human impacts), patterns of cultural variation and interaction and how these have come together to forge changing landscapes and regions.

**Learning Outcomes:**

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

- Understand the development of landscapes and regional patterns in Ireland from prehistory to the modern period;
- Place developments in Ireland in appropriate comparative contexts;
- Critically evaluate alternative explanations/interpretations of the pattern of landscape and regional change in Ireland;
- Critically evaluate archaeological, field and documentary evidence relating to this topic.

**Prerequisites:** None

**Assessment:** 3 hour examination (50%); coursework (50%)

**Key Texts:**

- Clarke, H.B., Hennessy, M. & Prunty, J. (Eds.) (2004) *Surveying Ireland's Past*. Dublin: Geography Publications.
- Aalen, F. H. A., Whelan, K. & Stout, M. (Eds.) (2011) *Atlas of the Irish Rural Landscape*, Cork: Cork University Press.

# GGU44976 Glaciers and Glaciation

**Module Coordinator: Dr Margaret Jackson (margaret.jackson@tcd.ie)**

Glaciers mould landscapes and mountain ranges, leaving indelible impressions long after they disappear. Glaciers also provide vital information regarding past climate, serving both as proxies and archives of past conditions. At the same time, the sensitivity of glaciers to changing climate conditions has direct implications for global sea level. Glaciers also provide water resources for billions of people in sub-tropical regions and are a backbone of many tourist economies. Understanding glaciers, how they behave and the impacts they have on landscapes, is therefore crucial for understanding the history of our planet and for projecting future change. Through hands on activities, lectures, and discussion, this module explores how glaciers operate, their effects on landscapes over time, and the influence of glaciers in communities today. We will also investigate how glaciers can serve as indicators of past – and present – climate change.

**Learning Outcomes:**

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

**LO1:** Understand and explain the primary controls on glacial mass balance.

**LO2:** Describe the elements required for glaciation, and where glaciers are found today.

**LO3:** Evaluate different types of glaciers, how they behave, and how this relates to landscape.

**LO4:** Describe the ways glaciers modify landscapes, and the evidence of this modification.

**LO5:** Evaluate how glaciers and glacial landforms can be used to reconstruct past climate conditions.

**LO6:** Describe how and why glaciers influence changes in sea level.

**LO7:** Understand potential hazards associated with glaciers and glaciation.

**LO8:** Discuss the impacts of glaciers on communities and cultures.

**Prerequisites:** None

**Assessment:** Course work (100%)

**Recommend Reading List:**

Primary reference text: Glaciers & Glaciation, D. Benn and D. Evans, 2nd Ed. Additional topical material (shorter items, news articles, research journal articles, book chapters) will be made available to students on Blackboard.

# GGU44977 Environmental Governance 2 (5 Credits)

**Module Coordinator: Dr Rory Rowan (rowanro@tcd.ie)**

There is little disagreement that far-reaching societal, technological, political, and economic transformations are required if we are to avoid the worst effects of global, anthropogenic environmental change. What form these transformations should take and who should take responsibility for them are, however, far from settled.

This module considers some of the key conceptual debates and environmental conflicts arising in this context. Examination of these debates and conflicts will demonstrate the contested and uneven nature of environmental change and the measures sought to address these changes. The overall aim of the module is to help students develop a more nuanced, critical and multi-disciplinary understanding of environmental change and the different, often contested, ways of responding to such changes.

The module will consist of weekly interactive lectures/seminars, and set readings. Lectures will introduce students to key concepts and perspectives drawn from the broad field of political ecology. In this module students develop a semester-long research project focused on a key area of environmental contestation in Ireland through a political ecology lens. The projects will involve group work and individual work, written assignments, oral presentations, and primary research. Class attendance is essential.

**Learning Outcomes:**

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

- Understand and apply key theoretical concepts from the field of political ecology to contemporary environmental debates and issues;
- Identify and critically discuss key sites of environmental contestation in Ireland today;
- Explain why an in-depth understanding of environmental problems today requires an understanding of the political, economic and social contexts out of which they emerge and within which they are managed

**Assessment:** 100% Continuous assessment.

**Key texts:**


- Bresnihan, P. & Milner, N. (2024) A*ll We Want is the Earth: Land, Labour and Movements Beyond Enviormentalism*. Bristol: Bristol University Press.
- Castree, N. & Braun, B. (2001) *Social nature theory, practice, and politics*. London: John Wiley & Sons.
- Kaika, M. (2005) C*ity of Flows: Modernity, Nature, and the City.* London: Routledge.
- Patel, R. & Moore, J. (2017) *A History of the World in Seven Cheap Things: A Guide to Capitalism, Nature, and the Future of the Planet*. Berkley, CA: University of California Press.
- Robbins, P. (2012) *Political Ecology: a Critical Introduction* (2nd edition). London: Wiley.

# GGU44978 Finance and Climate Justice (10 credits)

**Module Coordinator: Dr Martin Sokol (sokolm@tcd.ie)**

This module examines finance and climate justice, and the links between them. As the worsening climate chaos threatens the very existence of humanity, it is increasingly clear that a climate justice approach is needed for both climate change mitigation and adaptation. Climate justice approaches emphasise the need for a fundamental transformation of society and the economy, while applying the principles of social justice and economic equity. However, there is a growing realisation that such a socio-economic transformation will not be possible without radical changes in the sphere of finance. Going beyond the proposition that finance needs to be mobilised to fund 'green' transition, this module examines the view that the entire global financial architecture must be transformed to safeguard a better, healthier, more stable and a more just future for all. Special attention is given to central banks and their role in the financialised economic system, their relation to climate change and their role in hampering and/or promoting climate justice. Alternative economic and financial models, including de-growth and post-growth approaches, will be examined. The module also highlights a critical role of geography in understanding both the climate justice issues and the operation of finance in capitalist economies. In line with the principles of climate justice, the module offers students the opportunity to co-design its elements, while also promoting students' climate activism, self-learning and self-reflection.

**Learning Outcomes:**

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

- Comprehend and explain the concept of climate justice.
- Comprehend and explain the role of finance in capitalist economies.
- Describe and discuss the links between finance and climate justice.
- Describe and discuss the role of central banks in advancing climate justice.
- Reflect on, and discuss, alternative economic and financial models for climate justice.

**Prerequisites:** No prior knowledge of economics, finance or economic geography is required. The only pre-requisite for students wishing to take this module is to care about people and planet, and to have their heart in the right place.

**Assessment:** Continuous Assessment (100%)

A combination of debate & reflection (40%) and climate action / report (60%)

[Indicative breakdown only]

# GGU44979 Living on the Edge: Estuaries and Coasts (5 Credits)

**Module Coordinator: Dr Iris Moeller (moelleri@tcd.ie)**

Coastal regions are some of the most dynamic on Earth, not least because human and natural processes act in tight connection to each other. This dynamism poses one of the great societal challenges of the 21st Century: as coastal populations are increasing at three times the global rate, they are also experiencing an increasing threat of coastal flooding and erosion under climatic extremes (e.g. tropical and extratropical storm surges), and are 'locked into' accelerated sea level rise for centuries to come. Building upon a basic, foundational knowledge of ocean and coastal processes covered in relevant modules within the first and second year ('Spaceship Earth' and 'Physical Geography: Dynamic Earth'), students will gain wide ranging theoretical and practical skills required to address those challenges.

The lectures and seminars take students on a journey that highlights how the natural processes operating within estuaries and on coasts are a function of external factors (past and present climate, geology, human influences) and feedbacks in which the landforms themselves affect the operation of processes that shape the landforms. Equipped with this knowledge, and several examples from around the world, students will put their knowledge into practice. A day-field trip and practical exercise will challenge students to apply what they have learnt to real-world coastal management problems. Working in groups, they will form 'coastal management consortia' that will navigate their way through the stages of problem definition to data acquisition and development of appropriate coastal management solutions.

The assessed practical exercise will develop and enhance team-working, independent research, critical thinking, scientific and applied writing, and presentation skills.

**Learning Outcomes:**

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

- Explain the theory behind estuarine and coastal morphodynamics.

- Draw on specific examples to illustrate the societal importance of coastal morphodynamics in the context of human use of the coast.
- Critically reflect on the importance of considering different temporal and spatial scales for an understanding of coastal change.
- Discuss the key impacts of climate change on coastal landforms and ecosystems.
- Carry out basic (bio)geomorphological assessments of estuarine and coastal landforms and associated ecosystems.
- Assist the development of coastal management approaches that consider societal and biophysical aspects of how coasts and estuaries function and deliver ecosystem services.
- Clearly and concisely present the results of their work in written and oral (presentation) form.

**Prerequisites:** None

**Assessment:** 100% Continuous assessment (lecture content, course and tutorial reading = 20%, case study report = 80%)

**Key Texts:**


- Woodroffe, C.D. (2002) *Coasts: Form, process and evolution*. Cambridge: Cambridge University Press.
- Masselink, G, Hughes, M., & Knight, J. (2011) *Introduction to Coastal Processes and Geomorphology*. London: Routledge.

# GLU44006 Carbonates: from the Atomic to Planetary Scale (5 Credits)

**Module Coordinator: Dr Juan Diego Rodriguez-Blanco (j.d.rodriguez-blanco@tcd.ie)**

Carbonate minerals constitute the Earth's largest reservoir of carbon and thus take a key role in the carbon cycle. Their occurrence is widespread, forming primary deposits in natural waters (e.g., oceans, lakes, hydrothermal systems and caves) through precipitation from supersaturated waters. They can form in many different environments, from carbonate-rich magmas, to biomineralisation, or as secondary minerals during the weathering of primary silicates during reactions with dissolved $CO_2$ or organic compounds.

This module provides a review of the most important carbonate minerals, their stability, reactivity and natural distribution. After an introduction on the importance of carbonates in Earth and planetary sciences, technology, carbon capture and storage and environmental sciences, we will focus on the chemistry and structures of carbonate minerals and the discussion on the processes that lead to adsorption and uptake of foreign ions by these minerals. The module concludes with the principal methods for carbonate synthesis and key tools for characterisation.

**Learning Outcomes:**

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

**LO1:** Evaluate the contribution of carbonate mineralogy and geochemistry to modern society and cite examples of the roles that carbonate minerals play in Earth and planetary sciences, technology and environmental sciences.

**LO2:** Understand the importance of the carbonate group and the factors affecting the formation of carbonate solids (ion size, ion coordination, ionic potential, supersaturation) and in the polymorphism and polyamorphism of carbonates.

**LO3:** Recognise what are the most abundant rock-forming carbonate minerals in nature and their chemical composition and structure, as well as their relevance in key processes (e.g., biomineralization, carbon capture and storage).

**LO4:** Recognise the structural (polymorphism) and chemical (solid-solution) variability of carbonates, as well as the main mechanisms of formation and transformation of these solids.

**LO5:** Understand the main mineral-water interaction processes in the carbonate world, their importance in the uptake of minor and trace elements in carbonate minerals and in water chemistry.

**LO6:** Describe the principal methods for the synthesis of carbonates in research and in industrial processes.

**LO7:** Familiarise with the key methods in research for carbonate identification and physicochemical characterisation.

**Prerequisites:** None

**Assessment:** Course work (50%); end of semester examination (50%).

**Recommended Reading List:**

Reeder, J. (1983) Carbonates: mineralogy and chemistry. *Reviews in Mineralogy*, vol **11**. 412 pages.

Hazel et al (2013) Carbon Mineralogy and Crystal Chemistry. *Reviews in Mineralogy and Geochemistry*, **75**, 7–46.

Morse et al (2007) Calcium carbonate formation and dissolution. *Chemical Reviews*, **107**, 342-381.

Also see blackboard for details on reading.

# GLU44009 Geoscience for a Sustainable Planet (5 Credits)

**Module Coordinator: Prof Quentin G Crowley (crowleyq@tcd.ie)**

Geoscience has a crucial role to play in implementing the Sustainable Development Goals (SDGs). In fulfilling a global strategy to achieve a more sustainable future for all, the role of Earth subsystems needs to be clearly mapped onto the SDGs. In the past, lack of a geoscience overview resulted in unsustainable development and several undesirable knock-on effects. For instance, the high energy output from combustion of fossil fuels was instrumental in development of key technologies as part of the industrial revolution and advancement of society. We now realise however, that large-scale utilisation of fossil fuels led to the unintended consequence of increased greenhouse gas emissions and climate disruption on a planetary scale. Whereas climate-change is unequivocally one of the greatest challenges faced by society today, there are also new opportunities for geoscience to contribute to climate adaptation and mitigation strategies. For instance, with the phasing out of fossil fuels there is now a new demand for raw materials to support the transition to renewable energy. Additionally, geoscience knowledge specifically developed for petroleum exploration now underpins carbon capture and storage technologies. In other areas, integration of geoscience knowledge is crucial for sustainable agriculture and food production. This module will explore various ways in which geoscience not only supports the SDGs but also underpins global sustainable development across several sectors and systems.

**Learning Outcomes:**

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

**LO1.** Evaluate how Earth system processes contribute to achieving the Sustainable Development Goals.

**LO2.** Analyse past and present resource use to assess its environmental and societal impacts.

**LO3.** Apply geoscientific knowledge to solutions for climate mitigation and adaptation.

**LO4.** Use systems thinking to propose sustainable management of Earth's resources.

**LO5.** Communicate the role of geoscience in advancing sustainability across sectors.

**Prerequisites:** None

**Assessment:** Course work (40%); end of semester examination (60%).

**Recommended Reading List:**

**Books:**

Meadows, D. H. 2008. Thinking in Systems: A Primer. Edited by Diana Wright. White River Junction, VT: Chelsea Green Publishing.

Meadows, D. H., Randers, J., & Meadows, D. L. 2004. Limits to Growth: The 30-Year Update. White River Junction, VT: Chelsea Green Publishing.

**Papers**:

Raworth, K. 2012. A Safe and Just Space for Humanity: Can we live within the doughnut? Oxfam Discussion Papers. Oxford: Oxfam. DOI: 10.21201/2012.3920.

Sakschewski, B., et al 2025. Planetary Health Check 2025 A Scientific Assessment of the State of the Planet. Planetary Boundaries Science (PBScience). Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany. DOI: 10.48485/pik.2025.017.

Senger, K. 2024. Sustainable Development Goals and the Geosciences: A Review. Earth Science, Systems and Society, 4, 1. DOI:10.3389/esss.2024.10124.

Steffen et al. 2015. Planetary boundaries: Guiding human development on a changing planet. Science, 347, 1259855. DOI:10.1126/science.1259855.

# GLU44011 Palaeoceanography and Palaeoclimatology (5 Credits)

**Module Coordinator: Dr Gerald Dickens (dickensg@tcd.ie)**

In the past 250 million years Earth has experienced significant physical, chemical and biological changes of the atmosphere, oceans and terrestrial environments; leading up to the planet that we live on today. How did this little blue planet evolve over that time, and how have we figured out its amazing history? In this course we will study the gradual long-term evolution of Earth, on land and in the oceans, and how this was interrupted by extreme global change events such as global mass extinctions, oceanic anoxic events, hyperthermals, but also more locally the Messinian Salinity Crisis, Pleistocene climate transitions, or the Younger Dryas. We study the forensics on how to constrain Earth's past, and how this helps us to understand the present, and predict the future.

**Learning Outcomes:**

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

**LO1:** Summarise the principal changes in the Earth's climate and ocean that have occurred during the last 250 Ma

**LO2:** Explain how these major Earth system changes are linked with internal and external forcing mechanisms

**LO3:** Linking stratigraphic record with climate

**LO4:** Discuss timescales

**LO5:** Knowledge of proxies phys chem bio

**LO6:** Relative strengths / weaknesses of proxies

**LO7:** Critically evaluate …Peer review literature – current state of knowledge

**Prerequisites:** None

**Assessment:** Course work (65%); end of semester examination (35%).

**Recommended Reading List:**

None. Peer reviewed literature referred to in class.

**Recommended Reading List:**

None. Peer reviewed literature referred to in class.

# GLU44012 Raw Materials in Building (5 Credits)

**Module Coordinator: Dr Robbie Goodhue (goodhuer@tcd.ie)**

The module will explore several recent failures in building materials and their legacy, highlighting the need for professional geoscientists in the industry. We explore the types of bulk raw materials and end uses (road dressing, concrete and mortar aggregate, fill, soil) in Ireland, focusing on specified properties and national standards. Basic testing methods and advanced analytical techniques will be covered, along with method and standard development. Predicting the stability of raw materials and the lifespan of the structures they are used in will introduce the topics of site-won material, recycling and alternative green building materials. The quarrying / extraction and processing will be taught with a trip to a working quarry / gravel pit / recycling and site stabilisation site.

**Learning Outcomes:**

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

**LO1:** Understand the links between geosciences, engineering, and construction

**LO2:** Acquiring an understanding of national and international standards

**LO3:** Learning about appropriate field and analytical methods related to raw materials

**LO4:** Learning about legacy failures and how they might be prevented

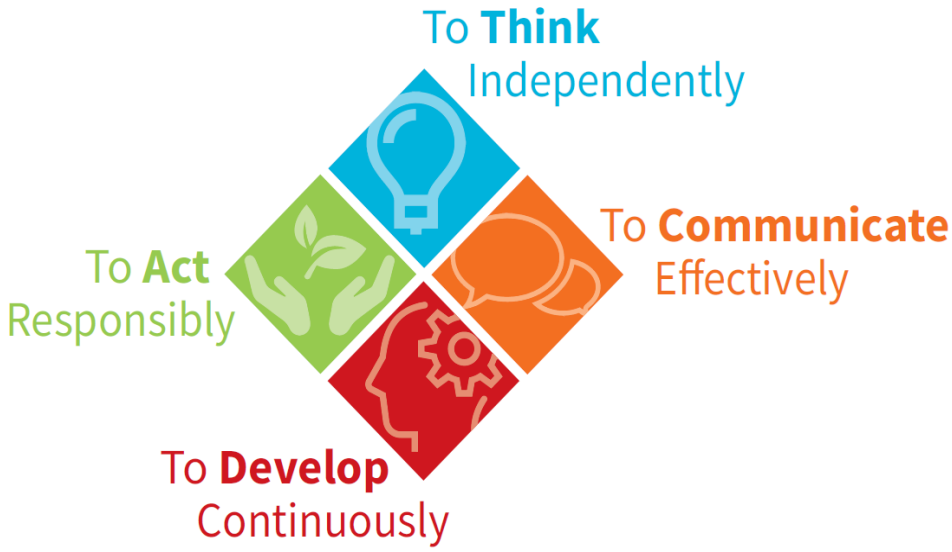
**LO5:** Exploring how public opinion interfaces with the need for raw materials

**Prerequisites:** None

**Assessment:** Course work (30%); end of semester examination (70%).

# Graduate Attributes

The Trinity Graduate Attributes represent the qualities, skills, and behaviours that you will have the opportunity to develop as a Trinity student over your entire university experience, in other words, not only in the classroom, but also through engagement in co- and extra-curricular activities (such as summer work placements, internships, or volunteering).




The four Trinity Graduate Attributes are:

- To Think Independently
- To Act Responsibly
- To Develop Continuously
- To Communicate Effectively

## Why are the Graduate Attributes important?

The Trinity Graduate Attributes will enhance your personal, professional, and intellectual development. They will also help to prepare you for lifelong learning and for the challenges of living and working in an increasingly complex and changing world.

The Graduate Attributes will enhance your employability. Whilst your degree remains fundamental, also being able to demonstrate these Graduate Attributes will help you to differentiate yourself as they encapsulate the kinds of transversal skills and abilities, which employers are looking for.

## How will I develop these Graduate Attributes?

Many of the Graduate Attributes are 'slow learned', in other words, you will develop them over the four or five years of your programme of study.

They are embedded in the curriculum and in assessments, for example, through undertaking independent research for your final year project, giving presentations and engaging in group work.

You will also develop them through the co-curricular and extra-curricular activities. If you help to run a club or society you will be improving your leadership skills, or if you play a sport you are building your communication and team-work skills.

# Important Information

## Student Services




For general information on the Supports and Services available to Trinity Students please visit: https://www.tcd.ie/students/supports-services/.

This is a comprehensive site which breaks down the different categories of support and services available to students is an intuitive manner.

## Trinity Tutorial Service (Undergraduate Students)

The Tutorial Service is unique, confidential, and available to all undergraduate students offering student support in all aspects of College life. The Tutorial Service is supported and coordinated by the Senior Tutor's Office which is located on the ground floor in House 27.

## Opening Hours and Appointments

The Senior Tutor's Office is open for student appointments between 10.30am - 12.30pm and 2.30pm - 4.00pm Monday to Friday ONLY (email stosec@tcd.ie to arrange an appointment).

## What is a Tutor?

A Tutor is a member of the academic staff who is appointed to look after the general welfare and development of the students in his/her care. Whilst the Tutor may be one of your lecturers, this is not always the case as the role of the College Tutor is quite separate from the teaching role.

## When should I go to see my Tutor?

You should visit your Tutor whenever you are worried or concerned about any aspect of College life or indeed your personal life, especially if it is affecting your academic work. The conversation with your Tutor takes place in strictest confidence. Unless you give him/her permission to do so, s/he will not divulge information given to them to anybody, whether a member of College or to anyone outside College (to your parents/family for example). Your Tutor can only help you if s/he knows you are facing difficulties, so if you are worried about anything go and see your Tutor before things get out of hand.

Further information on the Senior Tutors Office and College Tutors may be found via the following webpage: Senior Tutor Services- https://www.tcd.ie/seniortutor/students/undergraduate/

# Disability Services

The Disability Service aims to provide appropriate advice, support and information to help students and staff with disabilities. The Disability Service has in place a range of supports to ensure that students with disabilities have full access to the same facilities for study and recreation as their peers. Most students registering with the Disability Service request access to a range of supports that help the student reach their full potential while studying. Most

students' needs are accommodated through these supports. The student decides what level of support they require.

For contact information or to make an appointment please contact the Disability Services – contact details are available via the following webpage:

https://www.tcd.ie/disability/contact/

## Student Learning Development

Student Learning Development offers support in a variety of study and learning skills including essay writing, exam preparation, study skills, self and time-management and note taking. Mechanisms of support are workshops, individual appointments and drop-in clinics.

For new students: https://www.tcd.ie/sld/your-student-journey/new-to-trinity/

For Undergraduate Students: https://www.tcd.ie/sld/your-student-journey/undergraduate-students/

For Postgraduate Students: https://www.tcd.ie/sld/your-student-journey/postgraduate-students/

For general information on all resources and supports available visit: https://www.tcd.ie/sld/

## Student Health and Wellbeing

### College Health Service

Trinity Health Services have GP services available for the following Opening Hours:

Please contact us on 01 8961556 or 01 8961591 between 9am and 1pm and from 2-4:30pm

You can email collegehealth@tcd.ie , but please note that this email is NOT FOR ANY MEDICAL/CLINICAL enquiries and is not manned to manage clinical/medical enquiries, strictly only admin.

The Physiotherapist operates daily between 09.00 and 13.00 and also Monday/Tuesday afternoons during term time.

For further information visit: https://www.tcd.ie/collegehealth/

## Student Counselling

The Student Counselling Service is here to help you to manage any difficulties you are experiencing so you can enjoy and fully participate in your time here at College.

If you wish to make an appointment with the Student Counselling Service, please consider one of the options below. If you have any other queries you can call into reception on the 3rd floor of 7-9 South Leinster Street or contact us on:

Phone: (01) 896 1407

Email: student-counselling@tcd.ie

For further information visit the following webpage: https://www.tcd.ie/StudentCounselling/

## Student Life

Student life offers information on Supports and Services, Clubs and Societies, Student Unions etc., https://www.tcd.ie/students/

## Academic Registry

The Academic Registry is responsible for services that support the complete student lifecycle of Trinity College Dublin – from application to graduation.

For information on Registration, Fees, Grants, ID Cards etc. visit the Academic Registry (AR). AR is located in in the Watts Building, on the first floor, or visit the AR website: https://www.tcd.ie/academicregistry/

Queries can be emailed to academic.registry@tcd.ie, or you can telephone 01 896 4500 during office hours.

## Student Accommodation

CAMPUS: The Accommodation Office is open Monday to Friday from 8.30am to 1pm and 2pm-5pm each day. Queries can be emailed to residences@tcd.ie, or you can telephone 01 896 1177 during office hours.

After hours you can contact Front Gate at 01 896 3978 in case of difficulties or key problems. In Goldsmith Hall attendants are on duty in the residential area at weekends and overnight and they will assist with local problems.

In the event of a serious emergency, particularly where you require the attendance of ambulance, fire or police services please telephone College Security at 01 896 1999 (internal 1999).

To ensure a co-ordinated response please do not call these services directly. We recommend that you programme these numbers into your mobile phone using the prefix “01” before the number.  https://www.tcd.ie/accommodation/

# Appendix 1

| Item | Reference/Source |
|---|---|
| General College Regulations | Calendar, Part II, General Regulations and Information |
| Emergency Procedures | In the event of anemergency, dial Security Serviceson extension 1999<br>Security Services provide a 24-hourservice 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 alwaystelephone extension 1999 (+353 1 896 1999) in case of an emergency.<br>Should you require any emergencyor rescue services on campus, you must contact Security Services.<br>This includes chemical spills,personal injury or first aid assistance.<br>It is recommended that all studentssave at least one emergency contact in their phone under ICE (In Case of Emergency). |
| Health and Safety | School of Natural Sciences Health, Safety and Welfare |
| Data Protection | Trinity College Data Protection |
| Academic Integrity | Academic Integrity Policy |
| Research Ethics | Research Ethics |
| Blackboard | Blackboard |

| Item | Reference/Source |
|---|---|
| Academic Credit System (ECTS) and Module Regulations | Academic Credit System (ECTS) and Module Regulations |
| Assessment and Progression Regulations | Undergraduate Progression and Awards Regulations |
| Prizes & medals | Prizes and awards |
| Equality, Diversity and Inclusion | Equality, Diversity and Inclusion |
| Study Abroad | Trinity Global |
| Framework of qualifications | The National Framework of Qualifications |
| Attendance Requirements | Calendar, Part II, General Regulations and Information, Section II, Items 17-23 |
| Student Cases | Academic Registry, Student Cases |
| Student complaints procedures | Complaints Procedure |
| General Examination Guidelines | Exam Guidelines - Academic Registry - Trinity College Dublin |

| Item | Reference/Source |
|---|---|
| Academic Policies and Procedures | Academic Policies and Procedures |
| Registration | Academic Registry, Student Registration |
| Student supports | Current Students |
| STEM Schools and Disciplines | STEM School and Disciplines |
| Alumni Student Mentoring programme | Mentoring Programme |