



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

Science at Trinity

Faculty of Science, Technology, Engineering and Mathematics (STEM)

TR062

Geography & Geosciences

Sophister Course Programme 2021- 2022



tcd.ie/science

TR062 Geography & Geosciences Sophister Booklet 2021-2022

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Welcome

Dear Students

Congratulations – you are nearing the end of the Freshman years of your degree and are ready to make the important decision about which science Moderatorship you wish to pursue. The Freshman course structure has given you an excellent grounding in your core subject to prepare you for the advanced material you will cover in your Sophister years. You have also had opportunities to take open modules in other science subjects that have given breadth and context to your science education.

Development of educational breadth continues in the Sophister years via the opportunity to take further open modules and also Trinity Electives. Trinity Electives are stand-alone, College-wide modules that enable you to broaden your knowledge outside of your chosen subject. There is a wide range of choice available to you that encompasses languages and cultures, key societal challenges and Trinity's ground-breaking research activities. A list of the modules can be found at this link (<https://www.tcd.ie/trinity-electives/electives/>). Having the opportunity to develop these broader skills, particularly in communication and presentation, will allow you to derive the greatest benefits from your particular choice of Moderatorship subject and will give you important insights into other subjects and modes of scholarship outside of the sciences.

I wish you the very best in your Sophister years and look forward to seeing your future successes and achievements.

Prof Áine Kelly
Associate Dean of Undergraduate Science Education

Foreword

The purpose of this booklet is to provide you with information on courses that will be available to you in the Sophister (3rd and 4th) years in Geography and Geoscience. For those of you who entered the TR062 Geography and Geoscience programme, you now have to decide which Moderatorship subject (degree course) you wish to study. For some this will be very easy, because you have known from entry which course you wish to follow. For others of you, the decision may require a bit more thought and this booklet is designed to furnish you with all the information you need to make your choice.

The TR062 programme is designed so that many sophister modules are available to students from both Moderatorships, reflecting the closely aligned nature of Geography and Geoscience. The distinctive nature of the two courses comes from the combination of subject material that can be taken alongside these shared modules. If you have developed an interest in studying Geography, spanning the physical, human and environmental aspects of the discipline, you are advised to select the Moderatorship in Geography. This will give you access to a wider range of Geography modules than are available to those selecting Geoscience, permitting you to pursue a broad programme in Geography or to specialise in a particular sub-field of the discipline. If your interests are more aligned with studying the physical, chemical and biological mechanisms of Earth system function, extending from contemporary processes through to those operating over deep time, you are advised to select the Geoscience Moderatorship which replaces the former Trinity degree programmes in Earth Science and Geology. This will give you access to a wider range of Geoscience modules than are available for those selecting Geography, allowing you to pursue a broad programme combining Physical Geography and Geology or to specialise in one of these areas.

I wish you well over the next two years, whatever choices you make, and I trust you will maintain the tradition we have of producing the very highest quality of Science graduates.

Dr Robin Edwards
Director of the Geography and Geoscience Course

Introduction

Sophister courses in Science are organised so that students follow a continuous programme of work over two years leading to a Moderatorship in a particular subject. Each module has a specified credit value, where one credit represents a minimum of 20 hours of student work. This work will comprise a varying balance of contact hours (e.g. time in lectures, practicals or the field), time for independent study and time spent undertaking coursework or examinations. Students take modules to the value of 60 credits in each of the Sophister years.

The Sophister Course Booklet is intended as a guide to the Moderatorships in Geography and Geoscience. More detailed descriptions of module content and assessment requirements will be published in the individual Moderatorship handbooks at the start of each academic year.

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

The information in this booklet is accurate at the time of going to print but maybe subject to minor changes.

Allocation of Places

The Science Course office coordinates and processes the applications for Junior Sophister places in the TR062 programme. The procedures are documented below to show students that places are allocated in a fair, transparent and efficient manner.

Allocation is based on the overall mark obtained in the Senior Freshman examinations and the order of choice as expressed by the student.

Decisions on places are made by the Science Course Office and students cannot be allocated a place by circumventing the Science Course Office and going to the disciplines directly. All enquiries with regard to the allocation of places made to the disciplines will be redirected to the Science Course Office science@tcd.ie.

Places will be allocated in the following way until quotas are reached:

1. All students passing their Senior Freshman semester one and semester two examinations will be ranked in merit order on the basis of their overall mark. Students failing the Senior Freshman examinations must reapply for the remaining unfilled places until quotas are reached. Second round choice of subject forms will be made available on-line <https://www.tcd.ie/Science/TR062/>. Click on Junior Sophister on the left menu then click on Moderatorship Choice Form, following publication of the Senior Freshman examination results.
2. The closing date for the online second round form is Friday 23rd July 2021.
3. Examination results will be available on your personal portal at my.tcd.ie.

4. Publication of the JS places will be available through my.tcd.ie portal by the end of June 2021.
5. Students are informed by email when the places are published, and the procedures followed are clearly outlined in the email.
6. Students opting to go 'off books' rather than take up the place offered, will be treated as rising JS students in the following year. Places will not be reserved for such students. Students who apply for readmission will be considered for a place in the same way as the year in which they qualified (if a student did not qualify for a place in the first round, they will not be considered in the first round when they apply for readmission to the College).
7. Students who fail their Junior Sophister examinations will be treated ex-quota in relation to that Moderatorship.
8. Students who are given permission by the Senior Lecturer to defer their examinations until the reassessment examination session can defer a place in their **first** preference only. Following publication of the reassessment examinations, students who passed Senior Fresh examinations at the reassessment session will be allocated a place based on the same criteria used in the summer allocation of places. If the student in this category does not qualify for the deferred place, the Science Course Administrator will offer that student a place in the other Moderatorship available in the second round and the deferred place will be offered to the next qualified student from the first-round allocation.

Special note: Students who have passed their Senior Fresh examinations may not repeat the SF year in order to improve their performance.

Moderatorship Quotas

The numbers of places available in each Moderatorship subject is limited by quota as outlined below:

- TR062 Geography = 18 places
- TR062 Geoscience = 42 places

Moderatorship Choice Form

The choice of subject form is available online: <https://www.tcd.ie/Science/TR062/>. Click on Junior Sophister on the left menu then click on Moderatorship Choice Form

The closing date for submissions is **Friday 30th April 2021**.

Module Choice Forms

The Junior Sophister year consists of 60 credits spread over two semesters in the academic year (see individual moderatorship structures under each section in the following pages). Students are required to take a balanced programme of 30 credits in each semester.

In addition to the mandatory core modules (40 credits), students choose modules to the value of 20 credits from a list of open modules to include one or two Trinity Electives as indicated in the Module Structure tables under each moderatorship subject (10 credits in each semester).

Student will choose the open modules with the help of the Moderatorship Course Adviser following the allocation of moderatorship places. Online forms will be available on the Science web site <https://www.tcd.ie/Science/>.

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 to develop breadth within their education. Science students take a minimum of one and a maximum of two Trinity Electives in the Junior Sophister year. 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; some exceptions may apply to your moderatorship that are outlined in the Trinity Electives webpage (e.g. From Planets to the Cosmos is not available to TR063 Physical Sciences students, for obvious reasons).

Selection will be made through online enrolment which will open in July 2021, after publication of results and allocation of moderatorships. You will be asked to list your choice(s) of Trinity Elective in order of preference. Places are allocated according to a computer algorithm and are allocated based on student preference and places available in the Trinity Elective. Exam results are not factored into this algorithm.

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 will need to think carefully about your choice of Trinity Elective as the semester in which you take the module (Semester 1, Semester 2 or both) will affect the Open Modules that you can take – refer carefully to the tables in this handbook.

Please note that you CANNOT change your Trinity Elective so choose carefully!!!

Summary of Process

May: Results are published

June: Moderatorships are allocated.

Students apply for Trinity Electives through an online portal on the Trinity Electives website. Trinity Electives are allocated by computer algorithm.

Students are informed of Trinity Elective allocation. **THERE IS NO CHANGE OF MIND.**

Following this process, students will select their Open Modules.

Non-Satisfactory Attendance and Coursework

All students must fulfil the course requirements of the school or department, as appropriate, with regard to attendance and course work. Where specific requirements are not stated, students may be deemed non-satisfactory if they miss more than a third of their course of study or fail to submit a third of the required course work in any term.

At the end of the teaching term, students who have not satisfied the school or department requirements, may be reported as non-satisfactory for that term. Students reported as non-satisfactory for the Michaelmas and Hilary terms of a given year may be refused permission to take their semester two assessment/examinations and may be required by the Senior Lecturer to repeat their year <https://www.tcd.ie/undergraduate-studies/academic-progress/attendance-course-work.php>.

Please refer to the relevant handbook for moderatorship regulations.

Junior Sophister Examination Information

Modules are assessed by continuous assessment and/or by examination. The Junior Sophister year carries a total of 60 credits. The scheme of distribution of marks between papers and practical work at the Sophister examinations will be published by individual schools or departments/disciplines.

Calculation of Moderatorship results

The final moderatorship results are calculated as a weighted average of the overall result for the Junior Sophister (30%) and Senior Sophister (70%) assessment results.

Reassessment Regulations

Reassessment is available in all years.

Students may not present for reassessment in a module they have passed.

Capping of marks will not be applied for reassessment.

Repeat Year regulations

Students who fail to satisfy the requirements of their year at the Reassessment session are required to repeat the year in full (i.e. all modules and all assessment components).

Students are permitted to repeat any year of an undergraduate programme subject to, not repeating the same year more than once and not repeating more than two academic years within a degree course, except by special permission of the University Council (see calendar <https://www.tcd.ie/calendar/undergraduate-studies/general-regulations-and-information.pdf>).

The option to repeat a year on 'off-books' basis will be at the discretion of the Senior Lecturer (see Calendar <https://www.tcd.ie/calendar/undergraduate-studies/general-regulations-and-information.pdf>).

Dates to Note

| Date | |
|-----------------------------------|--|
| 19 th April 2021 | Semester 2 - Hilary Lecture Term ends |
| 6 th April 2021 | TR060 Virtual Moderatorship Fair |
| 30 th April 2021 | Closing date – Submit choice of Moderatorship forms |
| 11 th May 2021 | Semester 2 Examinations begin (TBC) |
| 23 rd May 2021 | Semester 2 Examination ends (TBC) |
| 25 th May 2021 | Deferred Semester 1 Examination begin (TBC) |
| 30 th May 2021 | Deferred Semester 1 Examination ends (TBC) |
| late June 2021 | Publication of Examination results (TBC) |
| late June 2021 | Allocation of JS Moderatorship places |
| late June 2021 | Notification of JS Moderatorship places |
| Friday 23 rd July 2021 | Closing date – 2 nd Round Choice Moderatorship Form |

N.B. These dates are accurate going to print but may be subject to change.

TR062 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 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 JS programme comprises **40 credits** of mandatory core modules that are taken by all TR062 Geography students. Students are required to select an additional **20 credits** of modules, ensuring that **10 credits** are chosen **in each semester**. 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.

| TR062 Science (Geography) – Junior Sophister Year | |
|--|---|
| Semester 1 (S1) | Semester 2 (S2) |
| MANDATORY CORE MODULES (40 Credits) | |
| GGU33001 Geography Residential Field Course (10 Credits) | |
| GGU33933 Geographical Information: Data & Tools (5 Credits) | GGU33928 Advanced Research Methods in Geography 1 (5 Credits) |
| GGU33010 Living on the Edge: Estuaries and Coasts (5 Credits) | GGU33011 Earth's Climate Past, Present and Future (5 Credits) |
| GGU33958 Red Planet (5 Credits) | GGU33012 Natural Hazards (5 Credits) |
| Trinity Elective (5 credits) + THREE Open Modules (15 credits) | |
| Trinity Elective (S1) (5 Credits) | Trinity Elective (S2) (5 Credits) |
| GSU33002 Blue Earth: Understanding the Function of Marine Ecosystems (5 Credits) | GGU33931 Environmental Governance 1 (5 Credits) |
| GSU33003 Ice Age Earth (5 Credits) | GGU33915 Globalisation and Geopolitics (5 credits) |
| GGU33939 Exploring the Sustainable City (5 Credits) | GGU33937 Urban Economic Structure & Regeneration (5 credits)* |
| BOU33105 Global Environmental Change (5 Credits) | BOU33123 Soil Science (5 Credits) |

*Module may be unavailable 2021-22

Core Modules (Mandatory)

GGU33001 Geography Residential Field Course

10 Credits

This residential field trip will introduce students to specific examples that illustrate the interplay between human society and the environment in a particular geographical setting. During the trip, key themes will be explored on set days, with students 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.

Assessment: Course work (100%)

GGU33933 Geographical Information: Data & Tools (S1)

5 Credits

This module explores how to identify, create and use geographic data and tools. The object is to teach students how data are constructed, used, found, and manipulated by geographic researchers. The module will enable students to: interpret maps; find and evaluate data; organise, manipulate and analyse data in statistical packages and GIS; create projects and maps using GIS; identify how geographic data construction and analysis differs from typical quantitative approaches.

Assessment: Course work (100%)

GGU33010 Living on the Edge: Estuaries and Coasts (S1)

5 Credits

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.

In this module students will gain wide ranging theoretical and practical skills required to address these challenges. The lectures and seminars will highlight 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. A day-field trip and practical exercise will challenge students to apply what they have learnt to real-world coastal management problems.

Assessment: Course work (100%)

GGU33958 Red Planet (S1)**5 Credits**

Almost all major planets and moons in our Solar System have been visited by spacecraft and the data they have returned has revealed the incredible diversity of planetary surfaces. This module travels from the formation of our solar system and evolution of the planets and moons to contemporary surface processes, focussing on our current understandings of planetary systems. Planetary image and remote sensing data are used to highlight the differences and similarities of desert landforms of our solar system and to explore how landforms and geomorphic processes vary under different atmospheric, gravity and temperature regimes. You will be introduced to geomorphic features that are not found on Earth. We will investigate how geomorphologists use landforms on Earth to understand those on other solar system bodies. There will be opportunities for students to interact with NASA and ESA scientists and explore the prospect of human exploration of our solar system with them.

Assessment: Course work (100%)

GGU33928 Advanced Research Methods in Geography (S2)**5 Credits**

This module helps students develop the research skills required to plan and undertake their final year 'Capstone Project' in Geography. The module focuses on approaches to solving geographic problems, although topics such as ethics, integrity, professionalism, philosophy, research project design, and presentation skills are also covered. Some preparatory work (e.g. project selection) may be required prior to the start of this module, details of which will be circulated at the start of the academic year.

Assessment: Course work (100%)

GGU33011 Earth's Climate: Past, Present and Future (S2)**5 Credits**

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.

Assessment: Course work (100%)

GGU33012 Natural Hazards (S2)**5 Credits**

Short-lived, high magnitude extreme events (e.g. meteorite impacts, volcanic eruptions, fire, storms etc) have shaped the surface of the earth throughout its geological history. Increasing population densities in critical locations on our planet 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. 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 addresses these elements, providing an introduction to 'natural' hazards, general concepts of risk and vulnerability, and case studies from an applied natural hazard and risk management perspective.

Assessment: Course work (100%)

Open Modules (Optional)

Students are required to take either **TWO** or **THREE** 'open' modules from the TR062 Geography programme depending on the number of Trinity Electives they select to undertake (See 'Trinity Electives' for further details). Module outlines are presented below along with a series of illustrative pathways that may be useful when considering your choice of open modules.

Pathways A and B are suitable for a student considering undertaking a human geography capstone project.

| TR062 Geography (Pathway A) | |
|---|--|
| Semester One (S1) | Semester Two (S2) |
| Trinity Elective | Any two from: <ul style="list-style-type: none"> • GGU33915 Globalisation and Geopolitics • GGU33937 Urban Economic Structure & Regeneration • GGU33931 Environmental Governance 1 |
| GGU33939 Exploring the Sustainable City | |

| TR062 Geography (Pathway B) | |
|---|---|
| Semester One (S1) | Semester Two (S2) |
| Trinity Elective | Trinity Elective |
| GGU33939 Exploring the Sustainable City | GGU33915 Globalisation and Geopolitics OR GGU33937 Urban Economic Structure & Regeneration OR GGU33931 Environmental Governance 1 |

Pathways C and D are suitable for a student considering undertaking a physical geography capstone project.

| TR062 Geography (Pathway C) | |
|--|---|
| Semester One (S1) | Semester Two (S2) |
| Any two from: GSU33002 Blue Earth: Understanding the Function of Marine Ecosystems GSU33003 Ice Age Earth BOU33105 Global Environmental Change | Trinity Elective |
| | GGU33931 Environmental Governance 1 OR BOU33123 Soil Science |

| TR062 Geography (Pathway D) | |
|---|---|
| Semester One (S1) | Semester Two (S2) |
| Trinity Elective (5 credits) | Trinity Elective (5 credits) |
| GSU33002 Blue Earth: Understanding the Function of Marine Ecosystems OR GSU33003 Ice Age Earth | GGU33931 Environmental Governance 1 OR BOU33123 Soil Science |

Other modules combinations are available, but students are advised to consider module prerequisites carefully when making their selections. Further advice on module choice will be available at the TR062 Sophister Information Session.

GSU33002 Blue Earth: Understanding the Function of Marine Ecosystems (S1) 5 Credits

Even though we call it 'Earth', it is the ocean that plays the central role in our planet's climate system, and marine biogeochemical processes regulate the impact of human activity on the global environment. Studying marine biogeochemistry provides working insights on how to adapt to climate and environmental change, enhance food production, manage fisheries and aquaculture, mitigate pollution, and innovate by developing new products including drugs and decarbonation technologies.

This module will concentrate on the key processes that regulate the climate and marine biology, from ecosystems to cells. The module will cover the biogeochemistry of marine and coastal systems, including coral reefs, estuaries and wetlands, processes regulating the formation and fate of organic matter in the marine environment, and introduce analytical and modelling techniques in marine biogeochemistry.

Assessment: Course work (100%)

GSU33003 Ice Age Earth (S1) 5 Credits

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

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

GGU33939 Exploring the Sustainable City (S1) 5 Credits

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?

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. 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.

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

BOU33105 Global Environmental Change (S1) 5 Credits

The global environment is changing more rapidly at present than at any time during the human occupancy of the planet. This module reviews the existence of the changing environment and the predictions for the future. Continual assessment consists of a mini desk study on the environmental pressures faced by a given country, and also a soil respiration practical where climate change is linked to increases in heterotrophic soil respiration

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

GGU33931 Environmental Governance 1 (S2) 5 Credits

Despite growing awareness of the 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. This historically informed understanding 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.

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

GGU33915 Globalisation & Geopolitics (S2)

5 Credits

This module examines the impacts of globalisation in both the developed and developing world and its relation to geopolitics. Particular emphasis is placed on the theories of geopolitics and globalisation and topics covered include the implications of the rise of China and its international relations in the developing world, “shadow globalisation” – human, arms and drug trafficking and resistance to these processes through social movements, amongst others.

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

GGU33937 Urban Economic Structure & Regeneration (S1: may not run AY2122) 5 Credits

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.

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

BOU33123 Soil Science (S2)

5 Credits

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.

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

TR062 Geography Senior Sophister Programme

| TR062 Science (Geography) – Senior Sophister Year | |
|--|---|
| Semester 1 (S1) | Semester 2 (S2) |
| MANDATORY CORE MODULE (20 Credits) | |
| GGU44930 Geography Dissertation (20 Credits) | |
| OPTIONAL OPEN MODULES (40 Credits – 20 Credits per Semester) | |
| GGU44974 Glaciers and Glaciation (10 Credits) | GGU44975 Coastal Wetlands (10 Credits) |
| GGU44969 Urban Geography: Cities, Space and Culture (10 Credits) | GGU44968 Historical Geography (10 Credits) |
| GGU44933 GIS and Remote Sensing Applications in Geography (5 Credits) | GGU44927 Environmental Governance 2 (5 Credits) |
| BOU44111 Restoration Ecology and Rewilding (5 Credits) | GGU44936 Globalisation and African Development (5 Credits) |

IMPORTANT NOTE: Senior sophister modules are subject to change. The module outlines listed below are based on the offerings for the academic year 2021-22. Whilst this can be regarded as indicative of the kind of content that will be available in 2022-23, the precise details of modules and their availability may vary from year to year.

Core Module (Mandatory)

GGU44930 Geography Dissertation

20 credits

The dissertation is an independent, individual research project in which field work, or the study of original source material is expected to play an important role. Students experience the entire research process, from framing the enquiry to communicating findings in the form of a dissertation. It is a test of a student's ability to negotiate the challenges of research design, project execution and dissertation writing. Specific research topics will be based on the current academic staff expertise in Geography (e.g., from the geographies of online media to nature-based solutions to coastal erosion). Data can be collected in a variety of ways - such as through field sampling or survey, satellite, drone or airborne remote sensing, laboratory analysis, questionnaire surveys, interviews, content analysis, census material or archival work or some combination of these - depending on the topic chosen.

Open Modules (Optional)

Students select **40 credits** of open modules during their Senior Sophister year (20 credits each Semester). Module selection may be limited by prerequisites or quotas.

GGU44974 Glaciers and Glaciation (S1)

10 Credits

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.

Prerequisites: None

Assessment: Course work (100%)

GGU44969 Urban Geography: Cities, Space and Culture (S1)

10 credits

This module will introduce students to key debates and concepts in urban geography that shed light on what it means to live in an 'urban society'. The first part of the module will outline how political economic processes, including the relationship between the supply of credit and the role of the property development sector and the role of entrepreneurial urbanism, produce urban space in highly uneven ways. The second part of the module will examine social and cultural geographies of cities, focusing on the role of identity and difference in shaping urban space and everyday life. The module will also use Dublin as a key case study and research laboratory to explore how these processes are shaping that city. Focussing on contemporary events, it will bring together rich and varied scholarship from leading researchers in Dublin and the experiential analysis of policy makers, community activists, and a range of other urban actors.

Prerequisites: None

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

GGU44933 GIS and Remote Sensing Applications in Geography (S1)

5 Credits

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 both the theory behind GIS and 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 geospatial information, with particular emphasis placed on resolution and accuracy, both spatially, temporally, and in the spectral domain. The module contains an appropriate amount of

hands-on learning, both within the classroom and in students' own time via accessible web-based platforms/software.

Prerequisites: GGU33933

Assessment: Course work (100%)

BOU44111 Restoration Ecology and Rewilding (S1)

5 Credits

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 to 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.

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

Assessment: Continuous Assessment (50%) and end of semester examination (50%).

GGU44975 Coastal Wetlands (S2)

10 Credits

Historically seen as 'wasteland', coastal wetlands are now recognised for providing a plethora of ecosystem services to coastal communities, such as sequestering carbon, buffering against the impact of sea level rise, coastal, flooding and erosion, and as valuable blue-green spaces for mental and physical recreation. At the same time, erosion and loss of coastal wetlands is reported from across the globe. Retaining existing and restoring lost wetlands is becoming a key challenge that must be addressed to meet ambitious climate and biodiversity targets. But how do we achieve that? This module provides a scientific understanding of how saltmarsh and mangrove systems, are shaped by tides, waves, sediment supply, climate, and human land use; how they provide ecosystem services and why they are experiencing degradation throughout the world. It includes practical fieldwork to map, measure, and describe saltmarsh geomorphology, ecology, and the action of biophysical processes that shape coastal wetlands through a mini-project carried out on the wetlands in Dublin Bay.

Prerequisites: None

Assessment: Course work (100%)

GGU44968 Historical Geography (S2)

10 Credits

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.

Prerequisites: None

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

GGU44927 Environmental Governance 2 (S2)**5 Credits**

This module introduces students to the interdisciplinary field of political ecology; political ecology seeks to better understand the complex drivers and uneven consequences of socio-environmental change. The module will provide students with the conceptual and methodological tools to carry out critical, independent research on an environment-related topic. The objective of the course is for students to come away with a critical “toolkit” for thinking, writing, and acting on complex social and ecological problems in Ireland and elsewhere. It is also hoped that the research carried out by the students will provide valuable and critical insights for a wider audience interested in environmental issues in Ireland.

Prerequisites: GGU33931 Environmental Governance 1

Assessment: Course work (100%)

GGU44936 Globalisation and African Development (S2)**5 Credits**

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”. Other topics covered included gender and the mobile phone revolution.

Prerequisites: None

Assessment: Coursework (50%); end of semester examination (50%).

TR062 BA Mod in SCIENCE (GEOSCIENCE)

Geoscience combines the study of geology, geography, chemistry, physics and biology, to develop a complete understanding of how the earth works. The work of geoscientists helps us understand the changing climate, predict earthquakes and volcanic eruptions, find supplies of energy and raw materials, maintain clean air and water, understand the motion of the earth's crust and oceans, and reconstruct the evolution of rocky planets and life.

Geoscience Learning Outcomes

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

- Demonstrate a thorough working understanding of the scientific method, the nature of scientific knowledge and its evolution over time.
- Discuss the core principles of Geoscience and apply the scientific method to the study of Geographical and Geological problems.
- Explain the interdisciplinary nature and acquisition of scientific knowledge, illustrating the relationships among geographical and geological sciences and cognate disciplines.
- Formulate and test hypotheses in order to make logical and scientific arguments based on current data.
- Collect qualitative and quantitative data with precision and organisation, using specific geographical and geological technical skills.
- Analyse and critically evaluate data using appropriate mathematical, statistical, computational and other relevant methods.
- Conduct geographical / geological research independently and as part of a team.
- Critically evaluate current and novel concepts and ideas.
- Communicate effectively in written, oral, electronic and social media formats to scientific and non-scientific audiences.
- Discuss the role and influence of scientific knowledge on society and illustrate its application in the geosciences.

TR062 Geoscience Junior Sophister Programme

The JS programme comprises **40 credits** of mandatory core modules that are taken by all TR062 Geography students.

Students are required to select an additional **20 credits** of modules, ensuring that **10 credits** are chosen **in each semester**. 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.

| TR062 Science (Geoscience) – Junior Sophister Year | |
|--|--|
| Semester One | Semester Two |
| CORE MODULES (40 Credits) | |
| GSU33002 Blue Earth: Understanding the Function of Marine Ecosystems (5 Credits) | GSU33001 Research Methods for Geoscientists (5 Credits) |
| GSU33003 Ice Age Earth (5 Credits) | GLU33005 Volcanism and Magmatism (5 Credits) |
| GLU33004 The Crystal World (5 Credits) | GSU33007 Junior Sophister Geoscience Field Course (10 Credits) |
| GLU33006 Stratigraphy: Earth Through Time (5 Credits) | |
| Trinity Elective (5 credits) + THREE Open Modules (15 credits) | |
| Trinity Elective (5 Credits) | Trinity Elective (5 Credits) |
| GGU33958 Red Planet (5 credits) | GLU33928 Structural Geology (5 Credits) |
| GGU33933 Geographical Information: Data and Tools (5 Credits) | GLU33008 Metamorphic Rocks and Processes (5 Credits) |
| GGU33010 Living on the Edge: Estuaries and Coasts (5 Credits) | GGU33011 Earth's Climate Past, Present and Future (5 Credits) |
| ZOU33010 Fundamentals of Ecology (5 Credits) | GGU33012 Natural Hazards (5 Credits) |
| BOU33105 Global Environmental Change (5 Credits) | GLU33009 Hydrology and Groundwater Quality (5 Credits) |
| | BOU33123 Soil Science (5 Credits) |

Core Modules (Mandatory)

The following modules are **core** for students taking the TR062 Geoscience Moderatorship.

GSU33002 Blue Earth: Understanding the Function of Marine Ecosystems (S1) 5 Credits

Even though we call it 'Earth', it is the ocean that plays the central role in our planet's climate system, and marine biogeochemical processes regulate the impact of human activity on the global environment. Studying marine biogeochemistry provides working insights on how to adapt to climate and environmental change, enhance food production, manage fisheries and aquaculture, mitigate pollution, and innovate by developing new products including drugs and decarbonation technologies.

This module will concentrate on the key processes that regulate the climate and marine biology, from ecosystems to cells. The course will cover the biogeochemistry of marine and coastal systems, including coral reefs, estuaries and wetlands, processes regulating the formation and fate of organic matter in the marine environment, and introduce analytical and modelling techniques in marine biogeochemistry. This module will prepare students for related modules, field and lab work in Geography, Environmental Sciences and Oceanography.

Assessment: Course work (100%)

GSU33003 Ice Age Earth (S1) 5 Credits

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

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

GLU33004 The Crystal World (S1) 5 Credits

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.

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

GLU33006 Stratigraphy: Earth Through Time (S1)**5 Credits**

We live on a planet that has evolved dramatically since 4.55 billion years ago (Ga). As known from the geological record, there was little oxygen in the atmosphere until about 2.6 Ga, while equatorial latitudes had thick ice sheets at 650 million years ago (Ma), and greenhouse conditions turned the poles ice free at 100 Ma; life on Earth has adapted accordingly. This module sets the foundation for how to reconstruct the history of our planet, from the samples and techniques employed, through the controversies that remain. It will address the fundamental question of how to constrain geological time, and why this is important to unravel the fundamental processes that control the Earth system.

Assessment: Coursework (100%)

GSU33001 Research Methods for Geoscientists (S2)**5 Credits**

The objective of this module is to develop the research skills required to plan and execute an individual piece of guided research (the capstone project). Students undertaking a Geosciences research project will receive some basic training in research design, critical evaluation of academic literature, and presentation skills. They will then be embedded in a research group and receive specialist training in their chosen topic, culminating in the production of a research proposal that will be implemented in the final year of study. Students undertaking a Geological Survey capstone project will receive specialised training in geological mapping and instruction on how to translate field data into publication quality geological maps, cross-sections and reports.

NOTE: The geological survey training is partially delivered in a field school. Students will be required to make a financial contribution to the cost of the trip (approximately €350).

Further details on the capstone project will be provided at the start of the academic year.

Assessment: Course work (100%)

GLU33005 Volcanism and Magmatism (S2)**5 Credits**

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.

Assessment: Coursework (50%); end of semester examination (50%)

GSU33007 Junior Sophister Geosciences Field Course (S2)**5 Credits**

Undergraduate field courses provide vital experience in practising core subject skills. In this module students will embark on a two-week overseas field excursion designed to provide first-hand experience of working in unfamiliar geological contexts. Particular emphasis is placed on the collection of high-quality field observations and their subsequent interpretation.

IMPORTANT NOTE: This module will take place overseas and is slated to run in the final week of Semester 2 and Trinity Week. Students will be required to make a financial contribution to the cost of the trip (approximately €800). Further details will be provided at the start of the academic year.

Open Modules (Optional)

Students are required to take either **TWO** or **THREE** 'open' modules from the TR062 Geoscience programme depending on the number of Trinity Electives they select to undertake (See 'Trinity Electives' for further details).

Important note on selecting a Trinity Elective

Due to the mandatory residential field course, students will be away from College during the final week of Semester Two. Students wishing to take an elective from Semester Two should check that their absence from the final week of the module will not impact on assessment.

Module outlines are presented below along with a series of illustrative pathways that may be useful when considering your choice of open modules.

Pathway A is suited for a student with an interest in geology. This pathway is **mandatory** for students considering a "Geological mapping" type capstone project. (Note: students taking pathway A can undertake a "Geosciences research" type project if preferred).

| TR062 Geoscience (Pathway A) | |
|---|--|
| Semester One (S1) | Semester Two (S2) |
| Trinity Elective | GLU33928 Structural Geology |
| GGU33958 Red Planet OR GGU33933 Geographical Information: Data and Tools OR GGU33010 Living on the Edge: Estuaries and Coasts | GLU33008 Metamorphic Rocks and Processes |

Pathways B and C are suited to a student with an interest in physical geography and (predominantly) contemporary earth surface processes.

| TR062 Geoscience (Pathway B) | |
|---|--|
| Semester One (S1) | Semester Two (S2) |
| Trinity Elective | Any two from: |
| GGU33958 Red Planet OR GGU33933 Geographical Information: Data and Tools OR GGU33010 Living on the Edge: Estuaries and Coasts | |
| | <ul style="list-style-type: none"> • GGU33011 Earth's Climate Past, Present and Future • GGU33012 Natural Hazards • GLU33009 Hydrology and Groundwater Quality • BOU33123 Soil Science |

| TR062 Geoscience (Pathway C) | |
|---|---|
| Semester One (S1) | Semester Two (S2) |
| Any two from: | Trinity Elective |
| | GGU33011 Earth's Climate Past, Present and Future OR GGU33012 Natural Hazards OR GLU33009 Hydrology and Groundwater Quality OR BOU33123 Soil Science |
| <ul style="list-style-type: none"> • GGU33958 Red Planet • GGU33933 Geographical Information: Data and Tools • GGU33010 Living on the Edge: Estuaries and Coasts | |

Pathways D and E are suited to a student with an interest in the environmental / biological aspects of Geoscience.

| TR062 Geoscience (Pathway D) | |
|---|---|
| Semester One (S1) | Semester Two (S2) |
| Trinity Elective | Any two from: <ul style="list-style-type: none"> GGU33011 Earth's Climate Past, Present and Future GGU33012 Natural Hazards GLU33009 Hydrology and Groundwater Quality BOU33123 Soil Science |
| GGU33933 Geographical Information: Data and Tools OR GGU33010 Living on the Edge: Estuaries and Coasts Or BOU33105 Global Environmental Change Or ZOU33010 Fundamentals of Ecology | |

| TR062 Geoscience (Pathway E) | |
|---|---|
| Semester One (S1) | Semester Two (S2) |
| Any two from: <ul style="list-style-type: none"> GGU33933 Geographical Information: Data and Tools GGU33010 Living on the Edge: Estuaries and Coasts BOU33105 Global Environmental Change ZOU33010 Fundamentals of Ecology | Trinity Elective |
| | GGU33011 Earth's Climate Past, Present and Future OR GGU33012 Natural Hazards OR GLU33009 Hydrology and Groundwater Quality OR BOU33123 Soil Science |

Other modules combinations are available, but students are advised to consider module prerequisites carefully when making their selections.

Further advice on module choice will be available at the TR062 Sophister Information Session.

GGU33958 Red Planet (S1)**5 Credits**

Almost all major planets and moons in our Solar System have been visited by spacecraft and the data they have returned has revealed the incredible diversity of planetary surfaces. This module travels from the formation of our solar system and evolution of the planets and moons to contemporary surface processes, focussing on our current understandings of planetary systems. Planetary image and remote sensing data are used to highlight the differences and similarities of desert landforms of our solar system and to explore how landforms and geomorphic processes vary under different atmospheric, gravity and temperature regimes. You will be introduced to geomorphic features that are not found on Earth. We will investigate how geomorphologists use landforms on Earth to understand those on other solar system bodies. There will be opportunities for students to interact with NASA and ESA scientists and explore the prospect of human exploration of our solar system with them.

Assessment: Course work (100%)

GGU33933 Geographical Information: Data & Tools (S1)**5 Credits**

This module explores how to identify, create and use geographic data and tools. The object is to teach students how data are constructed, used, found, and manipulated by geographic researchers. The module will enable students to: interpret maps; find and evaluate data; organise, manipulate and analyse data in statistical packages and GIS; create projects and maps using GIS; identify how geographic data construction and analysis differs from typical quantitative approaches.

Assessment: Course work (100%)

GGU33010 Living on the Edge: Estuaries and Coasts (S1)**5 Credits**

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.

In this module students will gain wide ranging theoretical and practical skills required to address these challenges. The lectures and seminars will highlight 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. A day-field trip and practical exercise will challenge students to apply what they have learnt to real-world coastal management problems.

Assessment: Course work (100%)

ZOU33010 Fundamentals of Ecology (S1)**5 Credits**

This module examines the factors that affect the distribution, growth and survival of plant and animal communities. It describes how organisms interact with their environment and the role that they have in ecosystem and community structure. There is an introduction to the concepts and models that help to explain and predict organism distributions and interactions.

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

BOU33105 Global Environmental Change (S1)**5 Credits**

The global environment is changing more rapidly at present than at any time during the human occupancy of the planet. This module reviews the existence of the changing environment and the predictions for the future. Continual assessment consists of a mini desk study on the environmental pressures faced by a given country, and also a soil respiration practical where climate change is linked to increases in heterotrophic soil respiration

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

GLU33928 Structural Geology (S2)**5 Credits**

This module aims to develop an understanding of structures in three dimensions by introducing the principal means of presenting structural data, namely maps, cross sections and stereographic projections. Students will examine the geometries, kinematics and mechanics of rock deformation. They will also deal practically with the representation of three-dimensional structural data using maps, cross-sections and stereographic projections.

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

GLU33008 Metamorphic Rocks and Processes (S2)**5 Credits**

Metamorphic rocks are the most common rocks on Earth and their compositions and textures provide information on the tectonic history of an area. This module introduces the minerals and mineral assemblages that develop in metamorphosed basic igneous rocks (metabasites), mudstones and shales (pelites) and limestones (calc-silicates) investigations of thin sections, hand samples and maps.

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

GGU33011 Earth's Climate: Past, Present and Future (S2)**5 Credits**

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.

Assessment: Course work (100%)

GGU33012 Natural Hazards (S2)**5 Credits**

Short-lived, high magnitude extreme events (e.g. meteorite impacts, volcanic eruptions, fire, storms etc) have shaped the surface of the earth throughout its geological history.

Increasing population densities in critical locations on our planet 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. 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 addresses these elements, providing an introduction to 'natural'

hazards, general concepts of risk and vulnerability, and case studies from an applied natural hazard and risk management perspective.

Assessment: Course work (100%)

GLU33009 Hydrology and Groundwater Quality (S2)

5 Credits

This module aims to provide students with an understanding of hydrological processes, following the different pathways of water through the terrestrial part of the hydrological cycle. It also aims to familiarise students with the factors affecting groundwater quality, and to develop an understanding of groundwater quality issues in the context of integrated catchment management.

The hydrology component of this module includes the following topics: the hydrological cycle and catchment water balances; rainfall and evapotranspiration; soil water and hillslope hydrology; river flow; hydrogeology; groundwater – surface water interaction.

The groundwater quality component includes groundwater chemistry and natural groundwater quality problems; groundwater quality issues in rural and industrial settings; groundwater vulnerability and protection. The interaction of groundwater and surface water quality is also considered.

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

BOU33123 Soil Science (S2)

5 Credits

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.

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

TR062 Geoscience Senior Sophister Programme

| TR062 Science (Geoscience) – Senior Sophister Year | |
|---|---|
| Semester One | Semester Two |
| MANDATORY CORE MODULES (30 Credits) | |
| GSU44001 Geoscience Capstone Project (20 Credits) | |
| GSU44002 Senior Sophister Geoscience Field Course (5 Credits) | |
| GSU44003 Geoscience Frontiers: Past, Present and Future (5 Credits) | |
| OPTIONAL OPEN MODULES (30 Credits – 15 Credits per Semester) | |
| GLU44009 Geoscience for a Sustainable Planet (5 Credits) | GLU44006 Carbonates: from the Atomic to Planetary Scale (5 Credits) |
| GLU44005 Advanced Palaeontology (5 Credits) | GLU44011 Palaeoceanography and Palaeoclimatology (5 Credits) |
| GLU44010 Hydrocarbon Exploration in Rift Basins (5 Credits) | GLU44008 Early Earth Evolution (5 Credits) |
| GLU44007 Earth Resources for a Critical Future (5 Credits) | GLU44012 Raw Materials in Building (5 Credits) |
| GGU44974 Glaciers and Glaciation (10 Credits) | GGU44975 Coastal Wetlands (10 Credits) |

IMPORTANT NOTE: Senior sophister modules are subject to change. The module outlines listed below are based on the offerings for the academic year 2021-22. Whilst this can be regarded as indicative of the kind of content that will be available in 2022-23, the precise details of modules and their availability may vary from year to year.

Core Modules (Mandatory)

GSU44001 Geoscience Capstone Project

20 Credits

The Geoscience capstone project is a significant piece of individual research conducted under the guidance of a member of academic staff. The project takes one of two forms: 1) a geological survey which aims to solve the geological history and evolution of a specific area over time, presenting the results as a digitised geological map sheet (including cross-sections and stratigraphic column), with an accompanying, descriptive Memoir; or 2) a geosciences research project which addresses specific research questions via field work, laboratory analysis, novel work on museum collection material / pre-existing data sets, or some combination of these, presenting the results in an extended written report (dissertation).

Assessment: Course work (100%)

GSU44002 Senior Sophister Geoscience Field Course

5 Credits

This module comprises a one-week residential field course that is usually held overseas. It provides students with practical experience in conducting primary research across a range of geoscience themes. Students are required to complete a series of guided research tasks and to present the results of their work in evening seminars, and in written form as a field notebook and report. This field course further develops practical fieldwork and problem solving skills. Emphasis is placed on the application of geoscience techniques in real-world situations. Based on previous years, the cost of the trip is likely to be around €650.

Assessment: Course work (100%)

GSU44003 Geoscience Frontiers: Past, Present and Future

5 Credits

This module explores the history, evolution and frontiers of geoscientific research. A new topic will be examined each week, starting with an introductory lecture, followed by time for reading and finishing with a symposium session with talks, posters and discussion on current thinking on the topic. The lecture will focus on the original ideas, how they were received and whether these ideas have been accepted, rejected or remain contested. The symposium sessions will focus on current ideas, problems and controversies in the geosciences.

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

Open Modules (Optional)

Students select **30 credits** of open modules during their Senior Sophister year (15 credits each Semester). Module selection may be limited by prerequisites or quotas.

GLU44009 Geoscience for a Sustainable Planet (S1)**5 Credits**

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 utilization 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.

Prerequisites: None

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

GLU44005 Advanced Palaeontology (S1)**5 Credits**

This module will build on foundation courses in Fresh and Junior Sophister to explore topics of palaeoecology/palaeoenvironmental analysis in more depth, with an emphasis on current research (e.g. in the field of conservation palaeobiology), and in association with concepts of palaeobiogeography, taphonomy and evolutionary theory. In addition, it will focus on practical aspects and methodologies of palaeontology, including field collection, sample preparation, microscopy, imaging, museum curation and data analysis. The course will contain some student-led practical elements that will draw on current palaeontological research and methods. Irish examples will be integrated throughout to further a deeper understanding of the geological history of the island.

Prerequisites: None

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

GLU44010 Hydrocarbon Exploration in Rift Basins (S1)**5 Credits**

As highly industrialised nations around the globe slowly shift towards renewable energy resources, the Developing World is increasing its demand for traditional non-renewables, such as oil and gas. Rift basins themselves account for a significant remainder of the world's natural oil and gas reserves. This module introduces the principal theoretical concepts behind hydrocarbon generation, migration and accumulation. It then investigates the coupled tectonic – climatic controls on sedimentary geodynamics in rift basins, which lead to the deposition of key source, reservoir and seal lithologies. Finally, the technical process of hydrocarbon exploration is outlined and illustrated using Industry data from three different rift systems across the Equatorial Tropics of Africa; in Uganda, Tanzania and the Democratic Republic of Congo (DRC). The module includes a four day residential field course, during Study Week, to the classic Namurian coastal exposures of Co. Clare, where exploration field geology concepts and techniques will be tested and applied in a series of problem-solving exercises.

Prerequisites: GLU33928 Structural Geology

Assessment: Course work (100%)

GLU44007 Earth Resources for a Critical Future (S1)**5 Credits**

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.

Prerequisites: None

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

GGU44974 Glaciers and Glaciation (S1)**10 Credits**

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.

Prerequisites: None

Assessment: Course work (100%)

GLU44006 Carbonates: from the Atomic to Planetary Scale (S2)**5 Credits**

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 CO₂ 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.

Prerequisites: None

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

GLU44011 Palaeoceanography and Palaeoclimatology (S2)**5 Credits**

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.

Prerequisites: None

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

GLU44008 Early Earth Evolution (S2)**5 Credits**

This module explores the uncertain science of the first billion years of Earth history. This was a period of significant change; however, the rock record is both sparse and ambiguous. Furthermore, the processes that shaped our planet may not have operated by the same mechanisms or at the same rate as today, and therefore the present may not be the key to the past. We will start by introducing the tools used to understand the early Earth, and then move on to investigate the formative processes that shaped the planet: What were conditions like in the Hadean? How did geological processes operate before plate tectonics? When did modern plate tectonics begin? And how and when did continental crust form?

Prerequisites: None

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

GLU44012 Raw Materials in Building (S2)**5 Credits**

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.

Prerequisites: None

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

GGU44975 Coastal Wetlands (S2)**10 Credits**

Historically seen as 'wasteland', coastal wetlands are now recognised for providing a plethora of ecosystem services to coastal communities, such as sequestering carbon, buffering against the impact of sea level rise, coastal, flooding and erosion, and as valuable blue-green spaces for mental and physical recreation. At the same time, erosion and loss of coastal wetlands is reported from across the globe. Retaining existing and restoring lost wetlands is becoming a key challenge that must be addressed to meet ambitious climate and biodiversity targets. But how do we achieve that? This module provides a scientific understanding of how saltmarsh and mangrove systems, are shaped by tides, waves, sediment supply, climate, and human land use; how they provide ecosystem services and why they are experiencing degradation throughout the world. It includes practical fieldwork to map, measure, and describe saltmarsh geomorphology, ecology, and the action of biophysical processes that shape coastal wetlands through a mini-project carried out on the wetlands in Dublin Bay.

Prerequisites: None

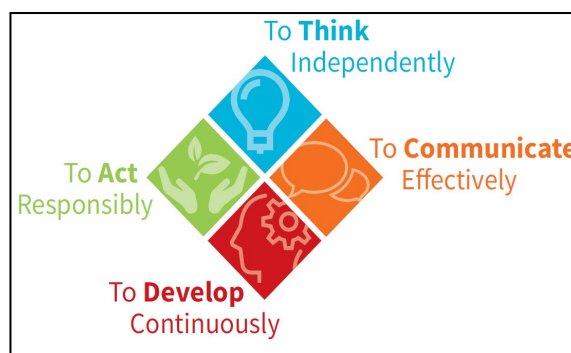
Assessment: Course work (100%)

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.

Appendix 1

| Item | Reference/Source |
|--|--|
| Statement on General Regulations | <p>Calendar, Part II, General Regulations and Information, Section II, Item 12</p> <p>Calendar, Part III, General Regulations, Section I</p> |
| Student Supports Co-curricular activities TCDSU, GSU & student representation structures | <p>Student Supports</p> |
| Emergency Procedure | <p>Standard Text: In the event of an emergency, dial Security Services on extension 1999</p> <p>Security Services provide a 24-hour service to the college community, 365 days a year. They are the liaison to the Fire, Garda and Ambulance services and all staff and students are advised to always telephone extension 1999 (+353 1 896 1999) in case of an emergency.</p> <p>Should you require any emergency or rescue services on campus, you must contact Security Services. This includes chemical spills, personal injury or first aid assistance.</p> <p>It is recommended that all students save at least one emergency contact in their phone under ICE (In Case of Emergency).</p> |
| Data Protection | <p>Data Protection for Student Data</p> |
| Research Ethics | <p>Policy on Good Research Practice</p> |
| Key Locations for students: Include Programme Offices, Laboratories, Online Learning Environments, Libraries, Academic Registry, Places of Faith/Prayer Rooms, Photocopiers and any relevant introductory information on these locations | <p>Blackboard</p> <p>Academic Registry</p> |

| Item | Reference/Source |
|---|--|
| Plagiarism & Referencing Guidance | Calendar, Part II, General Regulations and Information, Section II, Items 95-102 Calendar, Part III, General Regulations & Information, Section I 'Plagiarism' Plagiarism Policy Library Guides - Avoiding Plagiarism Plagiarism Declaration |
| Explanation of ECTS Weighting | ECTS Weighting |
| Health and Safety Statements | Faculty of Science Engineering , Mathematics and Science website - https://www.tcd.ie/stem/undergraduate/health-safety.php School Handbooks will have School/Discipline information on Health and Safety. |
| COVID-19 Information | TCD Coronavirus TCD Phased reopening plans HSE Coronavirus |
| Foundation Scholarships | Calendar, Part II, Foundation and Non-Foundation Scholarships |
| Prizes, medals, and other scholarships | Provided by School/Discipline handbooks. |
| Absence from Examinations | Calendar, Part II, General Regulations and Information, Section II, Item 35 Calendar, Part III, Section III, 'Examinations, Assessment and Progression' Academic Policies |
| Reference to Relevant University Regulations | Academic Policies Student Complaints Procedure Dignity & Respect Policy Equality Policy |
| General Information for students teaching, assessment etc. May include Programme Offices, Laboratories, Online Learning Environments, Libraries, Academic Registry, Places of Faith/Prayer Rooms, Photocopiers and any relevant introductory information on these locations | Blackboard Academic Registry |
| Item | Reference/Source |

| | |
|---|--|
| Timetable for students | My TCD |
| Internships/ Placements for Credit | Provided by School/Discipline Handbooks |
| Teaching & Learning Study Abroad | Contact School/Discipline |
| Teaching & Learning Coursework Requirements | Student Learning Development |
| Marking Scale | Calendar, Part II, General Regulations & Information, Section II, Item 30 |
| Progression Regulations | Calendar, Part II, General Regulations & Information Calendar, Part II, Part C Calendar, Part III, Section III 'Examinations, Assessment and Progression' and 'Assessment and Progression Regulations' |
| Awards | National Framework for Qualifications Trinity Pathways Trinity Courses |
| Professional and Statutory Body Accreditation | Provide by School/Discipline Handbooks |
| Careers Information & events | https://www.tcd.ie/Science/careers/ For further information refer to School/Discipline Handbooks. |
| External Examiner | Procedure for the transfer of students assessed work to external examiners |
| Learning Outcomes | Provided in JF, SF & JS Handbooks on the Science Course Website https://www.tcd.ie/Science/#menu . Also available in School/Discipline Handbooks. |

| Item | Reference/Source |
|-----------------------------|---|
| Capstone (UG Programmes) | Capstone website Policy on Good Research Practice |
| Attendance Requirements | Calendar, Part II, General Regulations and Information, Section II, Items 17-23 Calendar, Part III, General Regulations and Information, Section I 'Attendance and Off-Books'; Section II 'Attendance'; Section III 'Attendance, Registration, Extensions'; Section IV |
| Examination Attendance | 'Attendance and Examinations' |
| Feedback and Evaluation | Student Evaluation and Feedback Student Partnership Policy Procedure for the conduct of Focus Groups |
| Registration (UG only) | Students in TR060, TR061, TR062 & TR063 will find handbooks and information on the Science Course website https://www.tcd.ie/Science/#menu and in School/Discipline Handbook. |