

***Bachelor of Science in
Geography and Geosystems***

SECOND YEAR

**Academic Year 2021/2022
Year Coordinator: Dr Audrey Morley**

Before the beginning of Year Two, students will choose two of the four possible pathways in (1) Coastal and Marine Sciences, (2) Ecosystem Sciences, (3) Environmental planning and policy, and (4) Palaeo-Sciences.

Pathway 1: Coastal and Marine Sciences

This pathway allows students to become proficient in both Oceanography and Coastal Sciences with an option to enhance their knowledge of sedimentary systems. The provision of trained graduates in Marine and Coastal Sciences is essential to underpin Ireland's use of national aquatic resources, as outlined in the Marine Knowledge, Research and Innovation Strategy 2017-2021, which highlights the renewed focus by the State on the value of the marine sector to the Irish economy. Students choosing this pathway will be better placed to identify in which area of Ireland's marine sector they are best placed to make a contribution and develop a career.

Pathway 2: Ecosystem Sciences

This pathway reinforces the identification and evaluation of terrestrial and marine ecosystems. Students taking this pathway will be able to perform in situ environmental assessment for a variety of physical settings and environments. These skills are all highly relevant for young professionals intending to work in the private or public institutions involved in research and monitoring of our coastal, marine, and terrestrial ecosystems (i.e., Marine Institute, EPA, BIM, GSI, NPWS, An Taisce, and county councils).

Pathway 3: Environmental Planning and Policy

This pathway will expose students to the role of environmental planning in policymaking. Students will be able to evaluate the relationships between environment and society at relevant local, national, and international scales. Students will apply various conceptual frameworks, including social-ecological systems and human-environment interaction theory, to explore and understand the importance of environmental planning to better secure necessary ecosystem goods and services over the long-term across a range of terrestrial, coastal, and marine environments. Students will learn major national and EU policies, how such legal bodies govern resource use and provide regulatory space for planning objectives, and how to apply field-based assessments to develop conservation tools consistent with management goals at various ecosystem and human scales.

Pathway 4: Palaeo-Sciences

This pathway exposes students to long-term environmental change and how it relates to modern environmental systems and issues. Gaining this long-term perspective provides students with an appreciation for the history of Earth's dynamic systems, which is crucial if we want to understand and estimate future environmental change.

Learning outcomes for the programme

• **Learning Outcomes for Year Two [Core]:**

On the successful completion of year two, students will be able to:

- Identify and differentiate among the basic principles and theories of biogeography.
- Apply the standard field methodologies and data analysis techniques currently used to analyse and examine environmental problems.
- Assess and evaluate human impacts on the environment and apply modern conservation strategies to these issues.
- Explain the principles and mechanisms of Anthropogenic climate change
- Demonstrate an awareness of the rates and timescales over which processes operate and landforms develop.
- Assess critically and identify physical vs. human controls on our physical landscape.
- Identify and discuss sources of Irish Planning Law
- Evaluate the planning process critically.
- Perform statistical analysis on a variety of datasets using specialised statistical software packages.
- Assess critically which statistical analysis is most suitable for a given environmental problem.

• **Learning Outcomes for Year Two [Pathways]:**

PW 1: Coastal and Marine Sciences

On the successful completion of this pathway in Year Two students will be able to:

- Describe the biogeochemical cycling of O₂, CO₂, and nutrients in the oceans
- Explain how the temperature, salinity, and density structure in the ocean arises and be able to distinguish different water masses on a T-S diagram
- Discuss the formation and global distribution of biogenic marine sediments
- Identify the short- and long-term processes shaping coastal landforms
Understand the complex suite of integrated pathways that connect the land (catchment science), coast, marine, and human systems.

PW 2: Ecosystem Sciences

On the successful completion of this pathway in Year Two students will be able to:

- Describe and characterise environments (terrestrial, freshwater, marine) based on structure, function, and identify the major controlling factors within each ecosystem.
- Apply environmental survey techniques in the field.
- Design a field-based investigation based on an environmental and/or geographical issue.
- Report and interpret field data in a professional manner.
- Understand the importance and factors determining plant diversity and conservation and their role for sustainable future development.

PW 3: Environmental Planning and Policy

On the successful completion of this pathway in Year Two students will be able to:

- Assess the role of environmental planning in policy-making.
- Explain and discuss the use of environmental planning tools.
- Demonstrate a comprehensive understanding of the relationships between society, the environment and planning.
- Identify formal and informal institutions, which govern human uses of terrestrial, coastal, and marine environments at local, national, and international levels.

- Discuss the sources of Irish Environmental Law
- Critically discuss the pollution licencing process
- Conduct research on environmental law issues

PW 4: Palaeo-Sciences

On the successful completion of this pathway in Year Two, students will be able to:

- Describe the principles of stratigraphy.
- Describe marine and terrestrial depositional environments.
- Discuss Irish geological history in terms of environmental change.
- Discuss the formation of Quaternary deposits and their climatic forcing.
- Use examples from Earth history to explain how Earth’s climate changes on various timescales.
- Conduct a field-based investigation of long-term environmental (climate and ecosystems) processes
- Report and interpret field data in a professional manner.

Timetable: *Reflecting the possibility of schedule adjustments due to COVID-19 restrictions, only the timetable for Semester 1 is provided below. A revised handbook containing the finalised timetable for Semester 2 will be provided to all 2BGS students before the end of Semester 1.*

Year 2 - Semester 1 PW1				
CORE	Code	Title	ECTS	Sem.
	TI216	Weather & Climate	5	1
	TI235	Biogeography	5	1
	LW217	Environmental Legislation	5	1
	ST2001	Statistics for Data Science 1	5	1
PW1	EOS213	Introduction Ocean Sciences	10	1

Semester 1	Monday	Tuesday	Wednesday	Thursday	Friday
09:00 09:30					TI216
10:00 10:30				TI235	TI216
11:00 11:30		EOS 213 (ST237 L1*)		ST2001 L2*	
12:00 12:30					
13:00 13:30	EOS 213				
14:00 14:30		ST2001 L2* (see note)			LW217
15:00 15:30		EOS213 P*	TI235	ST2001 P	LW217
16:00 16:30	ST2001 L1*	EOS213 P*			
17:00 17:30	ST2001 P	EOS213 P*	EOS 213		

Note: EOS 213: practical’s will be from 2-3.30pm, 3.30-5pm and 5-6:30pm on a Tuesday.

Note students will take their first ST2001 lecture on Monday 4-5. For the second ST2001 lecture, Students can take either the Tuesday 2-3 PM slot (in which case They will take a later EOS213 practical) OR the Thursday 11-12 slot.

Year 2 - Semester 1 PW2				
CORE	Code	Title	ECTS	Sem.
	TI216	Weather & Climate	5	1
	TI235	Biogeography	5	1
	LW217	Environmental Legislation	5	1
ST2001	Statistics for Data Science 1	5	1	
PW2	BPS202	Aquatic Plant Sciences	5	1
	TI2107	BioGeo Field Trip - TM	5	1

Semester 1	Monday	Tuesday	Wednesday	Thursday	Friday
09:00 09:30				BPS202 L W1-6	TI216
10:00 10:30	BPS202 L W1-6	BPS202 L W1-6		TI235	TI216
11:00 11:30		ST2001 L1*		ST2001 L2*	
12:00 12:30					
13:00 13:30	ST2001 P	TI2107 BioGeo			
14:00 14:30	BPS202 P# W1-6	ST2001 L2*			LW217
15:00 15:30			TI235	ST2001 P	LW217
16:00 16:30	ST2001 L1*				
17:00 17:30	ST2001 P		TI2107 BioGeo		

L – Lecture; T – Tutorial; P – Practical

Note: L* student attends 2 lectures a week, P student attends one 2h practical

Note: Practicals may be finalised after registration, depending on modules. Please monitor your NUIG email inbox for specific instructions.

Core Module Outlines:

TI216 Weather & Climate

Lectures	Friday: 09:00 - 11:00 Venue: AM200 / Fottrell theatre
Coordinator:	Dr. Audrey Morley
E-mail	audrey.morley@nuigalway.ie
Teaching Assistant:	Ms. Adrienne Foreman
E-mail	a.foreman1@nuigalway.ie
Office:	Room 109, Discipline of Geography
Telephone:	091 – 494104
Office Hours:	Thursday: 14:00-15:00, Fridays: 11:00-12:00

Course Overview:

This course is designed to provide students with applied example of weather and climate phenomena that have a strong impact on human lives. Each week will focus on an acute environmental problem that will be explained and analysed with in-class exercises. Case studies will focus on weather (e.g., storms, hurricanes, drought, flooding) and climate (e.g., Monsoons, El Nino, future global warming) events to provide students with context.

Aims and Objectives:

This module provides context to the theoretical basics of meteorology covered in first year. By providing students with detailed case studies on current environmental issues using a variety of datasets (e.g., tables, graphs, and images) this course will allow students to become familiar with interpreting geographical information and apply learned concepts into practical examples.

Learning Outcomes:

- Explain extreme weather events (including storms and heat waves) in Ireland.
- Explain risks associated with global warming for Ireland and Europe.
- Explain main features of global climates (Monsoon, El Nino, Hurricanes) and their impact on human lives.
- Diagram and explain positive and negative feedbacks in climate systems
- Comprehend a basic weather map

TI235 Biogeography

Lectures	Wednesday 15:00-15:50 & Thursday 10:00 -10:50 (both IT250)
Coordinator:	Dr. Terry Morley
E-mail	Terry.morley@nuigalway.ie
Teaching Assistant:	Mr. Thomas Gorman
E-mail	t.gorman1@nuigalway.ie
Office:	Room 102, Discipline of Geography
Telephone:	091 – 493897
Office Hours:	Tuesdays 3-4, or by appointment.

Course Overview:

This class provides an introduction to the study of biogeography. Bridging the fields of biology (particularly ecology) and geography, biogeography is the study of the spatial patterns of biological diversity and its causes. We will identify how historical, physical, and biological factors affect present and past distributions of individuals, species, populations, communities, and ecosystems. The actions of humans are a critical force impacting other species, and the human influence on past, present, and future species distributions is a central topic in this module.

Aims and Objectives:

In addition to offering a survey of the basics of biogeography via class lectures, this course also aims to introduce students to various methodologies used in biogeographic research. Hands-on field, lab, and data analysis exercises will allow students to put learned concepts into practice, and give students experience working with the techniques used by biogeographers.

Learning Outcomes:

- To identify and differentiate the basic principles and theories of biogeography
- Application of standard field methodologies and data analysis techniques used in biogeography to analyse and examine applied problems
- To assess and evaluate human impacts on species distributions and apply modern conservation strategies to these issues

LW217 Environmental Legislation

Lectures	Friday 14:00-16:00 Venue: ENG-G047
Coordinator:	Dr. Ronan Kennedy
E-mail	ronan.m.kennedy@nuigalway.ie
Office:	Cairnes 217
Telephone:	091 – 495626
Office Hours:	TBC

Course Overview:

This course treats of the legal regime regulating planning and development in Irish Law. The Irish planning code and issues of statutory interpretation and public law arising therefrom are examined. The course looks at: the institutions of planning control; the application for planning permission; participation by objectors; the appeal process and judicial review of planning decisions; and compensation for refusal of development. At the end of the module, students will have knowledge of the central principles of planning law and the structure of the system including the development plan, the concept of 'development', procedure for application for planning permission, rights of appeal, and enforcement of the law. In addition, special attention will be paid to specific topics such as the constitutionality of legislative restrictions on land use as well as developments in the law including the enactment of the Planning and Development (Strategic Infrastructure) Act 2006, the Planning and Development (Amendment) Act 2010, and the Environment (Miscellaneous Provisions) Act 2011.

ST2001 Statistics for Data Science 1

Lectures	Mon 16:00-17:00: Online (L1) Tue 11:00-12:00, AMB-1021 (L1) Tue 14:00-15:00, AC201 (L2) Thu 11:00-12:00, Online (L2)
Practical	Mon 17:00-18:00, AM PC Suite 201 Tue 18:00-19:00, Finnegan PC Suite Thu 15:00-16:00, Finnegan PC Suite
Coordinator:	Dr. Emma Holian
E-mail	ronan.m.kennedy@nuigalway.ie
Office:	ADB-G011
Telephone:	091 – 495490
Office Hours:	TBC

Note: ST2001: Students can access a tutor for online Q&A at any one (or more) of the four optional listed times as needed

Course Overview:

The course introduces probabilistic and statistical methods needed to make reasonable and useful conclusions from data. Topics include probabilistic reasoning, data generation mechanisms, modern techniques for data visualisation, inferential reasoning and prediction using real data and the principles of reproducible research. The course will rely heavily on R (a free open-source language) and will include examples of datasets collected in a variety of domains.

Learning Outcomes

- Calculate conditional probabilities and probabilities for random variables from standard distributions (Binomial, Poisson, Normal).
- Summarise data numerically (centre and spread) and graphically (e.g., bar charts, line, area, boxplots, histograms, density plots, scatterplots) with an emphasis on best practice for communication.
- Summarise the importance of probabilistic based sampling schemes (e.g., simple random sampling, stratified sampling, cluster sampling).
- Summarise the difference between observational and experimental studies and the principles of experimental design.
- Perform probability calculations about the sample mean and use them to make inferential statements using the Central Limit Theorem.
- Calculate interval estimates for parameter estimation in one sample problems using classical and computational (i.e., bootstrap) approaches.
- Perform hypothesis testing (null and alternative hypotheses, type I and II errors and p-values) in a variety of scenarios.
- Fit and interpret a simple linear regression model.
- Compile a statistical report, i.e., prepare a typed document which introduces the statistical research question being explored, describes the data collection mechanism, provides subjective impressions on relevant numerical and graphical summaries, and outlines conclusions from all formal statistical analyses undertaken.

Students will take two lectures and one practical weekly. Which lecture slot you are assigned will depend on your chosen PW, so check your email for directions.

Pathway 1: EOS213 Introduction to Oceanography

Lectures	Mon 13:00-14:00, Martin Ryan Annex 201 Tue 11:00-12:00, Martin Ryan Annex 201
Practical	Tue 14:00-15:30 Martin Ryan Annex Lab Tue 15:30-17:00 Martin Ryan Annex Lab Tue 17:00-18:30 Martin Ryan Annex Lab
Coordinator:	Dr. Rachel Cave
E-mail	rachel.cave@nuigalway.ie
Office:	
Telephone:	091 – 492351
Office Hours:	TBC

Course Overview:

This module will cover fundamental interactions between the oceans, atmosphere, and the seafloor. Students will study how physical, chemical, biological, and geological properties and processes shape the ocean we have today, and the key role of the oceans in Earth's climate.

Learning Outcomes:

- Explain the processes that exchange energy and water within the Earth system
- Describe the main sources, sinks and pathways of material in the oceans
- Explain how the temperature, salinity and density structure in the ocean arises and be able to distinguish different water masses on a T-S diagram
- Explain how waves and tides are generated in the oceans and how these generate currents
- Recognise the difference between Eulerian and Lagrangian co-ordinate systems and measurement techniques and be able to represent them graphically
- Describe the process of hydrothermal circulation of seawater through the seabed and resulting transformations in the chemistry of seawater
- Describe the biogeochemical cycling of O₂, CO₂ and nutrients in the oceans
- Discuss the formation and global distribution of biogenic marine sediments
- Carry out calculations of volume transport and fluxes of material in the oceans
- Grasp the breadth of instrumentation used in oceanography and understand how a subset of these work and how they are used in oceanographic research

Pathway 2: BPS202 Aquatic Plant Science

Lectures (Week 1 – 6)	Mon 10:00-11:00 Tue 10.00-11.00 Thu 09.00-10.00
Practical	Mondays 14:00-16:00 Mondays 16:00-18:00
Coordinator:	Dr. Dagmar Stengel
E-mail	dagmar.stengel@nuigalway.ie
Office:	
Telephone:	091 – 493192
Office Hours:	TBC

Course Overview:

This module will introduce key aspects of the biology of aquatic photosynthetic organisms including seaweeds, microalgae, and aquatic plants. In particular it explores the aquatic environments including lakes and marine systems as habitats for aquatic plant and algal growth and provides fundamentals of algal diversity, functionality and ecology, and plant/algal environment interactions.

BPS202 comprises three lectures and one 2-hour practical weekly. NOTE: Check Blackboard for Venue!

Pathway 2: TI2107 Field Studies in Biogeography

Lectures	Tue 13:00-14:00, AC115
Field excursion	TBD
Coordinator:	Dr. Terry Morley
E-mail	Terry.morley@nuigalway.ie
Teaching Assistant:	Mr. Thomas Gorman
E-mail	t.gorman1@nuigalway.ie
Office:	Room 102, Discipline of Geography
Telephone:	091 – 493897
Office Hours:	Tuesdays 3-4, or by appointment.

Course Description:

This module covers the biogeographical approach to field studies. The module will comprise of preparatory seminars that cover the concepts and techniques used to design and implement a field study. Students will gain an understanding of the methods used to collect primary data and put them to practice as part of a field excursion. The field component will evaluate habitat(s) complemented with data collection and using appropriate methods to ensure accuracy and consistency. The field excursion will be followed by group and individual work involving data analysis and interpretation and the production of a research report.

Aims and Objectives:

- 1) Develop theoretical and methodological underpinnings of biogeography via analysis of different methodologies and key papers in field studies.
- 2) Develop competency in Biogeographical Field Studies via a small field investigation, collection of data consistent with key methodologies.
- 3) Technical report writing via analysis and interpretation of field data presented in a report format.

Learning Outcomes:

- Understand biogeographical and conservation approaches in Ireland and internationally
- Evaluate the various techniques of collecting ecological data.
- Apply relevant technique(s) to examine biogeographical patterns relevant to Ireland.
- Present synthesised and critically evaluated information in graphical & written forms.