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: 31 January 2024
- Starts: 23 September 2024

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 AND CLIMATE SCIENCES) (ENVS103)

Credits: 15 / Semester: whole session

This module is designed to introduce students to key concepts and skills in ocean and climate sciences, for instance key software tools for data analysis and illustration, laboratory skills, and fieldwork experience. Students will also develop more generic skills, particularly in communication through essay writing, technical reports, and oral and poster presentations. This will involve both individual and teamwork and will help students develop time management skills. The module also introduces students to academic integrity and shows students how to access scientific literature and how to use bibliographic software. All students are assigned to a tutorial group with one of the academic staff as their tutor. Teaching is carried out both to the whole year group and also during tutorial group meetings. The module is assessed via a series of coursework assignments.

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 emphasises acquiring mechanistic insight and drawing upon order of magnitude calculations. By the end of the module students will understand how the oceans and atmosphere combine to shape Earth’s climate. Students gain quantitative skills by completing a series of coursework exercises and a final exam. Students address the Net Zero carbon goal via group work involving digital storytelling.

LIVING WITH ENVIRONMENTAL CHANGE (ENVS119)

Credits: 15 / Semester: semester 1

This module examines a number of global ‘grand challenges’ facing humans on the planet earth related to climate and environmental change. It will introduce students to core concepts of sustainability and human impacts upon the environment, as well as exploring the range of proposed solutions and mitigation strategies which are available to understand climate and environmental change. The module thus provides a core knowledge base for social and natural scientists who wish to understand environmental change.

MARINE ECOSYSTEMS: DIVERSITY, PROCESSES AND THREATS (ENVS122)

Credits: 15 / Semester: semester 2

This module is designed to deliver an introduction to the diversity of marine ecosystems across the globe. Each week during in person lectures you will be introduced to a new ecosystem and will learn about this habitat, specifically the main organisms, key processes, and human threats to each ecosystem described and explored. Central to this module are interactive discussion sessions (workshops) that will build an understanding of how marine ecosystems are expected to respond to the human-induced changes of the anthropocene. During these workshops you will learn to critique a piece of scientific research in small group discussions guided by academics. Your knowledge and understanding will be assessed via open-book online tests, and a group project in which you will create an infographic outlining the threats a particular ecosystem faces.

THEORY AND LABORATORY EXPERIMENTS IN EARTH SURFACES 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 year. This module comprises multiple whole-day practical sessions, each designed to give students first-hand experience of a topic important in understanding our changing environment. Students get formal feedback in each assessed week (one poster per group). However, perhaps most valuable is the feedback obtained informally via discussions during the sessions.

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.

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

ESSENTIAL MATHEMATICAL SKILLS (ENVS117)

Credits: 15 / Semester: semester 1

This module is designed to provide students without a A-Level GCE level (or equivalent) background in mathematics a foundation to their degree programme. The module covers pure maths, maths mechanics and statistics developing the required knowledge and skills to be able complete degree programmes in Ocean Sciences, Earth Sciences, Geography, Environmental Science and Marine Biology. The module is taught as weekly lectures following a ten-chapter book developed for the module by world leading experts in the fields. Lectures are supplemented with workshops where concepts can be discussed and skills improved. The module is assessed though online pop-quizzes and a formal written exam.

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. Basic matrix manipulation will be covered as well as vector algebra and an understanding of eigenvectors and eigenvalues.

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 research and careers skills required by marine biologists, ocean scientists and environmental scientists as they prepare for their final year of study. These aims are achieved through blended learning approach including: interactive tutorials, workshops, and the School of Environmental Sciences careers week. Students will focus on developing skills in critiquing and reading the scientific literature, assessed through a literature review essay. Students will also be introduced to the process of scientific research, learning how to analyse and synthesise real scientific data, create professional display items and write a research report, which is assessed, in standard scientific format. Students will develop knowledge of careers in their field and enhance their employability taking part in an assessment centre exercise and job video interview, which is 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 covers 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. The module has a balance between theory, processes, impacts, and hands-on experimentation and data analysis.

MARINE POLLUTION (ENVS232)

Credits: 15 / Semester: semester 2

Students are taught how marine systems are changing due to globally increasing water 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 affecting coastal and open ocean waters are covered. Students will gain an understanding of the causes and processes that drive marine pollution issues as well as techniques used to monitor, remediate and/or regulate those issues. Assessment is done through group work, coursework and a final in-person exam.

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 and learn how the physics, biology and chemistry of the ocean come together to control the lives of plankton. In this module we will get you to think about how turbulence and stratification in the ocean control the growth of different sizes of plants and animals by determining how they can acquire light, nutrients and food. You will learn how plankton play a key role in shaping Earth's climate, but that this depends on the plankton species and plankton size. We will also consider how plankton 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 global ocean to illustrate the fundamental links between the ocean's physical and biogeochemical processes, plankton communities and Earth's climate. Teaching is structured around a series of short videos on key topics and concepts, with class work then looking at relevant case studies, discussing some of the important implications of our changing climate on plankton, and gaining practice in quantifying plankton responses to changes in their ocean environment. Assessment is by one coursework assignment halfway through the semester, and an online open-book exam.

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 lectures, discussions around reading and Q&A. Two days of fieldwork 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

Increasingly recognition of the environmental threats that we all face means that responding to this crisis affects the decisions we all make at a variety of different scales. This module explores the extent to which environmental concerns are taken into account in various decision-making processes involving the public (government), private and third sectors at a variety of different scales, global, European, national and local. The module is assessed by an essay and an open-book exam, 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. Students will see how carbon is partitioned between the atmosphere, land and ocean in the contemporary and past Earth system, understand how the ocean stores 50 times more carbon than the atmosphere, and consider the impact of increasing carbon dioxide on the organisms living on land and in the ocean. Teaching is through lectures, workshops focusing on key components of the carbon cycle, and guided reading. Assessment is by two pieces of coursework.

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 research topics within Ocean and Climate Sciences. It also aims to develop generic skills such as team working and communication skills. The module considers recent reports such as the IPCC (Intergovernmental Panel on Climate Change) and the associated 2019 SROCC (Special Report on Oceans and Cryosphere in a Changing Climate), with students working with one of the lead IPCC authors based in Liverpool. Students will also attend the bi-weekly Ocean and Climate Sciences research seminars that are given by invited national and international experts on a range of subjects related to the marine and climate system. Assessment is by individual oral presentations by students presenting what they have learnt from recent research papers of particular interest to them, and a group presentation on a research topic of current importance (e.g. as highlighted in the latest SROCC report). A final in-person exam is focused around a recent high-impact scientific paper provided to the students.

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.

INDEPENDENT RESEARCH PROJECT (ENVS306)

Credits: 30 / Semester: whole session

This module consists of a two-semester dissertation research project, carried out individually by a student with supervision by a member of academic staff. Projects can be field-, laboratory- or desk-based studies on a predefined project and the student will learn about project design, data collection, analysis and interpretation of results.

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 and an essay.

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 and mitigation measures. Topics will be investigated through a combination of lectures, 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. Coursework is designed around the types of problems encountered, and the skills needed, in commercial, research and public sector jobs. There is an emphasis on data analysis and the use of big data towards understanding the global nature of climate change.

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.

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

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

Discover Uni, 2018-19.

Fees and funding

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

TUITION FEES

UK fees (applies to Channel Islands, Isle of Man and Republic of Ireland)	
Full-time place, per year	£9,250

International fees	
Full-time place, per year	£26,400

Fees are correct for the academic year 2024/25
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.

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 provide tuition fee discounts and help with living expenses while at university.

Check out our Undergraduate Global Advancement Scholarship. This offers a tuition fee discount of up to £5,000 for eligible students starting an undergraduate degree from September 2024. There's also the Liverpool Bursary which is worth £2,000 per year for eligible students.

Discover our full range of undergraduate scholarships and bursaries

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Entry requirements

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

Your qualification	**Requirements** About our typical entry requirements
A levels	ABB including two sciences (acceptable science subjects: Mathematics, Further Mathematics, Physics, Chemistry, Biology, Geology, Geography, Applied Science, Psychology, Marine Science). Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is **BBB** with **A** in the EPQ. You may automatically qualify for reduced entry requirements through our contextual offers scheme.
GCSE	4/C in English and 4/C in Mathematics
Subject requirements	For applicants from England: For science A levels that include the separately graded practical endorsement, a "Pass" is 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 in Advanced Highers, including two science subjects.

Your qualification	Requirements About our typical entry requirements
Welsh Baccalaureate Advanced	Accepted at Grade B with AB at two science A levels
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	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