UNIVERSITY OF LIVERPOOL

Climate Science BSc (Hons)

COURSE DETAILS

- A level requirements: ABB
- UCAS code: F764
- Study mode: Full-time
- Length: 3 years

KEY DATES

- Apply by: 25 January 2023
- Starts: 25 September 2023

Course overview

Study Climate Science at Liverpool and learn to understand the fundamental science behind our changing climate. It's a great choice for those looking to take an active role in developing solutions to current and emerging global environmental challenges.

INTRODUCTION

You'll study in depth the threats that climate change poses to our earth system, biodiversity and public health, from warming and rising sea levels to habitat and biodiversity loss.

This course aims to provide students with core knowledge on the impact of climate change through modules in ocean sciences, ecology, and physical and human geography. There is a focus on developing problem solving, numerical and practical skills through training in numerical coding, laboratory classes and research-focused projects.

Alongside learning about the fundamentals of climate science, you'll also be introduced to adaptation and mitigation options, and sustainability.

We have strong links with scientists from the National Oceanography Centre in Liverpool, who provide guest lectures and supervision of projects. Our staff contribute to IPCC reports and the recent COP26 meeting, and provide evidence on how our oceans are responding to climate change to government departments.

Please note that this course may be subject to change, and is pending formal validation.

A number of the School's degree programmes involve laboratory and field work. Fieldwork is carried out in various locations, ranging from inner city to coastal and mountainous environments. We consider applications from prospective disabled students on the same basis as all

other students, and reasonable adjustments will be considered to address barriers to access.

WHAT YOU'LL LEARN

- Detailed knowledge of the impact of climate change
- Critical thinking
- Teamwork
- Engagement in current debates
- How to undertake research, using the latest techniques and equipment
- How to develop sustainable management plans
- How to study independently

Course content

Discover what you'll learn, what you'll study, and how you'll be taught and assessed.

YEAR ONE

COMPULSORY MODULES

STUDY SKILLS (OCEAN SCIENCES) (ENVS103)

Credits: 15 / Semester: whole session

This module is designed to introduce students to key concepts and skills in Ocean Sciences (e.g. use of specific software, development of laboratory and analytical skills, fieldwork experience) as well as the development of generic skills, specifically communication skills, (through writing essay, technical reports, oral and poster presentations), teamwork and time management. The module also comprises introduction to academic integrity, how to access scientific literature or how to use a reference software. Biweekly (every 2 weeks) tutorials with an assigned individual tutor take place in groups of typically 6-7. These sessions can take place in-persons or on-line.

CLIMATE, ATMOSPHERE AND OCEANS (ENVS111)

Credits: 15 / Semester: semester 1

Climate, Atmosphere and Oceans provides an understanding of how the climate system operates. The module draws on basic scientific principles to understand how climate has evolved over the history of the planet and how the climate system is operating now. Attention is particularly paid to the structure and circulation of the atmosphere and ocean, and how they both interact. The course emphases acquiring mechanistic insight and drawing upon order of magnitude calculations. Students gain quantitative skills by completing a series of coursework exercises.

LIVING WITH ENVIRONMENTAL CHANGE (ENVS119)

Credits: 15 / Semester: semester 1

This module examines a number of global scale challenges facing humans on the planet earth related to climate and environmental change.

MARINE ECOSYSTEMS: DIVERSITY, PROCESSES AND THREATS (ENVS122)

Credits: 15 / Semester: semester 2

This module introduces the range of diversity of marine ecosystems using example environments from around the world. Each week a new ecosystem will be covered, with the main organisms, key processes and human threats to the ecosystem described and explored. Central to this module are interactive discussion sessions that will build an understanding of how marine ecosystems are expected to respond to the human-induced changes of the 21st Century.

THEORY AND LABORATORY EXPERIMENTS IN EARTH SURFACE PROCESSES (ENVS165)

Credits: 15 / Semester: semester 2

The module uses a lecture and laboratory-based problem-solving approach to explore some of the fundamental physical and chemical processes underlying physical geography. It is designed to provide a foundation for environmental and physical geography modules in the second and third years.

ECOLOGY AND CONSERVATION (ENVS157)

Credits: 15 / Semester: semester 2

The zone of life on earth, or the'biosphere', is a highly dynamic system responding to external pressures including changing human activities. The biosphere obeys a numbers of simple natural principles, but these often interact to create complex and sometimes unexpected responses. Using a wide range of examples we will explore these interactions between organisms and the environment. We will examine how species organise into communities, and how energy and other resources flow through ecosystems. We will explore how ecosystems respond to change, including gradual environmental shifts, sudden disturbance events and the effects of human activities. We will also learn how the key principles of ecology can be applied to conservation. We will assess the current state of the biosphere, and evaluate the major current threats. We will also look towards the future of ecosystems, including whether we can restore degraded habitats, and recreate"natural" landscapes.

Teaching will be via synchronous and asynchronous lecture content. Assessment will be by open book class tests and a multiple choice exam.

INTRODUCTION TO CLIMATE CHANGE AND MITIGATION (ENVS189)

Credits: 15 / Semester: semester 2

This module will introduce you to the concept of Earth System interactions as a framework for understanding the causes and consequences of climate change. The module will cover the key features of the earth, atmosphere and ocean, and their interactions. alongside the drivers and consequences for perturbing part of the Earth System. Past, contemporary and projections of climate change will be discussed, as well as the toolkit tools deployed by environmental scientists to detect climate change and show attribute it to be a consequence of human activities. The module will discuss also measures to mitigate against climate change, drawing on the United Nations Framework Convention on Climate Change (UNFCC) efforts .

OPTIONAL MODULES

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ESSENTIAL MATHEMATICAL SKILLS (ENVS117)

Credits: 15 / Semester: semester 1

This module is designed to provide students without a background in mathematics and physics at A-level (or equivalent) with sufficient knowledge and skills in these subjects to pursue degree programmes in ocean sciences, geology, geography, environmental sciences and marine biology. It is taught by means of lectures and weekly practical workshops and assessed by means of a written examination. Additional material is provided via Canvas. Whilst many of the topics covered in the module may be covered in A-level maths and or physics, there will be a number of topics included which are unique.

MATHEMATICS FOR PHYSICISTS I (PHYS107)

Credits: 15 / Semester: semester 1

This module aims to provide all students with a common foundation in mathematics, necessary for studying the physical sciences and maths courses in later semesters. All topics will begin "from the ground up" by revising ideas which may be familiar from A-level before building on these concepts. In particular, the basic principles of differentiation and integration will be practised, before extending to functions of more than one variable.

Programme details and modules listed are illustrative only and subject to change.

YEAR TWO

COMPULSORY MODULES

KEY SKILLS FOR ENVIRONMENTAL DATA ANALYSIS (ENVS202)

Credits: 15 / Semester: semester 1

The module provides a generic training in manipulating environmental data sets using the industry-standard Matlab software. Skills are provided in reading in data, manipulating and plotting the data, and interpreting the data signals. The assumption is that students have little or no experience in programming. The module begins with an introduction to Matlab – what it is, what it can do, how to operate it – and then develops a series of programming skills, each week using data collected in the staffs' own research to provide real-world examples of the use of Matlab. The aim is to provide students with sufficient grasp of programming in Matlab to enable its use in subsequent project work, as well as providing the foundations in one of the key tools used in science and industry.

RESEARCH AND CAREER SKILLS (ENVS204)

Credits: 15 / Semester: whole session

This module aims to develop the specific skills required by marine biologists, ocean scientists and environmental scientists as they prepare for their final year of study and the next steps in their careers.

In semester one, through a series of lectures, workshops and tutorials, students will learn how to write a research report. Students will analyse and synthesise a real scientific data set, create professional display items and write a research report in standard scientific format. This will be assessed through a written research report.

In semester two students will focus on developing skills in critiquing and reading the scientific literature. Lectures and tutorials will guide students in developing these skills. This will be assessed through a literature review essay.

Students will also develop knowledge of careers in their field and enhance their employability through a series of lectures, SOES careers week, an assessment centre exercise and job video interview. The video interview will be assessed.

CHANGING ENVIRONMENTS (ENVS214)

Credits: 15 / Semester: semester 1

The Earth is subject to a myriad of threats and stresses, ranging from a changing global climate to unprecedented scales of human impacts on ecosystems, so that a new geological time period, the Anthropocene was created. Placing future change in freshwater and coastal wetlands and lakes into a long-term context is a critical science, and without it, society cannot constrain the 'natural' baseline against which future changes could be judged. This module will provide a critical insight into the global changes currently impacting the Earth over decades to millennial timescales. We will introduce a series of contemporary environmental concerns, and teach how we can reconstruct climatic and environmental conditions, the landscapes and vegetation of the past. We will explore a wide variety of archives (lakes, freshwater and coastal wetlands, oceans) and develop an understanding of the key techniques used to trace environmental conditions (physical properties, biogeochemistry, biological indicators). We will assess how the drivers behind these changes will affect future landscapes and ecosystems.

ENVIRONMENTAL SUSTAINABILITY (ENVS218)

Credits: 15 / Semester: semester 1

Environmental concerns have become increasingly pressing over the last few decades, especially the global challenge of climate change. Environmental sustainability directs our attention to finding new approaches and methods for many of our activities and is an increasingly accepted principle that many professions are seeking to work out in practice.

This module explores the notion of environmental sustainability particularly within the context of urban planning. In this context, it can help us to develop the places where we live in a way that makes them cleaner, more energy efficient and better adapted to climate change, and that provides more biodiversity and a better quality of life. Planners, geographers and environmental scientists can all contribute to achieving a more sustainable world around us.

CLIMATOLOGY (ENVS231)

Credits: 15 / Semester: semester 2

The module has a balance between theory, processes, impacts, and hands on experimentation and data analysis. It cover energy balance and transfer processes at the surface, clouds, rain formation, weather forecasting, monsoons, tropical cyclones, weather in the mid latitudes, and the regional climates.

MARINE POLLUTION (ENVS232)

Credits: 15 / Semester: semester 2

Marine systems are changing with globally increasing temperatures and increasing carbon dioxide concentrations in the atmosphere, which are affecting the chemistry, physics and ultimately biology of the marine systems at unprecedented rates. These changes are expected to accelerate in the coming decades. Localised anthropogenic stressors such as excess nutrients, plastic debris, trace metals (e.g. mercury, copper), marine heatwaves and/or other emerging contaminants are affecting our coastal and open ocean waters. This module focuses on the processes and recent scientific evidence about a range of marine pollution issues.

OCEANOGRAPHY, PLANKTON AND CLIMATE (ENVS245)

Credits: 15 / Semester: semester 1

The tiny plankton are the base of marine food chains and also affect the Earth's climate. If you want to understand how and where these organisms live in the ocean, you need to step out of your own experience as a terrestrial animal. In this module we will get you to think about how the viscosity and flow of water control the different sizes of plants and animals by determining how they can acquire light, nutrients and food. For instance, a copepod zooplankton needs to detect, grab and hold on to tiny food particles in what, to the copepod, feels like a very sticky fluid environment. For us it would be a little like trying to swim through thick honey and reaching out to grab a ping-pong ball. On much larger scales the physics of ocean circulation and mixing controls the distributions and diversity of different plankton species and the availability of the nutrients that they need. Plankton play a key role in Earth's climate, but this can depend on the plankton species. Plankton also respond to changes in Earth's climate, with important shifts in species distributions currently being caused by our warming climate. In this module we take you from the micron scales of the tiniest plankton up to the scale of the open ocean to illustrate the fundamental links between the ocean's physical and biogeochemical processes, plankton communities and Earth's climate.

GEOMORPHOLOGY: ICE, SEA AND AIR (ENVS252)

Credits: 15 / Semester: semester 2

The module develops an understanding of these major geomorphic systems and how they create terrestrial landforms. It explores the basic processes that have helped shaping the geomorphology of Britain and investigates magnitude and frequency of events, as well as time and space scales over which the processes operate.

The module is divided into four components, each composed of 4 sessions: glacial systems, glacial geomorphology and environmental change, aeolian processes, and coastal geomorphology . Weekly face-to-face sessions are supported by access to online videos, power point presentations, lecture notes, reading lists and some selected web sites. Weekly timetabled sessions will be a combination of discussions around reading and Q&A on online content. Two days of field practicals form the basis of the summative assessment addressing set problems and questions. A formative GIS exercise is also delivered via timetabled support sessions.

Programme details and modules listed are illustrative only and subject to change.

YEAR THREE

COMPULSORY MODULES

POLITICS OF THE ENVIRONMENT (ENVS325)

Credits: 15 / Semester: semester 1

Over the last decade the environment, and perhaps more importantly the concept of sustainable development, is claimed to have become a critical dimension that underpins decision making at a variety of different spatial scales, more particularly international, European, national, regional and local arenas. In this module we explore the extent to which environmental concerns are taken into account in various decision-making processes within the public, private and third sectors. The module will be assessed by an essay (50%) and an open book exam (50%) which provides students with significant choice to explore those parts of the module they find most interesting.

GLACIOLOGY PAST, PRESENT AND FUTURE (ENVS330)

Credits: 15 / Semester: semester 1

During this module students will be provided with fully up to date knowledge of how glaciers and ice sheets (1) have behaved in the past; (2) are currently behaving in the present; and (3) will behave in the future. This will be achieved through paired lectures and seminars on different glacial themes, where students will have the opportunity to examine and critique a range of glaciological research techniques that are applied to glacial environments around the world, ranging from valley glaciers to ice sheets. It is intended that this will provide students with a working knowledge of the controls on (and the social and climatic impacts of) past, present and potential future glacier behaviour.

GLOBAL CARBON CYCLE (ENVS335)

Credits: 15 / Semester: semester 2

Increasing amounts of carbon dioxide in the atmosphere are having a profound impact on our Earth system. This module will introduce students to the fundamental theory behind the global carbon cycle. It will evaluate how carbon is partitioned between the atmosphere, land and ocean in the contemporary and past system, why the ocean stores 50 times more carbon than the atmosphere and considers the impact of increasing carbon dioxide on the organisms living on land and in the ocean.

CONTEMPORARY ISSUES IN OCEAN AND CLIMATE SCIENCES (ENVS366)

Credits: 15 / Semester: semester 2

This research-led module aims to promote interest, awareness and understanding of current important and emerging research topic areas within Ocean and Climate Sciences. It also aims to develop generic skills such as team working and communication skills. The module has the following components:
– Presentations given by research staff on currently funded research programs of international importance;
– Attendance at research seminars that are on-going mostly within the Ocean Sciences group, the National Oceanographic Centre and other seminar of interests.
– Individual presentations of recent research papers or research topic of interest to the students;
– Group presentations (typically 4 students per group) on a research topic of current importance (e.g. as highlighted in the latest IPCC report).

CARBON, NUTRIENTS AND CLIMATE CHANGE MITIGATION (ENVS381)

Credits: 15 / Semester: semester 1

The module will involve both individual and group work, workshops, group presentations/debates, and engagement with the most current scientific literature and social media and science communication. This module is open to all students, but those taking this module must be willing to engage in quantitative analyses of carbon and nutrient cycling and its importance to climate mitigation strategies.

OCEAN SCIENCES RESEARCH PROJECT (ENVS377)

Credits: 30 / Semester: whole session

In this module year three students have the opportunity to work with our world leading researchers on an independent research project.

OPTIONAL MODULES

OCEAN DYNAMICS (ENVS332)

Credits: 15 / Semester: semester 1

Ocean dynamics addresses how the ocean and atmosphere circulate. Fundamental questions are addressed, such as how heat, salt, and dissolved substances are transported, how jets and weather systems emerge on our planet, why there are western boundary currents in the ocean, and how seafloor topography shapes the ocean circulation.

Students will improve their understanding of how the ocean and atmosphere behave, including comparing the importance of different physical processes in the climate system. The module is delivered via lectures and formative workshops to gain skills at problem solving. There is significant mathematical content, requiring familiarity with calculus and algebra. The module is assessed through two online tests (25% each) and an essay (50%).

COASTAL ENVIRONMENTS: SPATIAL AND TEMPORAL CHANGE (ENVS376)

Credits: 15 / Semester: semester 1

This module considers the evolution and response of coastal environments to marine and riverine processes and their variations in relation to past, present and future climate change. Attention is given to physical processes and inter-relationships acting along coastlines and coastal changes in response to sea level rise, variations in storms activity, wave climate and sediment supply. Consideration is also given to coastal management and climate change adaptation & mitigation measures. Topics will be investigated through a combination of lectures, virtual field trips, and development of a project aimed at identifying optimum coastal protection schemes for real case studies.

ENVIRONMENTAL COMMUNICATION: POLITICS, SCIENCE, ACTIVISM, AND THE MEDIA (COMM304)

Credits: 15 / Semester: semester 1

Global heating, deforestation, natural disasters, mass extinction of wildlife – the world is currently facing extraordinary environmental degradation that increasingly affects people's daily lives and our common future on this planet. At the same time, the veracity of these issues as well as questions of remedies are being heavily contested. It is the news media and social media platforms where viewpoints are promoted, exchanged, discussed and the battle for dominant issue interpretations is fought. In this module, students will learn about the most salient fault lines of mediated environmental discourse. Who are the stakeholders that engage in environmental debates and what are their arguments? What are the challenges for journalists and other content providers in communicating complex environmental issues to their respective audience? And what do we know about the short and long term effects of different forms of communication and sometimes widely differing arguments and narratives? Students will develop the knowledge and analytical skills to be able to tackle these issues via their own theory-driven and empirical work.

Programme details and modules listed are illustrative only and subject to change.

HOW YOU'LL LEARN

Teaching takes place through lectures, practical sessions, workshops, seminars, tutorials and computer-based learning, with an emphasis on learning through doing.

You will typically receive at least 15 hours of formal teaching each week.

A typical module might involve two or three one-hour lectures each week, and often a three-hour laboratory or computer-based practical as well. Tutorials typically involve groups of 4-7 students meeting with a member of staff at least every two weeks in years one and two. In years three and four, students meet with their project supervisor on a weekly or more frequent basis.

HOW YOU'RE ASSESSED

Assessment matches the learning objectives for each module and may take the form of written exams, coursework submissions in the form of essays, scientific papers, briefing notes or lab notebooks, oral and poster presentations and contributions to group projects.

LIVERPOOL HALLMARKS

We have a distinctive approach to education, the Liverpool Curriculum Framework, which focuses on research-connected teaching, active learning, and authentic assessment to ensure our students graduate as digitally fluent and confident global citizens.

Careers and employability

Climate Science graduates have sound knowledge of the fundamental science behind climate change, skills to detect and monitor change in a range of environments, and insight into sustainability and mitigation strategies. The employability options are extensive.

89.5% **OF ENVIRONMENTAL SCIENCES STUDENTS ARE IN WORK AND/OR FURTHER STUDY 15 MONTHS AFTER GRADUATION.**

Discover Uni, 2018-19.

Many graduates move on to have careers in areas such as:

- Government agencies (Environment Agency, Met Office)
- Environmental consultancy and management
- Climate research
- Accountancy and insurance brokers
- Education
- Renewable energy industries

PREPARING YOU FOR FUTURE SUCCESS

At Liverpool, our goal is to support you to build your intellectual, social, and cultural capital so that you graduate as a socially-conscious global citizen who is prepared for future success. We achieve this by:

- Embedding employability within your curriculum, through the modules you take and the opportunities to gain real-world experience offered by many of our courses.
- Providing you with opportunities to gain experience and develop connections with people and organisations, including student and graduate employers as well as our global alumni.
- Providing you with the latest tools and skills to thrive in a competitive world, including access to Handshake, a platform which allows you to create your personalised job shortlist and apply with ease.
- Supporting you through our peer-to-peer led Careers Studio, where our career coaches provide you with tailored advice and support.

Fees and funding

Your tuition fees, how to pay, and other costs to consider.

TUITION FEES

Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support. Learn more about tuition fees, funding and student finance.

UK fees	
Full-time place, per year	£9,250
Year in industry fee	£1,850
Year abroad fee	£1,385

International fees	
Full-time place, per year	£24,100

*Fees stated are for the **2022-23** academic year and may rise for 2023-24.*

ADDITIONAL COSTS

We understand that budgeting for your time at university is important, and we want to make sure you understand any course-related costs that are not covered by your tuition fee. This could include buying a laptop, books, or stationery.

Find out more about the additional study costs that may apply to this course.

SCHOLARSHIPS AND BURSARIES

We offer a range of scholarships and bursaries to help cover tuition fees and help with living expenses while at university.

Scholarships and bursaries you can apply for from the United Kingdom

Select your country or region for more scholarships and bursaries.

Entry requirements

The qualifications and exam results you'll need to apply for this course.

Your qualification	**Requirements** About our typical entry requirements
GCSE	4/C in English and 4/C in Mathematics
Subject requirements	Two Sciences from: Mathematics, Biology, Chemistry, Geography, Geology, Physics, Marine Science. General Studies and Key Skills are not accepted. For applicants from England: where a science has been taken at A level (Chemistry, Physics or Biology), a pass in the science practical of each subject will be required.
BTEC Level 3 Diploma	D*DD in a relevant Diploma
International Baccalaureate	33 points including 5 at Higher Level in two science subjects, no score below 4.
Irish Leaving Certificate	H1, H2, H2, H2, H3, H3 - including H2 or above in two sciences
Scottish Higher/Advanced Higher	ABB including 2 Sciences from: Mathematics, Biology, Chemistry, Geography, Geology, Physics.
Welsh Baccalaureate Advanced	Accepted at Grade B with AB at two science A levels

Your qualification	Requirements About our typical entry requirements
Access	Applications considered. 45 Level 3 credits in graded units, including 30 at Distinction and a further 15 with at least Merit. 15 Distinctions are required in each of two sciences. GCSE Mathematics and English grade C / 4 also required.
International qualifications	Select your country or region to view specific entry requirements. Many countries have a different education system to that of the UK, meaning your qualifications may not meet our entry requirements. Completing your Foundation Certificate, such as that offered by the University of Liverpool International College, means you're guaranteed a place on your chosen course.

ALTERNATIVE ENTRY REQUIREMENTS

- If your qualification isn't listed here, or you're taking a combination of qualifications, contact us for advice
- Applications from mature students are welcome.

THE ORIGINAL REDBRICK