Biological Sciences  BSc (Hons)

**COURSE DETAILS**
- A level requirements: **ABB**
- UCAS code: C100
- Study mode: Full-time
- Length: 3 years

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

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**Course overview**

Study Biological Sciences at Liverpool to focus on the study of living things, and understand how they respond to each other and the world around them.

**INTRODUCTION**

This programme allows you to pursue your own areas of specific interest and to have an appreciation of the full range of the subject.

Should you decide sometime in the first two years that you wish to specialise, you can transfer to a number of programmes in the School of Life Sciences, subject to meeting the appropriate pre-requisites for your chosen programme.

A progressive series of field, laboratory and lecture modules cover most aspects of the Biological Sciences, with students able to select topics to match their interests. Modules are selected from more than 50 options offered within the School of Life Sciences.

In year three, field courses in Zoology and Ecology are available. You will also undertake a research project that you will choose from one of the various parts of the School to complement the lecture programme chosen for your Honours year. Each project gives an invaluable opportunity to see what real scientific research is like and to work alongside staff who are international authorities in their fields.

Across all 3 years there are options to choose laboratory practicals or field courses. In your final year you will also undertake a research project that you will choose from one of the various parts of the School to complement the lecture programme you have chosen for your Honours year. Each project gives an invaluable opportunity to see what real scientific research is like and to work alongside staff who are international authorities in their fields.
WHAT YOU’LL LEARN

- Knowledge and understanding of the subject and the ability to evaluate and interpret this knowledge to solve problems
- Skills that will equip you to investigate research topics and communicate your findings
- How to analyse and interpret real-world data and communicate the results clearly and concisely
- How to access and critically evaluate scientific literature in the area of biological sciences
Course content
Discover what you’ll learn, what you’ll study, and how you’ll be taught and assessed.

YEAR ONE
During year one you will develop essential skills and a thorough understanding of this subject to prepare you for the more advanced modules in subsequent years of this degree.

COMPULSORY MODULES

MOLECULES AND CELLS (LIFE101)
Credits: 15 / Semester: semester 1
This module describes the detailed composition of cells and the processes by which they obtain and generate energy, grow, replicate and eventually die.
The lectures will be supplemented with on-line resources and illustrated with some of the latest research methods that are used to study cell structure and function.
Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.
The module will be assessed by both continuous assessments and by a final examination.

EVOLUTION (LIFE103)
Credits: 15 / Semester: semester 1
This module describes the evolutionary processes that have resulted in the generation of the diverse life forms that populate the planet.
This includes the theory of evolution by natural selection, and the genetic processes that result in gene evolution and diversity.
Selected scenarios and case studies will apply evolutionary concepts, showing the fundamental importance of evolution to a broad range of the life sciences.
The module is split into two parts: the first part (A) is the same for all students, the second part (B) contains a number of parallel strands tailored to students interest.
Students will be advised by their programme director which strand to follow.
The lectures will be supplemented with a variety of on-line resources.
Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.
The module will be assessed by continuous assessments.

GRAND CHALLENGES IN BIOLOGY (LIFE105)
Credits: 7.5 / Semester: semester 1
This module introduces students to how grand challenges (scientific and societal) are addressed in universities and in particular at the University of Liverpool. Students will be introduced to four major topics (Infections and Global Health, Ageing, Food Security, Personalised Medicines) by experts in the respective fields. Emphasis will be placed on students understanding concepts and assembling information rather than memorizing facts. The material will be delivered based on the concept of a scientific conference with plenary talks and parallel sessions presented by the lecturers, and (in light of Covid-19 driven procedures at scientific meetings) a video session driven by student input. Assessment of lecture material and associated readings will be by continuous assessment.

**EXPERIMENTAL SKILLS IN CURRENT BIOLOGY (LIFE107)**

**Credits: 15 / Semester: whole session**

This is the first practical module that students will take in the School of Life Sciences. The skills that students acquire will be needed for other practical modules that they will take in semester 2 Year 1, and during Year 2 and will prepare them for their year 3 research project and for their subsequent career.

This module is designed to teach the basic multidisciplinary skills required in the biological sciences.

It aims to develop careful working practices, experimental design and interpretation of results. Skills acquired in this module will be both utilised and enhanced by the co-requisite module LIFE 109 (communication and study skills and quantitative skills).

The way in which LIFE 107 is taught and assessed is designed to place emphasis on encouraging students to take responsibility for their own learning. Demonstrators and academic staff will be on hand to answer questions or show students how to use lab equipment.

Resources will be available online via VITAL and include a weekly Blog, technical manual, module handbook, lab instruction manual and weekly lectures.

The module will be taught in weekly practical classes and it will be assessed through continuous assessment (assessment 1-2) and a final exam (assessment 3).

**QUANTITATIVE SKILLS FOR THE LIFE SCIENCES (LIFE113)**

**Credits: 7.5 / Semester: semester 1**

For any student studying the Biological Sciences a firm grasp of quantitative skills is an absolute necessity. This module will provide you with the knowledge and skills you need to manipulate numbers and analysis/visualise data using digital tools. The module emphasises a “learn by doing” approach to the development of quantitative skills and is heavily workshop based.

**COMMUNICATION AND STUDY SKILLS FOR THE LIFE SCIENCES (LIFE130)**

**Credits: 7.5 / Semester: whole session**

**OPTIONAL MODULES**
ANIMAL BIODIVERSITY (LIFE112)
Credits: 15 / Semester: semester 2
This module studies the body plans of the major groups of animals and explores the relationship between body form and function.

It also discusses the evolutionary origins of these basic body plans and how these have been modified to adapt to particular habitats.

The module will be taught through a mixture of asynchronous and synchronous material. The former consists of pre-recorded videos and other online learning material, the latter consists of scheduled interactive online sessions. Students will also be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed through continuous assessment.

BIOCHEMICAL METHODS (LIFE122)
Credits: 7.5 / Semester: semester 2
This course introduces widely used laboratory concepts and practical techniques that are relevant to academic research, industry and medical applications.

BIOCHEMISTRY AND BIOMEDICAL SCIENCES (LIFE102)
Credits: 15 / Semester: semester 2
This module will provide the foundation for future studies on the molecular basis of life and disease. It covers basic biochemistry and immunity and how these fields can provide a molecular explanation for life and disease. The module will encourage confidence, teamwork and communication through active learning in lectures and workshops centred around authentic assessments.

BIOLOGY & ECOLOGY FIELD SKILLS (LIFE124)
Credits: 7.5 / Semester: semester 2
This five-day course takes place in the early summer in a biologically rich, beautiful location in the UK, typically the Lake District or the Yorkshire Dales. Students gain an introduction to the skills biologists use to study individuals, populations, species and ecosystems in the field.

Students spend a day learning some of the basic skills biologists use to observe animal behaviour in the natural environment, focusing on birds and insects.

They then learn techniques used to monitor the number of animals in wild populations, given that in the field observing an entire population is typically impossible. They live-trap and release both small mammals and invertebrates, and trap moths.
Next, they spend a day examining the interactions between species, focusing on how the different characteristics of species determine how they compete and coexist with one another, and how seemingly minor microhabitat differences can radically alter community structure and the species that persist in an area. This day introduces plant taxonomy and diversity.

Finally, they learn techniques for investigating ecosystems at the largest scale, tracking how nutrients cycle through the plants and animals in a habitat, and the water and soil. They study how this flow of nutrients can alter an ecosystem, and impact on the survival of the species and individuals within it.

More broadly, students learn the basics of taxonomy, and an appreciation for the phenomenal diversity of organisms that can be found across the UK. Importantly, they are also taught to think critically about the methods they are using, gaining experience in experimental design, and a greater understanding of the challenges inherent to taking biology out of the laboratory and into the field.

**ECOLOGY AND THE GLOBAL ENVIRONMENT (LIFE120)**

 Credits: 15 / Semester: semester 2

This module will introduce students to the physical and chemical contexts of the biosphere, the cycling of important elements at different scales, the distribution of biomes and the ecosystem concept.

Ecological concepts such as succession, niche, food web theory and ecosystem stability will be introduced, and how these are impacted by human activities.

The module will also consider the conservation of biodiversity over a range of biological scales using UK and global case studies. The lectures will be supplemented with on-line resources.

Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by coursework, including online test.

**INTRODUCTION TO ANIMAL HUSBANDRY (LIFE118)**

 Credits: 15 / Semester: semester 2

This module provides an introduction to veterinary animal husbandry in the form of lectures, a workshop on poster presentation and a mini conference where students exhibit their posters.

The module covers the basic physiology relevant to animal management; environmental considerations, nutrition and housing; the welfare of managed animals and breeding issues.

The module is assessed by continuous assessment, the poster, and by a final examination.

**INTRODUCTION TO ANIMAL INFECTIOUS DISEASES, EPIDEMIOLOGY AND PUBLIC HEALTH (LIFE126)**

 Credits: 15 / Semester: semester 2
The module will introduce the biology of a range of veterinary infectious diseases. Basic concepts in disease epidemiology, surveillance and control will be introduced and the effects/association diseases have on animals, society and the environment. Students will be taught in small tutorial groups by research active teaching staff to develop information on a specific disease and present their group findings as a PowerPoint presentation at a “mini-conference”. The module is assessed through the presentation and a final exam.

**INTRODUCTION TO PHYSIOLOGY AND PHARMACOLOGY (LIFE106)**

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

**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.

**MICROBIOLOGY (LIFE110)**

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

**INTRODUCTION TO GENETICS AND DEVELOPMENT (LIFE128)**

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

This module introduces students to modern genetics and developmental biology at an introductory level. Using examples taken from across the biosciences and medicine, students will develop their understanding of the inheritance of genetic traits, how mutation can lead to disease and the molecular techniques used to study genes. They will also be introduced to development from meiosis and germ cell formation through to organogenesis, emphasising both the underlying genetic and molecular mechanisms involved and the embryological processes. Students will explore current advances in both fields including current and potential use of gene editing techniques and stem cells in therapeutics, and will consider the ethical implications of these advances.

The module is taught through a combination of lectures and workshops incorporating problem solving and discussion, with an emphasis on an appreciation of the techniques and experimental evidence underpinning the material. Assessment is by a combination of a written examination and a group ethics poster presentation.

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

In year two, you will take one compulsory module which serves to develop the essential life science skills that aim to enhance the employability prospects of students and career awareness. You then select entirely from a range of optional modules that allows you to pursue a focal point for your own specific areas of interest in biological sciences.

COMPULSORY MODULES

ESSENTIAL SKILLS FOR THE LIFE SCIENCES 2 (LIFE223)

Credits: 15 / Semester: whole session

This module will continue, extend, and broaden the transferable skills developed in Year 1. It will focus on improving the students’ analytical, communication, quantitative, and employability skills. The communication skills component is assessed through a portfolio whereas the quantitative skills component is assessed through a group poster and SAQ.

OPTIONAL MODULES

FROM GENES TO PROTEINS (LIFE201)

Credits: 15 / Semester: semester 1

This module aims to provide students with an understanding of the fundamental processes whereby genetic information is expressed as proteins in prokaryotic and eukaryotic cells. Lectures will be supplemented with on-line resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module. The module will be assessed two assessments.

CELL SIGNALLING IN HEALTH AND DISEASE (LIFE202)

Credits: 15 / Semester: semester 2

This module will describe the molecular mechanisms that allow cells to communicate with each other;

The basic properties common to all signalling pathways will be studied and then a series of individual pathways will be examined in more detail, in the light of these general principles;

The importance of cellular signalling mechanisms will be illustrated by examining diseases (e.g. cancer, diabetes, cardiovascular disease, obesity, neurological disorders) that result from defects in these mechanisms;

The lectures will be supplemented with on-line resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module;

The module will be assessed by continuous assessment

STRUCTURE AND DYNAMICS OF MACROMOLECULES (LIFE203)

Credits: 15 / Semester: semester 2
This module aims to provide an introduction to the detailed structure of biomolecules (particularly nucleic acids and proteins), the different techniques used to determine this structure and how structural features define biological function. LIFE245 is a prerequisite. Examples will be included to show how altered structure leads to altered function in disease. It will introduce cutting-edge technologies used to investigate protein structure and behaviour from actually visualising molecules using cryo-electron microscopy and X-ray crystallography, to determining how molecules move and interact using nuclear magnetic resonance (NMR). The uses, advantages and limitations of these techniques will be illustrated using case studies of specific macromolecular complexes. The lectures will be supplemented with on-line resources.

Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by both continuous assessments and by a final examination.

**ENDOCRINE AND NEURO-PHYSIOLOGY (LIFE204)**

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

This module aims to provide the essential background knowledge to understand key concepts in neuroscience. It covers the principles of operation of nervous system, systematic and sensory neurophysiology, excitotoxicity and behaviour. The module also provides essential background knowledge to understand the key principles of endocrinology, and how it contributes to physiological homeostasis. It covers the secretions, functions and regulation of the major endocrine glands. The module also explores the role of the nervous and endocrine systems in the integrative control of the digestive tract. The lectures will be supplemented with on-line resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module. The module will be assessed by both continuous assessments and by a final examination.

**THE MULTICELLULAR ORGANISM: TISSUES, DEVELOPMENT, REGENERATION AND AGING (LIFE205)**

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

This module aims to describe the structure and function of fundamental tissues, such as epithelial and connective tissue and of specialised tissues such as bone, muscle and the nervous system. An introduction to the mechanisms by which cells differentiate to form different tissues and regenerate following injury will be included. The processes that occur during aging will be explained with special reference to changes in key tissues and organs. The lectures will be supplemented with on-line resources, guided reading and formative assessment exercises that will enable students to evaluate their understanding of the module. The module will be assessed by both continuous assessment and by a final examination.

**DRUG ACTION (LIFE206)**

**Credits: 15 / Semester: semester 2**
This module aims to enable students to develop their understanding of the cardiovascular, endocrine and central nervous systems and the mechanisms by which drugs interact with physiological processes operating within each of these systems. They will also gain an appreciation of the drug development process, including clinical trials and drug regulation. The lectures will be supplemented with on-line resources. Students will be given guided reading, and regular formative assessment exercises in class will enable students to evaluate their understanding of the module. The module will be assessed by through two online assessments.

**PRINCIPLES OF PHARMACOLOGY (LIFE207)**

*Credits: 15 / Semester: semester 1*

This module will provide an understanding of the quantitative aspects of drug action on cellular receptors and will address the relationship between drug efficacy and chemical structure.

The module will introduce the basic principles of pharmacokinetics, outline the relationship between drug concentration and response, and include an introduction to the principles of toxicity of drugs and their metabolites.

The module will provide knowledge of the molecular biology of receptors.

The lectures will be supplemented with online resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by both continuous assessments and by a final examination.

**MOLECULAR AND MEDICAL GENETICS (LIFE208)**

*Credits: 15 / Semester: semester 2*

This module aims to introduce students with an interest in Genetics and Molecular Biology to the range of biological mechanisms that control structure and stability of the genetic material and their impact on health and disease.

It uses examples from both prokaryotic and eukaryotic organisms, to develop principles that explain DNA replication, repair and recombination. These principles and processes are then discussed in a clinical/medical genetics context.

The lectures will be supplemented with on-line resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by both continuous assessments and by a final examination.

**VIROLOGY (LIFE209)**

*Credits: 15 / Semester: semester 1*

This module is an introduction to modern virology.
The module provides an overview of different virus families and aims to explain the fundamental properties of different viruses, their infection in different organisms, their detection and control, and positive applications of viruses.

The lectures will be supplemented with online resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by both continuous assessments and by a final examination.

**BIOTECHNOLOGY (LIFE210)**

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

This module will examine the ways in which biological processes are applied for solving technological processes.

Examples of specific processes will be used including production of antibiotics, biomass, single cell protein, biopolymers, vaccines and other therapeutic agents.

The lectures will be supplemented with online resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by two assessments.

**ANIMAL BEHAVIOUR (LIFE211)**

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

This module provides an introduction to the fundamental evolutionary principles that explain a wide range of animal behaviours. These include sexual selection and animal mating behaviours, the evolution of co-operative societies, as well as conflict and conflict resolution.

The lectures will be supplemented with online resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module. The module will be assessed by both continuous assessments and by a final examination.

**COMPARATIVE ANIMAL PHYSIOLOGY (LIFE212)**

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

This module describes the physiological problems encountered by animals in their natural environments, and how these problems are overcome.

The setting is environmental, relating lifestyle and physiology to habitat and to the rigours of a potentially hostile environment.

The module will explain how the lifestyles of animals and the independence of animals from environmental disturbance are critically linked to the management of energy flow through their bodies. Physiological mechanisms will be described at all levels of organisation in relation to energetics, temperature, respiration, osmoregulation, and nitrogen excretion. Emphasis will be placed on differentiating the molecular, cellular and system levels of organisation and their integrated role in optimising animal-environmental interactions.
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The module is taught through a mixture of asynchronous and synchronous sessions. The former consist of pre-recorded videos, the latter are interactive online sessions to promote student engagement and active learning. Students will also be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by Coursework

**EVOLUTIONARY BIOLOGY (LIFE213)**

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

This module seeks to explain how the process of natural selection underpins the origins of biodiversity.

The first part of the module will address the origins of phenotypic diversity, focussing on where heritable phenotypic variation comes from and how it shapes the evolutionary process within species (microevolution).

Having established a basic model for understanding how evolution works, the second part of the module will explain the link between microevolution and evolution above the species level (macroevolution), overviewing the major evolutionary transitions. At the end of the module, students will choose between two specialised short courses on either evolutionary ecology or molecular evolution.

The lectures will be supplemented with online resources. Students will be given guided reading, and regular formative assessment exercises that will enable students to evaluate their understanding of the module.

The module will be assessed by both continuous assessments (40%) and by a final examination (60%).

**POPULATION AND COMMUNITY ECOLOGY (LIFE214)**

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

This module aims to introduce students to the concepts and principles underlying the dynamic interactions within populations and between species within communities. It will draw upon examples taken from across the globe: pressures on fish stocks; use of natural predators for biological control processes; how mutualistic interactions benefit communities, such as coral reefs and leguminous plants. It will also explore how knowledge and understanding of these species and community interactions can help plan for ecological mitigation and restoration. The lectures will be supplemented with online resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module. The module will be assessed by coursework.

**VETERINARY FORM AND FUNCTION (LIFE215)**

**Credits: 15 / Semester: semester 1**
This module will allow students to develop an understanding of functional anatomy and physiology of the major body systems (reproductive/endocrine, cardiovascular/respiratory, musculoskeletal, nervous, and digestive/excretory) using the dog as a model species;

The module will take an integrative approach, allowing the students to compare and contrast the anatomy and physiology of these body systems with those in other species of veterinary interest and apply this knowledge to understand how disruption of these systems can result in disease;

The module will be supplemented with on-line resources;

Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module;

The module will be assessed by two summative coursework assessments.

VETERINARY PARASITOLOGY AND PUBLIC HEALTH (LIFE216)

Credits: 15 / Semester: semester 2

The aim of this module is to develop knowledge of the important parasitic diseases of companion and food producing animals in the U.K. and globally, leading also to an understanding of the importance of these diseases to human and animal public health. The lectures will be supplemented with on-line resources.

Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by two items of continuous assessment and by a final examination.

ADVANCED ANIMAL HUSBANDRY (LIFE217)

Credits: 15 / Semester: semester 1

This module is designed to integrate and extend student’s knowledge of nutrition, reproduction, genetics and breeding, behaviour and welfare and to combine this with an assessment of the environment in which animals are kept. A species approach is used in which feeding, housing, breeding and general management of several major species important in the animal industries are considered. Transfer of knowledge about principles will be expected between species to help develop a deep understanding of animal husbandry.

The module will be supplemented with on-line resources. Students will be given guided reading, and regular formative assessment exercises will enable students to evaluate their understanding of the module.

The module will be assessed by both continuous assessments and by a final examination.

THE IMMUNE SYSTEM IN HEALTH AND DISEASE (LIFE221)

Credits: 15 / Semester: semester 1
The module will develop knowledge and understanding of the immune system, the molecules, cells and tissues that are involved in its function, its role in combating infection and how its dysfunction can contribute to disease.

Lectures will be supplemented with online resources. Problem solving workshops dedicated to case studies will be held to help students prepare for the assessments. Students will be given guided reading, and formative and summative assessment exercises held during the course will enable students to monitor and evaluate their progress and to prepare for the final assessment.

The module will be assessed by two assessments.

**TROPICAL ECOLOGY FIELD COURSE (LIFE222)**

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

This is an elective residential field course in Uganda. The aim of this module is to introduce students to the ecology of tropical ecosystems and the field techniques used to study them, through staff-led field visits, seminars and student executed field studies.

The module includes tropical ecosystem function, patterns of forest regeneration, patterns of biodiversity in the tropics, the natural history of important plant and animal taxa and primate behavioural ecology. Interactions between humans and tropical ecosystems will also be a key focus, with conservation, sustainable development, human-wildlife conflict and ecotourism also being addressed.

The module will be assessed by continuous assessments. In the event of unforeseen circumstances that prevent either individual students attending, eg illness shortly before departure, or cancellation of the trip, eg on FCO and/or University insurer advice, local alternate assessment exercises will be made available. These will predominantly be library-based, but might involve field visits where possible to practice field skills.

**ADVANCED BIOCHEMICAL TECHNIQUES (LIFE224)**

**Credits: 7.5 / Semester: semester 2**

This module will provide practical experience in advanced biochemical techniques. Students, working in small groups (of 4, exceptionally 3) will plan and perform two experimental projects: one on enzyme stability, and the other on protein purification. This module is required for students intending to enter the Biochemistry Honours School and is continuously assessed.

**E-BIOLOGY: INFORMATICS FOR LIFE SCIENCES (LIFE225)**

**Credits: 7.5 / Semester: semester 1**
Many aspects of modern biology are being revolutionized by high-throughput methods that make copious amounts of data available in digital form. The aim of this module is to provide students with a practical appreciation of the nature and significance of this revolution. While the focus will be on analysis of data from areas such as genome sequencing, gene expression, and protein structure studies, the module will also look at use of such data in the context of understanding higher order phenomena within cells, such as metabolism, gene regulation, and protein-protein interaction. The module is continuously assessed.

**ADVANCED GENETICS TECHNIQUES (LIFE226)**

Credits: 7.5 / Semester: semester 2

This practical module aims to provide practical experience in a range of genetic techniques including the production and characterisation of specific deletion mutants, mutagen screening, cytogenetics and karyotype analysis, population studies, molecular analysis of genomes and bioinformatics. This module is required for students intending to enter the Genetics Honours School. The module is continuously assessed.

**TECHNIQUES IN CELL BIOLOGY (LIFE227)**

Credits: 7.5 / Semester: semester 1

This practical module aims to provide practical and theoretical experience in techniques currently used in cell biology. These techniques include assay, culture, histology and microscopy. The module is assessed through coursework and a final exam.

**ADVANCED MICROBIOLOGICAL TECHNIQUES (LIFE228)**

Credits: 7.5 / Semester:

This practical module aims to provide students with an opportunity to learn and apply a range of microbiological laboratory techniques in order to develop their ability to plan and execute research projects in microbiology. The module is continuously assessed.

**PRACTICAL HUMAN PHYSIOLOGY (LIFE229)**

Credits: 7.5 / Semester: semester 1

The aim of this practical module is to develop students’ core experimental skills in human physiology, including methods to measure the cardiovascular and respiratory systems. Students will thus improve their understanding of scientific method, and develop teamworking and presentation skills. During the practical classes and plenary lectures students will be introduced to various techniques for measuring physiological variables. Then they will learn how to apply appropriate statistical tools to define the normal or expected range for physiological variables. Students will learn how to design experiments and how to assess the accuracy and precision of data, and identify sources of error. The module is continuously assessed.

**ADVANCED TECHNIQUES IN ZOOLOGY (LIFE230)**
Credits: 7.5 / Semester: semester 2

This module aims to provide practical experience in advanced laboratory techniques in zoology. These techniques are placed within a biological context so that students will not only learn the techniques, but also use them to answer questions about form and function of animals. The module is laboratory-based and students will work in small groups to conduct experiments and generate data that will be analysed using Excel and Minitab, SPSS or similar software. The module is assessed continuously and through an exam.

EXPERIMENTAL PHYSIOLOGY (LIFE232)

Credits: 7.5 / Semester: semester 2

The aim of this practical module is to provide students with an understanding of physiological regulatory mechanisms, the importance of these systems in maintaining homeostasis and the consequences of system malfunctions. It will use a variety of teaching and learning strategies including lectures, practicals and self-directed study to develop key skills for subsequent educational and employment needs. Students will develop their understanding of scientific method, and where conditions allow their teamworking skills. During the practical classes and plenaries they will be introduced to various techniques for investigating physiological variables. Students will learn how to work individually and, where possible, in small groups to collect, analyse and present data from experiments, simulations and databases. The module is assessed through coursework and an exam which might be conducted online.

BIODIVERSITY PRACTICAL SKILLS (LIFE233)

Credits: 7.5 / Semester: semester 1

This practical module aims to provide practical experience in many of the techniques and methods currently used to identify and classify plants and animals. This will include microscopic and macroscopic examination of specimens, recognition of the role of museum collections in research, and electronic methods of data analysis and storage. Teaching activities include a combination of field work at Ness Gardens and the World Museum, laboratory sessions, and introductory lectures. The module is continuously assessed with workbooks completed in the practical classes, and a final report which draws on several of the practical classes.

PRACTICAL PHARMACOLOGY (LIFE234)

Credits: 7.5 / Semester: semester 2

This module aims to provide practical experience in many of the techniques specifically used in the study of Pharmacology. It will also provide you with the specialist skills and knowledge of techniques necessary to undertake practical work and project work in Year Three. Each practical will be introduced through a 15-20 minute presentation and will run for 3 hours. The module will be assessed through a report describing the experimental techniques and main findings of one of the key practicals, and through a final online assessment aimed at evaluating student understanding of the experimental approaches, underpinning pharmacological principles and data processing/interpretation.
PRACTICAL SKILLS IN TROPICAL MEDICINE (LIFE236)

Credits: 7.5 / Semester: semester 2

This practical module will enhance knowledge and understanding of the biology and control of parasites of medical importance and their vectors. This is achieved through a series of laboratory experiments and plenary lectures. Topics will include the diagnosis and pathology of parasitic infections; interactions between the environment, humans, mosquitoes, and their parasites; techniques for the control of vectors, including susceptibility to insecticides; data handling and interpretation. The module is continuously assessed.

MOLECULAR SCIENCE (LIFE237)

Credits: 7.5 / Semester: semester 1

This module is a 6 weeks molecular biology practical to provide experience in techniques to isolate, clone and analyse genes (analysis of DNA fragments by agarose gel electrophoresis, PCR, transformations, plasmid DNA preparations, gene cloning). The module has a range of different formative and summative assessments to include in-course problem-solving exercises, online quizzes and abstract writing, which ensure the student becomes confident to continue genetic manipulations in specialist Year 2 Semester 2 practical modules and for project work in Biochemistry, Genetics and Molecular Biology. The module will encourage confidence, teamwork and communication through active learning in lectures and practicals centred around authentic assessments.

ADVANCED EXPERIMENTAL DESIGN AND ANALYSIS (LIFE238)

Credits: 7.5 / Semester: semester 2

This module extends and puts into practice the knowledge and understanding students gained from LIFE223. In a series of interactive seminars and practicals, students will design and perform their own experiments, choose and perform the appropriate data analysis, and write up the results in a report.

ADVANCED TECHNIQUES IN ANIMAL BEHAVIOUR, HEALTH AND WELFARE (LIFE239)

Credits: 7.5 / Semester: semester 2

The aims of this module are for students to gain skills in assessing animal health and relate this to measuring behaviour, physical condition and welfare. The module will be supplemented with on-line resources. Students will be given guided reading, and regular formative feedback will enable students to evaluate their understanding of the module. The module will be assessed by producing a final report of protocols.

PATHOLOGICAL BASIS OF ANIMAL DISEASES (LIFE240)

Credits: 15 / Semester: semester 2
The aims of this module are to describe the comparative pathology, cellular and immunological responses in veterinary diseases in different species and explore the cellular and molecular mechanisms that underpin them. Lectures will be supplemented with a practical session, online resources, guided reading, and regular formative assessment exercises that will enable students to evaluate their understanding of the module. The module will be assessed by a final examination.

**E-BIOLOGY: INFORMATICS FOR LIFE SCIENCES (S2) (LIFE242)**

*Credits: 7.5 / Semester: semester 2*

Many aspects of modern biology are being revolutionized by high-throughput methods that make copious amounts of data available in digital form. The aim of this module is to provide students with a practical appreciation of the nature and significance of this revolution. While the focus will be on analysis of data from areas such as genome sequencing, gene expression, and protein structure studies, the module will also look at use of such data in the context of understanding higher order phenomena within cells, such as metabolism, gene regulation, and protein-protein interaction. The module is continuously assessed.

**BIRD ECOLOGY, IDENTIFICATION AND CONSERVATION (LIFE243)**

*Credits: 7.5 / Semester: semester 1*

This module considers the ecology, identification and conservation of birds. It seeks to provide an evidence based understanding of bird conservation through studying bird ecology. Key to this is the ability to identify species and assess how key ecological concepts apply to this group. This course will teach students to integrate avian ecology with population and habitat management practices. It will illustrate the links between management and avian biology, habitat fragmentation, migration, and other ecological concepts. Throughout the module, emphasis is placed on the role of research methods in ornithology and how data gained are used to achieve maximally effective conservation and management. The module is aimed at students studying C100 Biological Science and C300 Zoology. The module will be of interest to students wishing to learn more about birds, including those who wish to pursue a career in ornithology or applied ecology.

**BIOLOGICAL CHEMISTRY (LIFE245)**

*Credits: 15 / Semester: semester 1*

The Biochemistry and Pharmacology programmes, and at UoL require students to have studied chemistry to A level or equivalent standard. The Biological Chemistry module is designed to build on this background, and the chemical content of the Year 1 modules, especially LIFE101 and LIFE102 (which is designed for all students) to develop chemical understanding and analytical skills to support later modules in structural and mechanistic biochemistry, medicinal chemistry and pharmacokinetics. The module may also be taken by C130 or C100 students with the appropriate chemical background to equip them to study some of these later modules as part of their general programmes.

**ORGANIC CHEMISTRY FOR PHARMACOLOGY (CHEM038)**
A year 2 Chemistry module for Life Sciences. Whilst designed and aimed to offer Pharmacology students a grounding in directly relevant organic chemistry and spectroscopy, other Life Science students with an interest in Pharmacology may wish to take this as an optional module.

CHEMICAL TECHNIQUES (CHEM022)
Credits: 7.5 / Semester: semester 2
This laboratory module covers the basic techniques of chemical experimental science, including analysis of unknown chemicals, basic chemical synthesis and separation and computerised search for molecular information.

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 ECOLOGY FIELD STUDIES (ENVS278)
Credits: 15 / Semester: semester 2
This module introduces the ecology of coastal marine ecosystems and the techniques for studying them through staff-led field visits, seminars, laboratory practicals and computer analysis sessions. It will explore the diversity, occurrence, distribution and energy flow of the plant and animal communities in these ecosystems. We will also consider the morphological, physiological and behavioural adaptations of marine organisms to coastal environments. Students are introduced to key skills required for coastal ecology, including learning how to employ classic field techniques, making use of traditional, e.g. corers, and more modern, e.g. video surveying with a remote operated vehicle, equipment. Our focal study area will be the Mersey and Dee estuaries with their range of physical conditions and habitats.

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

YEAR THREE
Year three includes two compulsory modules which develop transferable skills
in critical thinking, interpretation of data, and science communication in the context of biological sciences. You will further develop the ability to work on your own initiative or in a team environment all to achieve a scientific aim and properly communicate the scientific concepts/findings in a variety of formats. Additionally, you will choose from a range of optional modules allowing you to pursue your own scientific interests and develop your own specialisms and/or thematic focus.

**COMPULSORY MODULES**

**ADVANCED SKILLS IN BIOLOGICAL SCIENCES (LIFE355)**

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

This module aims to provide a set of communication and critical reflection skills in the context of biological sciences. These skills will help students enhance the execution and presentation of their research project, prepare them for Level 6 assessments and maximise their employment and personal development opportunities. The module is taught through seminars and tutorials, but has a strong emphasis on independent learning. Learning material is provided through VITAL. The module is assessed by continuous assessment.

**RESEARCH PROJECT (LIFE363)**

**Credits: 30 / Semester: whole session**

This module provides students with experience in the planning, design, and execution of a research project in the area of their programme discipline. The project will encompass a range of approaches including laboratory work, fieldwork, outreach work and data, and/or literature analysis depending on the nature of the project. Students will write an evaluative report on a relevant scientific area and work in collaboration with an academic supervisor to develop, plan, carry out, and record research work. The supervisor will hold regular discussion meetings with the student, and both will contribute to a reflective record of progress. Students will be expected to communicate their findings orally and in a variety of written formats.

**OPTIONAL MODULES**

**GENES AND CANCER (LIFE302)**

**Credits: 15 / Semester: semester 2**
The main aim of this module is to develop students’ understanding of the molecular and cellular mechanisms that lead to tumour formation and be able to critically read published papers on the biology of cancer. In the first part of the module, the students will learn about the molecular and cellular mechanisms that lead to tumour formation. This includes understanding the origin of cancer by studying the mutations causing cancer and the genome instability. A bioinformatic workshop and a case study exercise on mutations in cancer cells will complement the lectures. This leads to the identification of oncogenes and tumour suppressor genes. The second part focuses on the general cancer hallmarks acquired during the development of human cancer, including the role of tumour microenvironment and cancer stem cells. The third part of the module will cover therapeutic strategies including drug design, targeted therapies, and a clinical viewpoint. The module will be assessed by both continuous assessment and a final examination.

PROTEIN STRUCTURE, FUNCTION AND ORGANISATION (LIFE303)
Credits: 15 / Semester: semester 1
Understanding protein structure and function is vital to elucidate the mechanisms of biological processes and if proteins are to be used as drug targets. For a protein to acquire function it must fold into a correct conformation. The course will cover how proteins fold into a three-dimensional conformation, and the modern techniques for determining the three-dimensional structures of proteins, including X-ray crystallography, NMR and Mass spectrometry. It will also address how proteomics is used to characterise the function of proteins. To study protein structure and functions, it is important to obtain pure protein and the module will cover how recombinant and native proteins are produced and purified. The module is taught mainly through lectures and one bioinformatics workshop. It will be assessed by continuous assessments and a final examination.

CELL SIGNALLING IN HEALTH AND DISEASE (LIFE305)
Credits: 15 / Semester: whole session
This module will introduce the concepts that are fundamental to modern ideas in biophysics and cell signalling in both health and disease. It will provide students with the ability to access, collate and discuss the modern literature in cell signalling from a systems physiology perspective. Successful students will develop the skills required for interpretation of experimental cell signalling data. The module will be taught through a series of lectures and tutorials and will be assessed by both continuous assessment and by a final examination.

MOLECULAR MEDICINE (LIFE306)
Credits: 15 / Semester: semester 2
This module introduces advanced principles of the application of molecular approaches to the study and treatment of human disease. Selected topics, namely inherited disorders, post-genomic medicine and drug discovery, the therapeutic potential of stem cells in regenerative medicine, and diseases associated with the extracellular matrix are presented in detail. The module will be assessed by both continuous assessment and a final examination.
PRINCIPLES OF MOLECULAR PHYSIOLOGY RESEARCH (LIFE309)

Credits: 15 / Semester: semester 1

This module will build upon Level 5 systems physiology and introduce the techniques and concepts of molecular and cellular physiology. The students will understand the nature of leading research initiatives as they are applied in investigations into physiological processes and human disease. The module will be delivered through a series of lectures and tutorials, and will be assessed by both continuous assessment and a final examination.

DATA HANDLING FOR PHYSIOLOGISTS (LIFE310)

Credits: 15 / Semester: semester 2

The aim of this module is to develop the fundamental skills of experimental design, data analysis, data interpretation and data presentation. It will illustrate how these skills are applied to different areas of modern physiology. This module will help students develop a numerical and analytical approach to physiology. The module will be assessed by continuous assessment and formal examination.

SURVIVING THE MARINE ENVIRONMENT: ADAPTATION, BEHAVIOUR AND CONSERVATION (ENVS310)

Credits: 15 / Semester: semester 1

This module aims to foster a broad understanding of contemporary theory in behavioural ecology, evolutionary biology and ecophysiology, with special reference to the marine environment. We will consider processes that operate at scales from individuals to populations and consider implications of these processes for the conservation of marine species and ecosystems. This 15 credit module builds on knowledge acquired about techniques, theory and processes acquired in Year 1 (e.g. Marine Biology: Life in the Seas and Oceans & Marine Ecosystems: Diversity Processes & Threats) and Year 2 (e.g. Marine Ecophysiology, Ecology & Exploitation) and provides the opportunity to experience the integration of current research themes in marine biology.

NEUROMUSCULAR PHYSIOLOGY AND DISEASE (LIFE311)

Credits: 15 / Semester: semester 1

This module will develop an understanding of the concepts fundamental to modern ideas in the physiology of muscles and neurons, related human diseases and model organisms. It will also develop in students the skills to access, collate and discuss the modern literature and to interpret experimental data in neuromuscular physiology. The module will be taught in lectures and tutorials and it will be assessed by both continuous assessment and by a final examination.

CHEMOTHERAPY AND CELLULAR PHARMACOLOGY (LIFE312)

Credits: 15 / Semester: semester 2
The aim of this module is to reinforce the relevance and importance of the principles of chemotherapy learned in level 5 (antibacterial chemotherapy) and extend the application of these principles to diseases caused by viruses (e.g. HIV/AIDS) and parasites (e.g. malaria). The module will be assessed by coursework which will consist of TWO separate assessments. Module material will be delivered primarily through a mixture of recorded and live online lectures as well as Face-2-Face on-campus sessions (subject to Covid-19 restrictions), supported by materials on VITAL and other web-based resources for students’ independent learning. Students will be directed to key articles in the literature (textbooks, original papers and review articles), and will be expected to use this material to inform their independent learning. A revision tutorial will prepare students for the second assessment (Week 13/14).

**CARDIOVASCULAR AND RESPIRATORY PHARMACOLOGY (LIFE313)**

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

The aim of this module is to develop advanced knowledge and understanding of cardiovascular and respiratory pharmacology. It will develop an awareness of the basic pathophysiology of major cardiovascular and respiratory diseases. It will also explain the mechanisms of action of drugs at the molecular, cellular, organ, and system levels in health and disease. The module is taught through short asynchronous course content delivery and face to face tutorial and revision sessions held in person in lecture theatres. It will be assessed according to the two teaching-cycle model with an assessment at week 8 (40%, 1,250 words) and a final assessment at the end of the course (60%, 1,750 words).

**CANCER PHARMACOLOGY (LIFE314)**

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

The aim of this module is to provide an understanding of cancer development and progression and how this is exploited in the rational design of drugs to target cancer. A further aim is to explain the molecular mechanism of anti-cancer drugs and the potential for side-effects, drug toxicity and drug resistance. The module will be assessed by continuous assessment in the form of a student presentation, and by a final examination. Module material will be delivered primarily through standard lectures. For independent learning, materials such as lecture handouts and links to research articles will be available on VITAL. Students will be directed to further key articles in the literature (textbooks, original papers, and review articles) and be expected to use this material to inform their independent learning. One class revision tutorial will be held at the end of the course.

**DRUG METABOLISM AND DRUG RESPONSE (LIFE315)**

**Credits: 15 / Semester: semester 1**
The aim of this module is to demonstrate the relevance and importance of the principles of drug metabolism and pharmacokinetics. It will stress the importance of the relationship between drug disposition and drug response. The module will be mainly taught through formal lectures. Formative exercises will be submitted electronically and feedback will be provided electronically. In-class online problem solving workshops will address the topics pharmacokinetics and PBPK and demonstrate the use of software. The module will be assessed through coursework and an exam.

MOLECULAR TOXICOLOGY (LIFE316)
Credits: 15 / Semester: semester 2
The aim of this module is to introduce current concepts of mechanisms by which cells are killed by toxic chemicals with particular emphasis on drugs. It will also outline the main defence mechanisms that cells possess against injury. The module will be assessed by both continuous assessments and by a final examination.

MOLECULAR AND NEUROPHARMACOLOGY (LIFE317)
Credits: 15 / Semester: semester 1
The aim of this module is to provide a contemporary review of drug treatment for the most common disorders of the brain, focusing on pathophysiology, receptors and ion channels as drug targets, and the mechanisms of action of key classes of neuropharmacological agents. The module will be assessed by both continuous assessment and by a final examination.

BACTERIAL DISEASE MECHANISMS (LIFE318)
Credits: 15 / Semester: semester 2
This module describes the mechanistic diversity and common themes of bacterial infection. The pathogenesis of infection is described from first contact with the host to explain the importance of attachment, colonisation and avoidance of the immune system through to persistence and chronic infection. Pathogenesis is described in terms of common themes and the variation between pathogens due to their complement of virulence determinants by covering multiple, key bacterial pathogens. Lectures are delivered on broad aspects such as subversion of the host, expression of bacterial toxins and expression, motility loci and intracellular survival. Specific disease mechanisms used by major human pathogens are outlined to demonstrate the complexity and multicomponent aspects leading to successful infection. The use of infection models to study infection and techniques to assay the contribution of both individual and multiple genes are described. The importance of temporal regulation of virulence determinant expression is outlined along with gene mobilisation via phages, plasmids and transposons. Resistance to antimicrobials and the future prospects for treatment are featured. The module is assessed by formal examination and continuous assessment.

VIRAL DISEASE MECHANISMS (LIFE320)
Credits: 15 / Semester: semester 2
This module provides a review of the role of viruses as important pathogens of humans and animals. A broad overview of viral virulence mechanisms, immune evasion and vaccine development will be given followed by detailed consideration of significant groups of viruses. The module is assessed by formal examination and continuous assessment.

**HUMAN AND CLINICAL GENETICS (LIFE321)**

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

This module aims to develop an advanced understanding of modern medical genetics. It will develop fundamental principles introduced at level 5, including the identification of disease genes, epigenetics, genome instability, cytogenetics and post-genomic approaches. These processes will be explained in the context of clinical genetics, in a manner that illustrates the variety of genetic phenomena that affect human health. The module also aims to develop a critical awareness of the ethical considerations raised by advances in clinical genetics. Content will be delivered through a mixture of lectures and workshops with discussion. In workshops, students will participate by considering the appropriate genetic analyses and techniques that should be utilised in a variety of clinical scenarios, together with the arising ethical concerns. Stream capture of all sessions will be available on VITAL, together with additional resources. The module is assessed by an in course written test (examination) and by a final examination.

**CURRENT TOPICS IN ANIMAL BEHAVIOUR (LIFE322)**

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

This module addresses contemporary topics in animal behaviour within an evolutionary framework. It combines current experimental and field research and links behaviour to other areas including ecology, neurobiology, comparative cognition and human evolution. The module is delivered through traditional lectures and a combination of guided and self-directed reading. The module is assessed by formal examination and continuous assessment.

**GENE EXPRESSION AND DEVELOPMENT (LIFE323)**

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

This module aims to provide students with a systematic knowledge and critical understanding of how patterns of gene expression in an organism alter in response to environmental changes, growth and development;

It will explain the steps at which control of gene expression can be exerted, focusing on eukaryotic cells;

The module will be taught through lectures and assessed by both continuous assessments and by a final examination.

**CURRENT SKILLS AND TOPICS IN EVOLUTIONARY BIOLOGY (LIFE324)**

**Credits: 15 / Semester: semester 2**
This module uses research-led teaching to critically examine a selection of contemporary themes in evolutionary biology.

In the first part, students will receive training in modern methods for reconstructing the evolutionary history of species and specific traits. In the second part, we will cover a range of up to date and exciting topics in evolutionary biology, delivered by staff who are experts in their field;

Here students will learn about and discuss the cutting edge of important and generally applicable areas of evolutionary thought;

The module is taught via lectures, seminars, structured discussions and computer practicals; and assessed by formal examination and continuous assessment.

**CONSERVATION BIOLOGY (LIFE326)**

*Credits: 15 /
Semester: semester 1*

This module uses research-led teaching to explore current thinking in conservation biology;

The module explores patterns of biodiversity and encourages students to critically evaluate the evidence supporting alternative explanations for the extinctions or demise of many animal and plant species;

It also enables students to critically evaluate different approaches to conserving biodiversity;

The module is taught via lectures and student led seminars, in the form of debates. To support independent learning, students will also be guided to sections of specific textbooks and expected to follow up preferences, primary and secondary sources, listed by staff.

**ADVANCED BIOTECHNOLOGY (LIFE327)**

*Credits: 15 /
Semester: semester 1*

This module describes the exploitation of microorganisms and microbial processes in the context of modern developments in biotechnology.

Economic and ethical aspects of the development of novel products and the potential environmental benefits and risks of using biotechnological processes will be examined.

Specific aspects to be examined will be antibiotic production, plant biomass conversion, microbial informatics and biofuels.

The module is taught through standard lectures and workshops, and it is assessed by formal examination and continuous assessment.

**VETERINARY EPIDEMIOLOGY AND PUBLIC HEALTH (LIFE328)**

*Credits: 15 /
Semester: semester 2*

This module will provide training in epidemiological and statistical approaches and methods, for applications in bioveterinary sciences, animal science and human medical science.

It addresses topics including epidemiology and clinical veterinary medicine, public health issues for farm animals, zoonoses, and food of animal origin.
The module is assessed by written examination and by continuous assessment.

**ZOOLOGY FIELD COURSE (LIFE333)**

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

This module is a residential field course that usually takes place in late August/early September, prior to the start of Level 6. It lasts for ten days and students learn a variety of field skills, including observational study of animal behaviour, field ecology, and experimental design through a mixture of formal lectures, tutorial discussion groups, staff-led field visits and student-executed research projects in the field. The field course also provides in-situ and ex-situ examples of conservation projects and gives students the opportunity to observe zoologists in the workplace. It is assessed by continuous assessments. All scheduled activities take place during the residential field course, but optional tutorials to help with the analysis as well as feedback tutorials are offered on campus at the beginning of term.

**CLINICAL, ANATOMICAL AND CELLULAR BASIS OF NEUROLOGICAL DYSFUNCTION (LIFE334)**

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

This module allows students to complement and extend their existing knowledge of CNS anatomy and biology. This will further their awareness of the mechanisms that allow the brain to perform a myriad of different functions under normal physiological conditions, but also how these mechanisms go wrong in disease.

Students will have the opportunity to develop an understanding of structure-function relationships within the CNS. They will also gain experience of current clinical and translational research in the neurosciences. This should allow the students to discuss latest research results and to extrapolate this knowledge to mental health and neurological disorders.

Students will also acquire an appreciation of the interdisciplinary nature of cutting edge science and how anatomy and neuroimaging in particular, can inform both surgical and pharmacological intervention in neurological disorders.

It is assessed by two periods of assessment with a 40/60% split.

**THE BODY IN MOTION: MUSCULOSKELETAL FUNCTIONING IN HEALTH, PERFORMANCE AND DISEASE (LIFE335)**

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

This module addresses how the musculoskeletal system of humans and other animals functions to perform whole body tasks, such as locomotion and keeping balance.

It will focus on healthy normal functioning but also on sports performance and disease. To do this, the module will first present the basic principles from anatomy, physiology and mechanics that underly musculoskeletal functioning, and then show how these aspects apply to gait and other daily activities, see syllabus.

The module will also address all major relevant techniques.
This module very strongly aligns with the B110 programme, and most notably with the LIFE219, Human Locomotor Anatomy, module but also with LIFE218, Functional Neuroanatomy. B110 students will see how the anatomy is used in living humans doing daily activities such as walking or running, and how such activities are being studied scientifically and clinically. That said, the module will require no prior detailed anatomical knowledge in order to accommodate for students from other programmes. Rather, the students will contextualise the new materials with their own existing knowledge.

The course will use hybrid teaching delivery with asynchronous content including pre-recorded lectures, videos, texts and interactive use of software. Synchronous sessions will introduce the course contents and provide feedback opportunities.

Summative assessment will consist of essay-style coursework and an online portfolio. A peer forum will be setup on Canvas to help peer and self-directed learning.

**ADVANCED TOPICS IN ECOLOGY (LIFE337)**

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

This module will examine a range of topics in contemporary ecology.

It will follow on from material covered at a more general level in associated modules in levels 4 and 5.

Four main topics will be explored: population ecology, macro ecology, disease ecology, and community ecology.

The module will be assessed by continuous assessment.

**CHEMOTHERAPY OF PARASITIC DISEASE (LIFE338)**

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

This module introduces students to the concepts of anti-parasitic chemotherapy, with attention being directed at the major classes of anti-helmintics and anti-protozoal drugs. It will discuss new developments in drug discovery and clinical development of anti-parasitic drugs through identification of novel targets.

It is assessed by formal examination and continuous assessment.

**INTEGRATIVE COMPARATIVE ANIMAL PHYSIOLOGY (LIFE339)**

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

This module will provide students with an insight into physiological mechanisms underpinning adaptations to potentially hostile environmental conditions such as anoxia, toxic sulphide, high hydrostatic pressure and extreme temperatures.

It will also explore the physiological mechanisms related to homeostasis and the evolution of air-breathing, terrestriality and endothermy.

The module will take an integrative approach, considering physiological mechanisms from molecules to cells, tissues, whole animals and the environment.
The module is taught through a mixture of pre-recorded short online lectures and synchronous online seminars and is assessed by coursework.

**TOPICS IN GLOBAL HEALTH (LIFE340)**

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

The module gives students a broad understanding of the public health significance of tropical infectious and non-infectious diseases.

It aims to enhance awareness of the global distribution of disease and the impact of poverty induced inequalities in access to effective and affordable treatments.

The module is assessed by equally weighted formal examination and continuous assessment.

**GENOME BIOLOGY AND TECHNOLOGY (LIFE342)**

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

This module aims to develop an advanced understanding of genome structure, organisation and evolution across all domains of life.

In addition it will provide advanced awareness of genomic technologies, how they can be applied to a wide range of biological research questions as well as translational applications.

The module will provide molecular, comparative and evolutionary perspectives to allow students to appreciate how knowledge from different systems can be applied to the understanding of the human genome. Also, how genomes from a range of species can develop our understanding of different biological phenomena, such as genome expansion, polyploidy and the evolution of sex chromosomes.

Modern advances in technology will be explained with examples of how they have advanced our understanding of subjects as diverse as cancer and microbial ecology.

The module is assessed through continuous assessment and a final exam.

**MICROBIOMES – MICROBIAL DIVERSITY AND HOST INTERACTIONS (LIFE343)**

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

Microbiome research is a new and important area of microbial research. This course is relevant to the full range of students in health and life sciences from ecologist to health professionals.

**ANIMAL NERVOUS AND MUSCULOSKELETAL DISORDERS (LIFE344)**

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

This module will address the cellular, molecular and biochemical basis of a number of disorders in animals.

The latest science underpinning these conditions will be examined through case studies explained by experts in the relevant fields.
Students will be assessed by both in-course and final exam written assignments.

**VECTOR BIOLOGY: THEORY, RESEARCH AND IMPLEMENTATION (LIFE359)**

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

This module introduces students to current knowledge and research into insects and other vectors of disease. It has a major focus on vector biology, including life cycle, ecology, behaviour and methods of control. The vectors covered include different mosquito species, sandflies, tsetse flies and snails. The emphasis is on how understanding vector biology through theory and research is critical to the implementation of successful control programmes. There is also teaching on research into novel methods of control, focusing on malaria, dengue, sleeping sickness and schistosomiasis. The module is delivered by formal lectures and a revision tutorial, and is assessed by a formal examination and continuous assessment.

**PARASITOLOGY (LIFE361)**

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

This module aims to describe the major features of the structure and life histories of a range of protozoan and helminth parasites of humans. It describes the causes of major clinical symptoms and pathology attributable to these parasites and describes major approaches to their prevention and control. The module is delivered in four main themes, diagnostics, pathogenesis, epidemiology, and control. The module will be delivered through lectures and is assessed by formal examination and continuous assessment.

**BECOMING HUMAN: GENOMICS, DEVELOPMENT, AND EVOLUTIONARY ANTHROPOLOGY (LIFE364)**

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

This module takes an interdisciplinary approach to examine human evolution. Beginning with the human genome and how it has evolved, the module moves through the biological scales to examine how the genome has shaped developmental evolution in the human lineage, and finally the adaptations that this developmental evolution produced in the Homo lineage since it split with chimpanzees.

The module will utilise a variety of learning strategies to facilitate student-led and active learning. The teaching sessions will include significant workshop components and problem solving elements. In some cases these will stand independently as traditional lectures/seminars, and in some cases flipped classroom workshop approaches will be used, with material delivered in advance online. In the workshop sessions, students will then engage in activities including debates, small group discussions, and presentations. Supporting materials such as recorded lectures, links to online resources and literature will be provided on VITAL. Students will be guided to key articles (reviews, primary literature) and textbooks which will support learning. Opportunities for individual feedback on learning will be provided.

The module will be assessed through a combination of coursework and a final examination.
**BIOLOGY OF VETERINARY PATHOGENS: LESSONS FOR DISEASE CONTROL (LIFE367)**

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

The aim of this module is to provide an overview of major veterinary pathogens and modern approaches to their control and diagnosis, with a particular emphasis on the societal impact of infectious diseases of livestock. Lectures will be supplemented with laboratory practicals. To support independent learning, online resources, guided reading, and formative exercises will be provided. The module will be assessed by continuous assessment and a final examination.

**MARINE ECOLOGY: THEORY AND APPLICATIONS (ENVS383)**

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

This module develops the connections between ecological theory and the management of marine communities and ecosystems. Students will develop understanding of the major threats to marine species, how we evaluate these and interpret the possible outcomes for ecosystem functions and human wellbeing.

**LIFE SCIENCES WORK BASED PLACEMENT (LIFE399)**

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

This module allows students to undertake an employment placement that will be undertaken during the summer-break between Year 2 and Year 3. Students will have to find and secure their own placement, which will need to be approved by the module leader beforehand. Placements will typically be 6-8 weeks. Early in Year 2 there will be an introductory event to present the module and advise students on how to search for placement opportunities. This session will be available to all students (including those who do not wish to enrol on the placement module). Students will be encouraged to search for placements during Semester 1, with the support of Academic Advisers and the Careers and Employability Service. Other seminar activities will take place during Semester 2 of Year 2 to prepare students for the placement work. More taught sessions will be delivered in early Semester 1 of Year 3, which include lectures on relevant psychological theories and research (e.g., workplace performance, leadership, motivation) and reflective group sessions on placement experience. The module will provide students with an opportunity to develop their employability skills by direct engagement in a commercial, research, voluntary or similar professional organisation that will support future plans, develop skills and graduate attributes. Module assessments include a skill audit and reflective log to be completed before and during practical work placement, and final written recommendations-to-employer report based on reflection on the placement experience of the individual student and the wider cohort, supported by relevant employability and occupational theories.

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

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**HOW YOU’LL LEARN**
You will experience a range of learning environments during your studies at Liverpool. These will include student-centred activities as well as lectures, tutorials, laboratory practicals, dissection classes, fieldwork, data handling sessions and computer workshops. Some of these activities will be performed individually, such as personal research projects, and others in small tutorial or project groups, in addition to formal lectures and workshops. You will have research staff as well as your own academic adviser for individual tuition on our acclaimed tutorial programme.

**HOW YOU’RE ASSESSED**

As well as factual knowledge and understanding, biologists need practical and organisational skills, and an ability to work both alone and with other people. We record development of these abilities through continuous assessment during each semester and by final examination.

**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

As a Life Sciences graduate from the University of Liverpool, you will have an excellent set of career options ahead of you. For those committed to a career as a professional scientist, higher degrees (MBiolSci, MSc, MRes, MPhil or PhD) at the University of Liverpool or elsewhere provide a flexible set of options for further study.

4 IN 5 LIFE SCIENCES STUDENTS FIND THEIR MAIN ACTIVITY AFTER GRADUATION MEANINGFUL.

Graduate Outcomes, 2018-19.

In the public sector, Life Sciences graduates are in demand in research institutes, government departments, the National Health Service, forensic science and the Environment Agency. Commercial sectors that actively recruit graduates from the Life Sciences include the pharmaceutical, food, biotechnology, water and agriculture industries. There is also an increasing demand for life scientists to contribute to the public understanding of science as journalists and information/liaison officers.

A number of routes are available for graduates to enter the teaching profession one of which is taking a postgraduate qualification (PGCE). There are significant financial inducements provided to meet the current demand for science teachers. In addition to all of the opportunities for graduates in general, including careers outside of biology (such as management, accountancy and human resources), where the skills you have obtained in our degree programmes will be of considerable benefit. Our degree programmes are also popular routes to postgraduate Medicine, Dentistry or Veterinary Science.

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.

<table>
<thead>
<tr>
<th>UK fees</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time place, per year</td>
<td>£9,250</td>
</tr>
<tr>
<td>Year in industry fee</td>
<td>£1,850</td>
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<tr>
<td>Year abroad fee</td>
<td>£1,385</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>International fees</th>
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</thead>
<tbody>
<tr>
<td>Full-time place, per year</td>
<td>£24,200</td>
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</tbody>
</table>

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 includes the costs associated with placements or internships, and the optional field course in Uganda.
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></td>
<td><strong>About our typical entry requirements</strong></td>
</tr>
</tbody>
</table>

| A levels | Typical A level offer ABB  
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](#). |
|----------|----------------------------------------------------------|
|          | 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:  
- [Biological Sciences (with a Foundation Year) leading](#) to BSc (Hons) |
| GCSE     | 4/C in English and 4/C in Mathematics |
| Subject requirements | Biology and a second science, preferably Chemistry, at A level  
Also accepted as a second science: Environmental Science, Mathematics, Physics, Geography, Psychology, Geology and Applied Science.  
For applicants from England, where A levels in Biology, Chemistry or Physics have been taken, we will also require a pass in the Practical Endorsement |
<table>
<thead>
<tr>
<th><strong>Your qualification</strong></th>
<th><strong>Requirements</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>About our typical entry requirements</strong></td>
<td><strong>Download our <a href="#">BTEC Applied Science unit requirements for School of Life Sciences document</a> for more information.</strong></td>
</tr>
</tbody>
</table>
| **BTEC Level 3 National Extended Diploma** | D*DD in Applied Science with a selection of preferred units in Biology and Chemistry, to include Distinction in Units 1 and 5 (Principles and Applications of Science I and II).
For previous BTEC (QCF) qualification:
D*DD in Applied Science with a selection of preferred units in Biology and Chemistry, with at least 120 Level 3 credits at Distinction.
Please note alternative BTEC subjects are not acceptable for this programme. |
| **BTEC Applied Science unit requirements** | 33 points, including 6 in Higher Level Biology, and 5 in another Higher Level Subject |
| **International Baccalaureate** | H1, H2, H2, H2, H3, H3 - including grade H2 in both of Higher Level Biology and Higher Level (second science). |
| **Irish Leaving Certificate** | Not accepted without Advanced Highers at grades ABB |
| **Scottish Higher/Advanced Higher** | Accepted at grade B as equivalent to a third non-science A level at grade B. |
| **Welsh Baccalaureate Advanced** | 45 Level 3 credits in graded units in a relevant Diploma, including 30 at Distinction and a further 15 with at least Merit. 15 Distinctions are required in each of Biology and Chemistry. GCSE Mathematics and English grade C/4 also required. |
| **Access** | }
### Your qualification | Requirements
--- | ---
 | About our typical entry requirements

<table>
<thead>
<tr>
<th>International qualifications</th>
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</table>
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.

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**ALTERNATIVE ENTRY REQUIREMENTS**

- If your qualification isn’t listed here, or you’re taking a combination of qualifications, [contact us](mailto:admissions@liverpool.ac.uk) for advice
- [Applications from mature students](mailto:admissions@liverpool.ac.uk) are welcome.