Ocean Sciences  MOSci

**COURSE DETAILS**
- A level requirements: AAB
- UCAS code: F710
- Study mode: Full-time
- Length: 4 years

**KEY DATES**
- Apply by: 25 January 2023
- Starts: 25 September 2023

**Course overview**

Our Ocean Sciences programme takes an interdisciplinary approach to understanding the ocean environment. With fieldwork opportunities embedded in each year of the course and our strong links to the National Oceanography Centre, Liverpool is an excellent place to study Ocean Sciences. Studying the Master’s programme will provide you with higher level skills and knowledge.

**INTRODUCTION**

The ocean plays a central role in the Earth’s climate system by regulating the transfer of heat and carbon over the globe. The effect of the ocean on Earth’s climate and on life can only be fully understood by addressing the fundamental biological, physical and chemical processes operating in the environment. This degree route takes a multidisciplinary approach to developing an understanding of the ocean and climate system.

We have strong links with scientists from the National Oceanography Centre in Liverpool, who provide guest lectures and supervision of projects.

The four-year master’s programme, (F710), is based on the same multidisciplinary approach as the three-year (F700) programme. In year four we go on to provide you with higher-level skills and knowledge required to work in a research or commercial environment and address the biggest challenges in ocean science. There is a strong emphasis on numerical skills, hands-on laboratory and fieldwork, and independent study.

The first three years follow BSc (Hons) degree programmes offered in ocean sciences, developing a strong, multidisciplinary foundation of knowledge.
and skills. Semester one of year four is focused on broadening your knowledge of ocean research, strengthening data analysis skills, writing and reviewing research ideas, and discussing current research issues in ocean science.

The training in semester one will provide you with the skills to conduct a major independent research project in semester two, which will be supervised by ocean scientists from the University and/or the National Oceanography Centre in Liverpool. This high-level training will prepare you with the critical thinking, communication and writing skills you will need to work in a research environment, as well as an awareness of the future challenges in ocean sciences. The degree in Ocean Sciences at Liverpool is accredited by the Institute of Marine Engineering, Science and Technology.

A number of the School’s degree programmes involve laboratory and fieldwork. 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**

- How the climate is changing
- How life operates in the dynamic ocean environment
- Numerical skills
- Data analysis
- How to write and review research ideas
- Critical thinking.

**ACCREDITATION**

The degree in Ocean Sciences at Liverpool is accredited by the Institute of Marine Engineering, Science and Technology.
Course content
Discover what you’ll learn, what you’ll study, and how you’ll be taught and assessed.

YEAR ONE
The required modules in year one provide grounding in Ocean Science, as well as developing essential and transferable skills that are required throughout your degree programme. Optional modules allow you to focus on areas of ocean and environmental sciences that interest you.

COMPULSORY MODULES

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. Students address the Net Zero carbon goal via group work involving digital storytelling.

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 anthropocene.

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 and how to use a bibliographic software. Tutorials with an assigned individual tutor take place in groups of typically 6-7 students, typically once every 2 weeks.
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 years.

OPTIONAL MODULES

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.

ENVIRONMENTAL CHEMISTRY (ENVS153)

Credits: 15 / Semester: semester 2

This module will give students an understanding of the basics that control fundamental properties of elements and matter, either solid, liquid or gas. It will introduce the fundamentals of atomic structure, elements and molecules from simple inorganic to large organic ones and the bonding forces that held them together. It will look at the basics of chemical reactions with processes of oxidation and reduction, solubility of solids and gases, acid–base properties and thermo-chemistry. Students will learn how to make quantitative predictions on e.g. the amount of products that will be produced based on balanced chemical reactions and will see how basic chemistry can be used to explain many environmental properties. Teaching will be delivered through lectures, tutorial sessions and on-line formative quiz with automated feedback. The tutorial session consists in a set of formative exercises with the presence of demonstrator for facilitate individual learning. The module also include revision sessions (run by demonstrators and staff) as well as revision sessions run by Year 2 and/or Year 3 students who have done this module previously. Assessment is done through 3 on-line tests and a final in-person open book exam.

SEDIMENTARY ROCKS AND FOSSILS (ENVS118)

Credits: 15 / Semester: semester 1
This module provides a basic introduction to sedimentology and palaeontology. Students learn about the origin of sediment, sedimentary processes and structures and the ways in which sediments are converted into solid rock. The course outlines the importance of sedimentary rocks for hydrocarbons, water and as construction materials. Students learn how to describe and interpret sedimentary deposits.

The palaeontology component introduces students to the major fossil groups and to the ways in which organisms can be preserved as fossils. It covers the importance of fossils for the study of evolution, environmental change and earth history. Students learn how to describe fossils and how observations contribute to a broader understanding.

Students will be assessed by means of two practical tests and a theory examination.

**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.

**LIFE IN THE SEAS AND OCEANS (ENVS121)**

**Credits: 15 / Semester: semester 1**

The seas and oceans cover 71% of the Earth’s surface, with an average depth of 3.6 km and a volume of >1 billion cubic kilometres, the seas and oceans represent around 99% of planet Earth’s living space. Around 50-80% of all life on Earth is found in the oceans, with an estimated 240,000 species. As we have only explored around 10% of the oceans, more species and ways of life are still being discovered.

This module is designed to deliver an introduction to the diversity of life in the marine environment. You will be introduced to the range of living organisms in the oceans from microscopic plants and bacteria to whales through a series of E-lectures. During a series of workshops and practicals you will have the opportunity to examine marine organisms in our award winning teaching facilities and explore some of the diverse adaptations marine organisms have adopted in order to meet the challenge of survival in the marine environment. Your knowledge and understanding will be assessed via open-book online tests, a group project and an individual project.

**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.

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

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**YEAR TWO**

The required modules in year two develop further an opportunity to focus on topics in more specialist skills and knowledge in Ocean Sciences. Optional modules provide an opportunity to focus on topics in ocean and climate sciences.

**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.

**MARINE ECOPHYSIOLOGY, ECOLOGY AND EXPLOITATION (ENVS251)**

**Credits: 15 / Semester: semester 2**

The marine environment presents a particular set of challenges for the organisms which inhabit it and these conditions are constantly changing as a result of human interventions. This module will provide a solid grounding in a number of topics, concepts and issues in the marine environment relating to the physiology and ecology of marine organisms and how they are affected by the activities of humans. Module content will be delivered primarily through interactive lectures supported by computer-based practical exercises and assessed by examination (55%) and coursework (45%). Students will be guided to specific sections of textbooks, online resources and scientific papers to shape their learning.

**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.

**SAMPLING THE OCEAN (ENVS220)**

**Credits: 15 / Semester: semester 2**

This module provides some of the fundamental skills required for surveying and sampling the ocean, either for research or for commercial environmental surveying work.

The module covers the methods and skills used in oceanography for:
- Navigation and survey design.
- The measurement of physical parameters, such as temperature, salinity and currents.
- The measurement of biogeochemical parameters such as nutrients, phytoplankton, dissolved oxygen and particles.
- The importance of assessing data quality and instrument calibration, metadata and data banking.

Laboratory work develops skills in the analyses for key oceanographic parameters (e.g. salinity, chlorophyll, dissolved oxygen and nutrients).

Computer laboratories develop skills in sensor calibration, data quality control and data analysis.

These components are all relevant to the subsequent planning and sampling as part of the ENVS349 Sea Practical.

Assessment is by coursework.

**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, students will focus on developing skills in critiquing and reading the scientific literature. Lectures, workshops and tutorials will guide students in developing these skills. This will be assessed through a literature review essay. In the second half of semester one students will be introduced to the process of scientific research through a series of lectures, workshops and tutorials, this will continue in semester two.
In semester two students will continue to learn about scientific research and 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. Students will be supported through this via a series of lectures, workshops and tutorials.

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.

**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.

**OPTIONAL MODULES**

**CATCHMENT HYDROLOGY (ENVS217)**

**Credits: 15 / Semester: semester 1**

The study of catchment hydrology is concerned with water above and below the land surface, its various forms, and its circulation and distribution in time and space within drainage catchments; it is based on fundamental knowledge of the hydrological cycle and its governing factors. Understanding the hydrological cycle is fundamental to physical geography. All life is supported by water and all earth systems incorporate fluxes of water to some extent. The module covers the main hydrological processes operating in drainage catchments in terms of their measurement, operation and controlling factors. The module provide 'hands-on' experience of both observing hydrology and modelling hydrological systems, with an emphasis on applied learning, which might be useful in a vocational sense in the future. The module will aim to deliver excellent training in the knowledge required to work in a wide variety of environmentally-facing careers, including those with the EA, Natural England or DEFRA, as well as Environmental Consultancies.
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.

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.

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.

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

YEAR THREE
Year three provides the opportunity to conduct an independent research project in
oceanography and to engage in sampling activities at sea during a three day research cruise. Optional modules are available in physical geography and oceanography.

**COMPULSORY 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%).

**SEA PRACTICAL (ENVS349)**

**Credits: 30 / Semester: semester 1**

Measurements made at sea are a key activity in oceanographic research and this module provides an introduction to the collection of data and samples including navigation, meteorological parameters, temperature and salinity, currents, dissolved oxygen, nutrients, chlorophyll, and plankton. We will use the Field Studies Council Site at Millport in Scotland. The laboratory phase will take place in Millport and in the Central Teaching Laboratories in Liverpool. The module is assessed by (1) a group presentation on components of the data analysis and quality, (2) a record and laboratory book and (3) a scientific report/paper addressing a key question. The Sea Practical introduces students to the way in which professional ocean scientists work. It involves collecting data and samples at sea, analysing samples in the laboratory, processing and analysing data using computer software, assessing and reporting on the data and its quality, and finally presenting the methods, results and interpretation in an accurate and comprehensive report. By following professional ways of working it provides students with both subject specific and generic employability skills. Research integrity is an integral component of this module.

**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 research topic 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:
- Presentation of the IPCC (Intergovernmental Panel on Climate Change) and the 2019 SROCC (Special Report on Oceans and Cryosphere in a Changing Climate) with one of the lead author, Prof. A. Tagliabue;
- Weekly Ocean Sciences research seminars that are given by international experts on a range of subject (physical, chemical and/or biological) related to the marine system, in the past, currently and/or in the future;
- Individual oral presentations by students of recent research papers or research topic of particular interest to them;
- Group presentations (typically 3 to 4 students per group) on a research topic of current importance (e.g. as highlighted in the latest SROCC report).

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

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, field trips, and development of a project aimed at identifying optimum coastal protection schemes for real case studies.

FLUVIAL ENVIRONMENTS (ENVS372)

Credits: 15 / Semester: semester 2
Fluvial processes are found all over the world and are some of the most important in sculpting the Earth's surface and producing landforms. This module examines fundamental concepts and recent ideas relating to fluvial geomorphology, building on study throughout your educational career. A key point about studying fluvial environments is to understand how the system functions, its links and interactions. It is important to look at all the main components of the system, to understand the dynamics and controls on water and sediment flux and how these produce different types of landforms. The amounts of water and sediment can vary with the environmental conditions and thus study of the drivers of these systems such as climate and human activities and how they have changed over time is essential for being able to interpret the current landscape. Understanding of the present functioning of fluvial systems is essential for any environmental management since rain and runoff are ubiquitous and floods are a major natural hazard.

**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.

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

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**YEAR FOUR**

**COMPULSORY MODULES**

**INTEGRATED MASTERS RESEARCH PROJECT (ENVS402)**

**Credits: 60 / Semester: whole session**

Working closely with the world class scientists within the department, students will carry out an individual research project, building on the knowledge and skills acquired elsewhere in the programme. The project module consists of a literature review conducted during semester 1, followed by the research project through semester 2.

**MODELLING PROCESSES IN OCEANS AND CLIMATE (ENVS414)**

**Credits: 15 / Semester: semester 1**
Many of the important discoveries and hypotheses in ocean sciences are underpinned to some degree by numerical models. These range from large scale climate models that seek to assess the effects of climate change to models of the phytoplankton cell that address nutrient acquisition. Understanding the assumptions and rigour of these approaches is crucial in assessing their results and implications. In this module students will develop an appreciation for how computer models are used to solve differential equations and provide insight into oceanic processes. These will be illustrated with practical examples of how the climate, ocean physics and ocean biogeochemistry operate. The students will learn a number of practical skills focused mainly on developing simple finite-differencing numerical models of ocean processes. Particular emphasis will be placed on using models to draw out an understanding of how the complex ocean and climate systems operate over different scales. The module is based on using the Matlab computer programming language. Worksheets are available for self-learning of the basics of Matlab for students with no Matlab experience.

**ANALYSING CLIMATE PROCESSES AND VARIABILITY (ENVS475)**

**Credits:** 15 / **Semester:** semester 2

This module will introduce the students to a range of large climate data sets from the whole Earth-atmosphere-ocean climate system; these data sets will range from satellite data sets of ocean processes, satellite rain estimation to gridded climate data sets of the ocean and atmosphere, produced from observations, reanalysis and forecasts or projections and the introduction and use of palaeorecords of climate change and variation.

**OPTIONAL MODULES**

**POLITICS OF THE ENVIRONMENT (ENVS525)**

**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.

**INTRODUCTION TO QUATERNARY MICROPALAEONTOLOGY (ENVS542)**

**Credits:** 15 / **Semester:** semester 2
Programme details and modules listed are illustrative only and subject to change.

**RESEARCH IN ANTHROPOCENE ENVIRONMENTS (ENVS485)**

**Credits: 15 / Semester: semester 1**

Research in Anthropocene Environments provides an opportunity for students to be introduced to, and focus on a wide range of potential topics at an early stage in their MSc studies, providing insight into how research spanning this broad theme is undertaken. The only condition for the topic that students select is that it addresses an aspect of an Anthropocene environment (defined here as one which is directly or indirectly human influenced). It is delivered by staff from across the School of Environmental Sciences whose research is intimately linked to the module title, also allowing students to gain a better insight into the wide range of topics that fall under this theme and what research is done in the school. Staff also talk briefly about their own paths into academia to highlight how research ideas and interests evolve. It is assessed by an abstract and a combined large poster/short oral presentation. The latter occurs during a day of presentations, which is designed to mimic an academic conference.

**COASTAL ENVIRONMENTS: SPATIAL AND TEMPORAL CHANGE (ENVS576)**

**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 and field trips aimed at identifying optimum coastal protection schemes for real case studies.

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

**HOW YOU’LL LEARN**
Teaching takes place through lectures, practicals, workshops, seminars, tutorials and computer based learning, with an emphasis on learning through doing.

Students value the learning opportunities provided by field classes, including the rapid feedback on performance. You will typically receive at least 15 hours of formal teaching each week. Between 30 and 100 hours of fieldwork and hands-on activities are provided each year depending on the discipline.

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 year one and two. In year three, you will undertake an Honours project, which is a piece of independent research (field, laboratory or data analysis) on a topic of your choice, supervised by a member of staff. In years three and four students meet with their project supervisor on a weekly or more frequent basis. As you progress through your degree, you will be increasingly challenged to engage with current debates, to think critically and to study independently.

A number of the School's degree programmes involve laboratory and field work. The field work is carried out in various locations, ranging from inner city to coastal and mountainous environments. We consider applications from prospective students with disabilities on the same basis as all other students, and reasonable adjustments will be considered to address barriers to access.

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. Emphasis is placed on good laboratory practice and maintaining useful lab notebooks in the context of scientific integrity and scientific data management. In year four of this integrated master's programme assessment of the final research project guides students through the peer-reviewed scientific publication process.

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
With the environmental challenges facing the planet, there has never been a better time to study programmes in the ocean sciences: to understand the drivers of climate change, how the oceans are responding to our warming climate, why and where sea level is rising, and how these changes are affecting ecosystems on land and in the ocean. Our degree programmes are designed to provide you with the skills to tackle these global environmental challenges.

89.5% OF ENVIRONMENTAL SCIENCES STUDENTS ARE IN WORK AND/OR FURTHER STUDY 15 MONTHS AFTER GRADUATION. 
Discover Uni, 2018-19.

After completing this course, the employability options are extensive and include:
- 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, funding your studies, 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.

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<th>Also applies to Channel Islands, Isle of Man and Republic of Ireland</th>
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<tr>
<td>Full-time place, per year</td>
<td>£9,250</td>
</tr>
<tr>
<td>Year in industry fee</td>
<td>£1,850</td>
</tr>
<tr>
<td>Year abroad fee</td>
<td>£1,385</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>International fees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time place, per year</td>
</tr>
</tbody>
</table>

Fees stated are for the 2023-24 academic year:

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 includes the cost of a lab coat, food and drink during compulsory field courses, and dissertation expenses.

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.

<table>
<thead>
<tr>
<th>Your qualification</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A levels</td>
<td><strong>About our typical entry requirements</strong></td>
</tr>
<tr>
<td></td>
<td>AAB</td>
</tr>
<tr>
<td></td>
<td>Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is <strong>ABB</strong> with <strong>A</strong> in the EPQ. You may automatically qualify for reduced entry requirements through our <a href="#">contextual offers scheme</a>.</td>
</tr>
<tr>
<td></td>
<td>If you don’t meet the entry requirements, you may be able to complete a foundation year which would allow you to progress to this course. Available foundation years:</td>
</tr>
<tr>
<td></td>
<td>• Earth Sciences entry route leading to BSc (Hons) (4 year)</td>
</tr>
<tr>
<td>GCSE</td>
<td><strong>4/C</strong> in English and <strong>4/C</strong> in Mathematics</td>
</tr>
<tr>
<td><strong>Subject requirements</strong></td>
<td>Including two sciences. Acceptable sciences: Mathematics, Further Mathematics, Physics, Chemistry, Biology, Geology, Geography, Applied Science, Marine Science, Environmental Science, Psychology. For applicants from England: For science A levels that include the separately graded practical endorsement, a &quot;Pass&quot; is required.</td>
</tr>
<tr>
<td>Your qualification</td>
<td>Requirements</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>BTEC Level 3 National Extended Diploma</td>
<td>Not accepted. Applicants should apply for F700</td>
</tr>
<tr>
<td>International Baccalaureate</td>
<td>35 points including grade 5 at Higher Level in two science subjects (see subject specific requirements), no score below 4.</td>
</tr>
<tr>
<td>Irish Leaving Certificate</td>
<td>H1, H1, H2, H2, H2, H3 including H2 or above in two sciences</td>
</tr>
<tr>
<td>Scottish Higher/Advanced Higher</td>
<td>Not accepted without Advanced Highers at ABB including two sciences</td>
</tr>
<tr>
<td>Welsh Baccalaureate Advanced</td>
<td>Accepted at Grade B with AA at A levels in two science subjects</td>
</tr>
<tr>
<td>Access</td>
<td>Not accepted. Applicants should apply for F700</td>
</tr>
<tr>
<td>International qualifications</td>
<td>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.</td>
</tr>
</tbody>
</table>

**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.