



School of Biosciences

Guide to Module Choices for Incoming Exchange Students

2021/22

Introduction

This booklet sets out the modules offered to exchange students visiting the School of Biosciences in University of Birmingham in 2021-22. We make a wide range of modules available to incoming exchange students.

Credits

If a student is here for one semester, they should take 60 credits.¹ If a student is here for a full year, they should take 120 credits. Students who are here both semester 1 and 2 should ideally take 60 credits in each semester.²

Selecting Appropriate Modules

Exchange students come to Birmingham from a wide variety of countries, and they will be at different stages of their degrees. Incoming students may take modules that are aimed at first year students, second year students and third year students.

Please note: *Year 1 = Level C* *Year 2 = Level I* *Year 3 = Level H*

Students must check that their sending university is happy with their module selections. The responsibility is with the student.

All modules are worth 20 credits, except for the below;

- 03 28777 - LC Introduction to Microbiology
- 03 28776 - LC Cell Biology & Physiology
- 03 28778 - LC Metabolism
- 03 19822 - LI Molecular Biology and its Applications

Students must pick modules from ONE-year group only. If you are studying with us for more than one semester, you can take modules from different years in each semester. For example, you can take year 3 modules in semester 1 and year 2 modules in semester 2.

Non-Biosciences Modules

Students may take modules from other schools if their home university permits this and if it is compatible with the student's timetable. However, it is the student's responsibility to find out whether the timetables are compatible, and to get in touch with different tutors in each school to make such arrangements possible. The staff in the School of Biosciences will only deal with Biosciences modules.

PLEASE NOTE:

Students only in attendance for Semester 1 may be asked to sit an alternative assessment in place of an exam.

Email address:

Bio-affiliates-admin@contacts.bham.ac.uk

¹ Exceptions to this need to be agreed with the student's Home University.

² 20 Birmingham Credits = 10 ECTS Credits

Module Availability 2021-22

There may be timetabling constraints with some module combinations where students have selected across different levels. Should this be the case students will be asked to choose alternative module(s) following the publication of the timetables.

Year 1 (Level C)

Banner	Module	Semester	Credits
22924	Introduction to Evolution & Animal Biology	1	20
28776	Fundamentals of Biochemistry	1	10
23318	Cell Biology & Physiology	1	20
23320	Genetics I	2	20
27806	Ecological Concepts and Plant Sciences	2	20
28777	Introduction to Microbiology	2	10
22652	Physical Biochemistry	2	20
28778	Metabolism	2	10
30143	Human Nutrition & Metabolism	2	20

The following modules cannot be taken together, and only ONE from each group can be chosen:

22652/23617, 22924 and 27806
28777, 28778 and 30143

Year 2 (Level I)

Banner	Module	Semester	Credits
18540	Topics in Medical Biosciences	1	20
19822	Molecular Biology and its Applications (Must attend exam after Christmas)	1	10
13282	Plant Sciences: from cells to the environment	1	20
37115	Microbiology: Medicine, Environment & Industry	1	20
23328	Membranes, Energy and Metabolism	1	20
28780	Evolution of Humans and Other Animals	1	20
23326	Proteins and Enzymes	2	20
13160	Genetics II	2	20
24985	Cell and Developmental Biology	2	20
26999	Human Structure and Function	2	20
28822	Animal Biology: Principles & Mechanisms	2	20
30145	Critical Issues for 21st Century Ecosystems	2	20

The following modules cannot be taken together, and only ONE from each group can be chosen:

18540,23771 OR 13160

26999, 28822 OR 30145

24986 – Capped at 25 students and is picked at random**

Year 3 (Level H)

Banner	Module	Semester	Credits
36076	Animal Behaviour: From Theory to Application	1	20
11221	Eukaryotic Gene Expression	1	20
21893	Cancer Biology	1	20
21894	Molecular & Cellular Immunology	2	20
30948	Omics for Biomedical Research	2	20
36113	Bacterial Pathogenesis: methods and applications	2	20
36118	Responses to Global Environmental Change	2	20
30790	Current Developments & Advances in Eukaryotic Genetics	2	20
25349	Human Evolution	2	20
25343	Bacterial Gene Regulation	2	20

Please note the following modules cannot be taken together and only one from each group can be chosen:

36076,30948,36113 or 36118

11221, 30790,25349 OR 15851

27876,14675,21893,25343 OR 36462

Banner Code - 22924		Introduction to Evolution and Animal Biology	Credits: 20
Level: C	Semester: 1	Staff responsible: Dr Jim Reynolds	
Module Description:	<p>This first year module provides a broad introduction to whole animal biology. The first half of the module provides a gentle introduction to evolution by exploring the history of evolutionary thinking that led to our modern understanding of evolutionary processes such as natural selection, gene flow and speciation. Examples of evolution are taken from both the animal and plant kingdoms to illustrate some of the core concepts. We also consider human evolution in some detail in this first half of the module. In the second half the focus shifts to include the key principles of animal anatomy, behaviour, ecology, morphology and physiology as we consider the basic biology of selected taxa such as birds, insects and mammals. Students are shown how such knowledge can be applied through assessed practical sessions that develop skills in observation, illustration, and the handling and simple analysis of data generated in class.</p>		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • understand the development and current impact of evolutionary thought • outline the mechanisms of the origin and early development of life • demonstrate a working knowledge of the mechanism of natural selection • understand the need for, and the parameters of, taxonomy • define 'species' and 'selection' in a number of contexts. Interpret adaptations in terms of increased fitness and environment • understand the genetic mechanisms underpinning evolution • outline the major phenotypic changes and the potential selective pressures driving the evolution of humans. Relate the functional morphology and physiology of different animal groups to their wider biology • understand the methods by which the behaviour of animals is studied, recorded and interpreted • carry out laboratory experiments, reflect on these and record, analyse and interpret results • apply knowledge in data-handling and problem-solving 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) - Computer based (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 28776		Fundamentals for Biochemistry	Credits: 20
Level: C	Semester: 1	Staff responsible: Dr Roisin Madigan	
Module Description:	<p>This module will provide Biochemists, Biological Sciences and Human Biology students with a broad introduction to biochemistry: the chemistry underlying the processes that take place in cells</p> <p>You'll study:</p> <ul style="list-style-type: none"> how the structure of molecules explains their function, focusing on proteins such as enzymes; how cellular processes are determined by energy relationships; the sources of biological energy, and how energy present in food is captured and used by cells <p>In parallel, students will use independent learning texts to learn or revise fundamental topics: chemical bonds; concentrations and amounts; reaction kinetics; pH and pKa; and energetics and redox reactions.</p> <p>Lab practical classes will provide opportunities to experience core techniques in biochemistry: the application of spectrophotometry to the quantitative analysis of proteins using and the kinetics of enzyme activity.</p>		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • demonstrate knowledge of the structures and interactive properties of amino acids, and be able to discuss the structure-function relationships of proteins • describe the key features of metabolism with reference to central sugar metabolism, the tricarboxylic acid cycle, redox reactions, and the integration and regulation of metabolism • demonstrate an understanding of enzymes and introductory enzyme kinetics • carry out practical exercises to illustrate methods of quantitative analysis including studies of enzyme activity • understand fundamental chemical concepts of bonds, concentrations, reaction kinetics, pH and buffers and redox potentials • demonstrate sufficient mathematical skills to exploit the data handling and skills classes later in the course • demonstrate data manipulation skills and problem solving in the workshops • use and learn from a specific independent learning component of the course 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		

Assessment Methods:	Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) - Unseen (50%) Reassessment: Supplementary examination
----------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------

Banner Code - 23318		Cell Biology and Physiology	Credits: 20
Level: C	Semester: 1	Staff responsible: Dr Saverio Brogna	
Module Description:	<p>In the first part of the module, the components of the cell are introduced and discussed in terms of their structure and function. This includes sections on membranes and membrane bound organelles, and the flow of materials inside the cell. There will be an emphasis on understanding the experimental basis. The next part of the module covers the basics of human and animal physiology and reproduction. It covers underlying concepts such as homeostasis, and outlines in more detail the cardiovascular system, endocrinology, immunology, and neurophysiology. It aims to highlight the important relationships between these systems and the connections between cell biology, anatomy and physiology. The final part of the module covers the basics of reproduction gametogenesis, fertilisation and reproductive cycles and reproductive strategies in humans and animals. The module will have practicals that will permit the students to study aspects of cell membrane properties and physiology. These practicals are tightly allied to the lectures and are designed to give experimental insights about our understanding of cell biology and animal physiology.</p>		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • Understand concepts of cell biology and the relationship between cell biology and functionality for the physiological systems studied; • Understand concepts of human and animal physiology and reproduction; • Carry out and understand practical exercises in specific aspects of cell biology and physiology; • Undertake independent learning activities in an enquiry-based manner. • understand and be able to carry out basic statistical techniques for comparing data sets including a t test and chi squared test; be able to use Excel for these analyses 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) – Computer based (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 23320		Genetics I	Credits: 20
Level: C	Semester: 2	Staff responsible: Dr Chris Thomas	
Module Description:	<p>Students will receive a comprehensive introduction to modern genetics in both prokaryotic and eukaryotic organisms, including humans. This module will cover molecular genetics (the study of the physico-chemical nature of genes and how they work) and transmission genetics (the study of how genes and the characters they determine are shuffled into new combinations and passed from individual to individual). The topics that will be covered will include: information, how it is stored, transmitted, and translated; the regulation of gene expression; the genetics of bacteria and viruses; the cell cycle in eukaryotes and its regulation; mitosis and meiosis; gene linkage and chromosome mapping; DNA damage and DNA mutation.</p> <p>Basic principles will be illustrated in practical classes and considerable attention will be given to solving problems in transmission genetics.</p>		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • show knowledge and understanding of all parts of the syllabus • apply their knowledge to solving simple problems in transmission genetics • formulate hypotheses as well as design and carry out experiments to test them • construct genetical hypotheses and test them, using simple statistical methods where appropriate • appreciate the different methods used for genetical analysis in prokaryotic and eukaryotic organisms 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) – written unseen (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 27806		Ecological Concepts and Plant Sciences	Credits: 20
Level: C	Semester: 2	Staff responsible: Dr Jeremy Pritchard	
Module Description:	<p>This module provides a broad overview of the biology of our environment. As plants are key to shaping our environment the course fosters an understanding of the biology of higher plants with emphasis on plant physiology structure/function relationships, developmental processes and the exploitation of plants by humans. A set of basic plant physiological processes are considered, with special reference to physiological modifications that have ecological agricultural and economic consequences. The course also covers plant hormones, life cycles, reproduction and evolution, all of which are key to environmental stability and feeding the planet. There is focus on Arabidopsis, which has become the model species for plant molecular genetic research. However, the course also considers crop plants, including crop domestication and methods for crop improvement including crop genetic You will consider definitions and methods to quantify animal and plant biodiversity in its many forms and some key concepts in animal ecology. You will study the relationship between animals and their environment, some of their behavioural and physical adaptations and the methods used to study them. You will then look at the use of modern DNA-based techniques that have defined the field of molecular ecology. Interesting and perplexing biological problems relating to population structures, speciation, biodiversity and conservation can only have been addressed by the use of genetic markers. These genetic markers of the past two decades are now giving way to whole genome-based studies of natural populations, which are opening new doors for fundamentally understanding the origin and maintenance of ecologically important attributes of animal and plant species. You will consider the diversity of the planet's biome in light of how environments vary across the globe. The various anthropogenic pressures on these environments will also be examined including habitat fragmentation, invasive species and pollution, in particular, emphasizing the effects of increased temperatures and levels of greenhouse gases that are driving climate change. A range of strategies will be considered to facilitate conservation fo the natural world and sustainable solutions in agricultural situations, including the use of GM crops.</p>		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • understand how plant structure and function are interrelated in key physiological and developmental processes • understand how plants were domesticated and how the continual improvement of crop plants will meet the demands of an expanding global population. • describe the different types of natural environments. • outline the major threats to biodiversity. • understand key principles and methods in animal ecology. • evaluate the advantages and disadvantages of a range of sustainable solutions to threats to the environment. 		

	<ul style="list-style-type: none">• plan, carry out, analyse and interpret simple experiments in the laboratory, including in groups.• Analyse experimental data, compare data sets using statistical tests, show an understanding of probability and use of Student's T- Test• use a range of quantitative methods of assessing environmental diversity.• develop skills in scientific writing.
Delivery:	Lectures, workshops, laboratory practical's, independent study, seminars and tutorials.
Assessment Methods:	Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) – written unseen (50%) Reassessment: Supplementary examination

Banner Code - 28777		Introduction to Microbiology	Credits: 10
Level: C	Semester: 2	Staff responsible: Dr Julia Lodge	
Module Description:	<p>This module will provide Biological Sciences and Human Biology students with broad introduction to microbiology. You will learn about the major microbial groups: bacteria, fungi, protists, archaea and viruses. Common themes will be explored including how microorganisms are studied, microbial lifestyles, their key structural components, and the key features of the different types of microbial cell.</p> <p>Lab practical classes will provide opportunities to develop important competencies in handling, isolating and growing different types of microorganisms as well as introducing methods for analysing the effect of different growth conditions.</p>		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • describe the key features of the major microbial groups and understand key similarities and differences between them • explain how their key structural components allow these small organisms to exist in diverse environments • Demonstrate an understand the evolutionary relationships between and within prokaryotic and eukaryotic microorganisms • apply an understanding of the principles underlying isolation and growth of different types of microorganisms and methods for analysing the effect of different growth conditions; • demonstrate an understanding of aseptic technique and develop competencies in safe handling of microorganisms • work as a group to resolve a real life infectious disease control problem. 		
Delivery:	Lectures, workshops, laboratory practical's, independent study, seminars and tutorials.		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) – written unseen (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 22652		Physical Biochemistry	Credits: 20
Level: C	Semester: 2	Staff responsible: Dr Klaus Futterer	
Module Description:	The module seeks to establish an understanding of the fundamental physical laws that biochemical reactions and processes. Why does a reaction go forward? How much substrate is left x seconds after starting the reaction? How does pH influence enzyme-catalysed reactions and how does the rate of turnover relate to concentration of enzyme and availability of substrate? These are some of the questions examined in this module.		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • Understand how pH affects ionisations states of ionisable groups in proteins and, as a consequence, how subtle changes in pH can affect enzyme activity. • Understand how thermodynamics and kinetics allow a quantitative description of biochemical processes. • Master a basic set of mathematical tools to predict biochemical equilibria; to describe the time-dependence of (enzyme-catalysed) chemical reactions; and to quantify the relationship between substrate concentration(s) and reaction rates in enzyme-catalysed reactions. • Relate molecular and structural features of a selected set of enzymes to the mechanism of rate enhancement. • Understand how knowledge of evolutionary relationships between proteins provides insights into the conservation of structure and molecular mechanism of protein function. • Know and understand a simple set of experimental techniques to study enzymes, their substrates and reactions they catalyse. • Know and understand a simple set of experimental techniques to study enzymes, their substrates and reactions they catalyse. 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) – written unseen (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 28778		Metabolism	Credits: 10
Level: C	Semester: 2	Staff responsible: Dr Roisin Madigan	
Module Description:	This module will provide Biochemists with in-depth study of metabolism as a progression from the semester 1 module Fundamentals of Biochemistry (10 credits). We will discuss the metabolism of carbohydrates and pyruvate, and of fatty acids in detail. We will emphasise the experimental techniques, evidence and unifying concepts behind our current understanding of metabolic processes. The module will also provide an introduction to the field of microbiology to equip Biochemists to choose the Level I Microbiology course should they wish.		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • demonstrate understanding of the features of metabolism exemplified by the major pathways of carbohydrate and fat metabolism • interpret some disorders of metabolism by analysis of clinical data in case studies • demonstrate observational, manipulative, numerical and deductive skills, and write reports (through experience gained in the practical and data-handling classes) • develop improved skills of independent learning and verbal reporting in the clinical case studies • develop knowledge of core microbiology including the gut microbiome and knowledge of how to culture microorganisms 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) – written unseen (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 30143		Human Nutrition and Metabolism	Credits: 20
Level: C	Semester: 2	Staff responsible: Dr Eleanor Cull	
Module Description:	<p>Upon completion of this module, students will be aware of, and be able to demonstrate understanding of the basic biochemistry that underpins the functioning of the human body. Four broad themes will be explored here: Nutrition- including recall of nutrient groups and basic processing within the body , exploring deficiencies and overdose problems</p> <p>Energy metabolism</p> <ul style="list-style-type: none"> • Pathways involved in release of ATP from biomolecules including both anabolic and catabolic reactions • Practical biochemistry techniques <ul style="list-style-type: none"> - Research led practical aspects to introduce students to common biochemical techniques used in research studies • Regulation and Deregulation of metabolic pathways • - The control of metabolic pathways including the effect of enzyme/ protein denaturation, redox, key enzymes and starvation 		
Module Outcomes:	<p>By the end of the module the student should be able to:</p> <ul style="list-style-type: none"> • Demonstrate a detailed understanding of important aspects of human nutrition. • Describe some of the techniques used to isolate cellular components and to purify and characterise proteins • Demonstrate understanding of the features of metabolism exemplified by the major pathways of carbohydrate, protein and fat metabolism • Interpret disorders of metabolism by analysis of clinical data in case studies • Demonstrate observational, manipulative, numerical and deductive skills, and write reports (through experience gained in the practicals and in the clinical case studies) 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%) Examination : Exam (Centrally timetabled) – written unseen (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 18540		Topics in Medical Biosciences	Credits: 20
Level: I	Semester: 1	Staff responsible: Dr Michael Tomlinson	
Module Description:	<p>In this module you will study four key areas:</p> <p>Blood constituents and their functions. You will learn about the types and roles of blood cells, haemoglobin synthesis and degradation, blood coagulation and homeostasis, blood lipids, and immunology methods.</p> <p>Cancer. You will learn about the biology of human cancer, the role of genetics and environmental factors in the origin of cancer and the development of anti-cancer treatments.</p> <p>Neurobiology. You will learn about molecular neurobiology and neurotransmitters and how they affect brain functions such as memory and how the brain responds to opiates.</p> <p>Pharmacology. You will learn about the biochemical principles of drug/target interactions, different types of drug actions on their target and the distribution and metabolism of drugs. In the workshop you will learn about sources of information on anti cancer drug effects, clinical trial outcomes and analysis of drug efficacy in the light of costs.</p> <p>This module builds upon aspects of biochemistry, cell biology and physiology learnt in year 1 and will be useful for a number of advanced modules such as cell signalling, neurobiology, cancer biology and immunology taken in years 3.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> Independently and in controlled conditions demonstrate, an understanding of the blood system, its cellular and protein components and their roles. Independently and in controlled conditions demonstrate an understanding of molecular neurobiology with particular reference to the action of neurotransmitters. Independently and in controlled conditions demonstrate an understanding of the mode of action, clinical efficacy and cost of treatment for of a number of drugs which affect different physiological systems and are used in the treatment of various diseases. 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment : Coursework (50%)</p> <p>Examination : Exam (Centrally timetabled) – written unseen (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 19822		Molecular Biology and its Applications	Credits: 20
Level: I	Semester: 1	Staff responsible: Dr Julia Lodge	
Module Description:	<p>In this module you will study four key areas:</p> <p>Blood constituents and their functions. You will learn about the types and roles of blood cells, haemoglobin synthesis and degradation, blood coagulation and homeostasis, blood lipids, and immunology methods.</p> <p>Cancer. You will learn about the biology of human cancer, the role of genetics and environmental factors in the origin of cancer and the development of anti-cancer treatments.</p> <p>Neurobiology. You will learn about molecular neurobiology and neurotransmitters and how they affect brain functions such as memory and how the brain responds to opiates.</p> <p>Pharmacology. You will learn about the biochemical principles of drug/target interactions, different types of drug actions on their target and the distribution and metabolism of drugs. In the workshop you will learn about sources of information on ant- cancer drug effects, clinical trial outcomes and analysis of drug efficacy in the light of costs.</p> <p>This module builds upon aspects of biochemistry, cell biology and physiology learnt in year 1 and will be useful for a number of advanced modules such as cell signalling, neurobiology, cancer biology and immunology taken in years 3.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Independently and in controlled conditions demonstrate, an understanding of the blood system, its cellular and protein components and their roles. • Independently and in controlled conditions, demonstrate an understanding of molecular neurobiology with particular reference to the action of neurotransmitters. • Independently and in controlled conditions, demonstrate an understanding of the mode of action, clinical efficacy and cost of treatment for of a number of drugs which affect different physiological systems and are used in the treatment of various diseases. 		
Delivery:	Lectures, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment: Coursework (50%)</p> <p>Examination: Exam (Centrally timetabled) –MCQ (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 13282		Plant Sciences: from cells to the environment	Credits: 20
Level: I	Semester: 1	Staff responsible: Dr Graeme Kettles	
Module Description:	<p>The aim of this module is to develop an understanding of how plants function, via their development and physiology, in relation to key influences in their natural environment. This includes both a consideration of physical factors, and the influences of other interacting organisms, some of which have positive consequences for plant performance, others of which are very detrimental. The module takes an integrative view of plant function at both the single cell and the whole plant level. The module will reflect the growing emphasis on integrating physiological, molecular and more recent computational approaches to (i) understand how plants develop and function and (ii) engineer plants for non-ideal environments. The modules exploit developing and pre-existing research strengths within the School.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Know and understand how plants perceive and respond to a range of physical stimuli and signals in order to better adapt themselves to their environment; • Understand the role of model plants including Arabidopsis in determining plant functions and be able to apply knowledge from model plants to crop plants; • Understand the fundamentals of plant development ; • Understand the key ways in which plants perceive, transduce and respond to various signals from their environment; • Understand how plants interact with other organisms (biotic interactions); • Design and execute scientific experiments and write scientific reports; • Apply knowledge to problem solving and data handling; including reading the scientific literature. 		
Delivery:	Lectures, seminars, workshops, laboratory practical's, independent study		
Assessment Methods:	<p>Continuous Assessment: Coursework (50%) Examination: Exam (Centrally timetabled) –written unseen (50%)</p> <p>Reassessment: Supplementary examination</p>		

Banner Code - 37115		Microbiology: Medicine, Industry and Environment	Credits: 20
Level: I	Semester: 1	Staff responsible: Dr Julia Lodge	
Module Description:	<p>In this module you will learn about how microorganisms impact on humans, both in the context of health and disease and by looking at how humans have exploited microorganisms.</p> <p>In the Human Health and Disease section you will learn about three of the major groups of disease causing microorganisms; bacteria, fungi and viruses, with emphasis on the underlying mechanisms by which these organisms cause disease. As the course progresses you will begin to recognise that common themes underpin our understanding of the diseases caused by these quite different groups of microorganisms; these themes will be explored in the overview session at the end of this section of the course.</p> <p>Many of the topics in the Environment and Industry section also relate to protecting human health, including antibiotic, vaccine, and medicinal protein production. You will also learn how properties of microorganisms have been exploited for more sustainable environmental and industrial applications.</p> <p>In the practical component of the course, you will carry out and compare classical and molecular approaches used for the identification of bacteria. This will give you hands on experience of handling bacteria and give you the opportunity to put into practice the aseptic technique that you learned in the first year. The molecular approach for identification is based on PCR and sequencing and will build on what you learned in the first semester module Molecular Biology and its Applications.</p> <p>In the Fungal growth and virulence” workshop you will work through data on fungal growth in liquid and solid culture and on different methods for the assessment of fungal virulence</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the nature and biology of bacteria, fungi and viruses and their medical and economic importance. • Discuss the common themes that underpin our understanding of the diseases caused by different groups of microorganisms. • Describe, using specific examples, how microorganisms have been exploited by humans and how this relates to their underlying characteristics. • Demonstrate practical skills required for the investigation of micro-organisms, and discuss the different techniques employed • Analyse and interpret data in order to make judgements and formulate arguments 		
Delivery:	Lecture, Seminar, Practical classes, Workshops and Independent study		

Assessment Methods:	Continuous Assessment: Coursework (50%) Examination: Exam (Centrally timetabled) –written unseen (50%) Assessment: Data Interpretation test (40%), 1500 word written assessment (60%) Reassessment: Reassessment of failed elements. Module mark capped at the pass mark.
----------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Banner Code - 23328		Membranes, Energy and Metabolism	Credits: 20
Level: I	Semester: 1	Staff responsible: Dr Scott White	
Module Description:	<p>This course aims to illustrate the pivotal role of biological membranes in the cell physiology of prokaryotes and eukaryotes, including both plant and animal cells. Lectures and student-centred activities will explore this subject under three broad themes.</p> <p>1) The role and properties of membranes: lipid and protein components; how membranes define compartments; techniques and methodologies.</p> <p>2) Energy generation within the cell: electron-transfer pathways; generation of ATP; oxidative phosphorylation and photosynthesis.</p> <p>3) Metabolism: gluconeogenesis and the pentose phosphate pathway; the Calvin cycle; regulatory mechanisms and the control of metabolic pathways; the influence of hormones and other factors.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • explain the principles of membrane fusion and give an account of the various methods used to study membranes; • calculate bio-energetic parameters based upon redox values and other types of data; • describe the properties and functions of electron transfer pathways and their protein and redox components; • explain the integration of anabolic metabolism with photosynthesis and energy metabolism; • compare and contrast microbial energy systems with those of eukaryotes; • recall the metabolic pathways and discuss how they function within the cell; • Explain the concepts of allostery, metabolic flux, and hormonal regulation of metabolism. • In addition, through participation in practical classes, workshops and group work, students should be able to: • Follow experimental protocols to investigate enzyme catalysed cleavage of phospholipids, lipid separation and redox reactions; • record and analyse experimental TLC and redox potential data; • complete lab reports on the module experiments, evaluate data and draw conclusions; • Analyse data from bioenergetics and membrane studies by tackling problem-based questions. 		
Delivery:	Lectures, practical classes, workshops and independent study		
Assessment Methods:	<p>Continuous Assessment: Coursework (50%)</p> <p>Examination: Exam (Centrally timetabled) –written unseen (50%)</p>		

	<p>Assessment:</p> <p>Practical 1 (Snake Venom) (pre-practical test and write up) 50%</p> <p>Practical 2 (Redox) (pre-practical test and Lab write up) 50%</p> <p>Reassessment:</p> <p>Supplementary examination</p>
--	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Banner Code - 28780		Evolution of Humans and other Animals	Credits: 20
Level: I	Semester: 1	Staff responsible: Dr Mary Blanchard	
Module Description:	<p>The primary aim of this module is to provide students with a comprehensive understanding of comparative animal biology in an evolutionary context. Humans are part of the animal kingdom, and our own evolution is also best understood from this perspective. We will develop student understanding of evolution in the four dimensions in which it occurs: genetic, epigenetic, behavioural and symbolic, and how these dimensions interact in different ways in different species during the process of evolutionary change. We will explore numerous examples that point to the fact that evolution shapes biodiversity, not merely by the rise and fall of species over millions of years, but also by the often rapid transition of species traits from one form to another at pace with rapid environmental changes, some caused by humans. Having obtained this broad overview, we will focus on the processes by which evolution operates in the four dimensions, resulting in adaptation and/or speciation, by studying key themes in animal biology, such as the evolution of the circadian system, sociality, locomotion and tool use. In so doing, the course will expand student understanding of core evolutionary concepts such as convergent evolution and units of selection, and will broaden their knowledge of the origins and maintenance of biodiversity.</p> <p>The module will include a number of practical's to give students experience of handling and interpreting fossil material, particularly Mesozoic reptiles and great apes, including early hominins. These practical's will help students understand the extent to which it is possible to infer behaviour, social organisation, culture, ecological context etc. of extinct animals from the fossil record. We will also have workshops to facilitate thought experiments on the evolutionary consequences of future events (e.g. major climate change or key species being wiped out) and to debate, within the group, pressing questions surrounding evolution.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Understand that in addition to genetic inheritance, epigenetic, behavioural and cultural inheritance provides variation on which natural selection can act • Critically compare and synthesize information from molecular biology and behavioural ecology to develop an integrated understanding of the four dimensions through which evolution occurs • Describe major events in animal evolution and their impact on biodiversity • Explain how human adaptations show that modern humans and our ancestors have been subject to the same evolutionary processes as the rest of the animal kingdom • Understand the origins of different forms of similarity between different species, and be able to differentiate between them, using examples • Understand and discuss evolutionary principles sufficiently well to be able to 1) conduct thought experiments on the evolutionary 		

	<p>consequences of future events and 2) convey evolutionary principles and events in an appropriate way for school children to understand</p> <ul style="list-style-type: none"> • Work as a team to examine fossil remains to establish genus/species, morphological similarities and key life history traits • Formulate and express own ideas concisely through independent learning and writing • Construct a logically sound well-structured argument when writing and be able to recognise and critically analyse weak arguments when reading them • Use the skills gained in the peer marking sessions to reflect on ways to improve their own academic writing.
Delivery:	Lectures, practical classes, workshops and independent study
Assessment Methods:	<p>Continuous Assessment: Coursework (100%)</p> <p>In-course assessment (50%) is split into three parts:</p> <ul style="list-style-type: none"> - A group-produced poster to present evolutionary principles to museum visitors (25%) - On-Canvas pre/post practical quizzes linked in with the lecture material (25%) - A final maximum 2000 word essay (50%) to be completed over the Christmas holiday. Students will be able to choose from four questions, designed to synthesise subject areas. The aim is to focus on developing skills in critical analysis and synthesis, rather than on short-term recall of information. <p>Reassessment: 2,000 word essay chosen from four questions to be completed by the re-sit exams</p>

Banner Code - 23326		Proteins and Enzymes	Credits: 20
Level: I	Semester: 2	Staff responsible: Dr Peter Winn	
Module Description:	<p>Assessments: 2 hour examination - 65% comprising essay questions and short-answer questions. This may include some data-handling problems. Continuous assessment 35% comprising:</p> <p>In course assessments;</p> <ul style="list-style-type: none"> - Practical write-up 50% - Data-handling test 50% <p>Reassessment: Supplementary examination Resit mark for the module is based solely on exam performance. Continuous assessment marks are not counted. Resit examinations will cover the whole course, i.e. theoretical aspects and practical aspects.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Explain how the amino acid sequence of a protein is related to its structure and hence to its function; including simple ideas of protein evolution and common secondary structure motifs; • Describe some common protein folds and structural motifs, and relate these to the functional roles of motifs, and how the structures are stabilised.; • Evaluate techniques used to determine the primary , secondary, tertiary and quaternary structures of proteins and explain the biophysical principles behind these techniques; • Discuss the mechanisms underlying the catalysis of reactions by certain enzymes and methods used to determine enzyme rates and mechanisms; • Analyse and interpret numerical data of ligand binding, UV spectroscopy, pH and enzyme kinetics, including use of Sigma Plot; • Download, display and examine protein structure from the RSC protein database. 		
Delivery:	Lectures, seminar, tutorial, practical classes, workshops and independent study		
Assessment Methods:	<p>Continuous Assessment: Coursework (50%) Sessional Examination: Exam (Centrally Timetabled) - Written Unseen (50%)</p> <p>Assessments:</p> <ul style="list-style-type: none"> • Practical write-up 50% • Data-handling test 50%. <p>Reassessment: Supplementary Examination.</p>		

Banner Code - 24985		Cell and Developmental Biology	Credits: 20
Level: I	Semester: 2	Staff responsible: Dr Yun Fan	
Module Description:	This module will cover relevant areas in the understanding of cell and developmental biology, with a major focus on the methods and model systems employed in these areas. Particular focus will be placed on the synthesis and trafficking of proteins in the cell, as well as the mechanisms through which cells physically interact with each other and the extracellular matrix to regulate differentiation and function. Development of multicellular organisms will be analysed from the regulation of stem cell function to the differentiation of organs.		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • evaluate relevant methods in cellular and developmental biology; • describe relevant model systems for use in cellular and developmental biology; • recognize, recall and define terms and processes relevant to the study of the cytoskeleton, cell adhesion, the extracellular matrix, cell migration and epithelial differentiation • critically evaluate stem cell biology • discuss the mechanisms regulating organogenesis and differentiation • understand the complexity of programmed cell death and how it is involved in development. 		
Delivery:	Lectures, seminar, tutorial, practical classes, workshops and independent study		
Assessment Methods:	<p>Continuous Assessment: Coursework (50%) Sessional Examination: Exam (Centrally Timetabled) - Written Unseen (50%)</p> <p>In course assessment (50%) comprising practical write-up (10%); and class test (20%). 2 hour written examination in May/June (70%) consisting of essay type and short answer questions</p> <p>Reassessment: Supplementary Examination.</p>		

Banner Code - 26999		Human Structure and Function	Credits: 20
Level: I	Semester: 2	Staff responsible: Dr Christopher Bunce	
Module Description:	<p>Having completed this challenging and diverse module, students will have a broad appreciation of the structure of the human body, and how this relates to its function and evolutionary origin. Anatomy is taught under four major themes: (1) Anatomy as a science – understanding the human body from the point of view of evolution and development; (2) Microanatomy – a brief survey of the cellular organisation of body tissues; (3) The structure and function of body systems – a survey of the topography of the entire body from a systems-based perspective, with consideration of how the gross anatomy relates to the function of each system; (4) The human body in a broader context – further discussion of the importance of evolution and development using specific illustrative examples. The module employs a diverse range of teaching methods including interactive lectures and the discussion of real-life clinical cases. Students should be aware that some lectures contain graphic images and videos of surgical operations and diseases.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Discuss the different approaches to thinking about human structure and function • Demonstrate an appreciation of the complex links between development, evolution and human structure and function • Discuss the evolution of some of the major anatomical adaptations of Homo sapiens • Describe the basic topographical anatomy and histology of the systems of the human body • Discuss the relationship between the structure and function of cells, tissues, organs and systems • Compare the structure and function of the human body with the bodies of other vertebrates and explain the relevance of such comparisons • Analyse, from the point of view of evolution and development, the apparently anomalous organisation of certain anatomical features • Outline the real-world applications of a sound understanding of human structure and function • Use the primary literature to defend a particular anatomical fact presented in a textbook • Develop an understanding of the three dimensional arrangement of body structures • Communicate in a variety of ways including posters and oral presentations 		
Delivery:	Lectures, practical classes, workshops and independent study		

Assessment Methods:	Continuous Assessment: Coursework (50%) Sessional Examination: Exam (Centrally Timetabled) - Written Unseen (50%) In course assessment (50%) comprising practical write-up and class test. A 2 hour written examination in May/June (50%) consisting of essay type and short answer questions Reassessment: Supplementary Examination.
----------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Banner Code - 28822		Animal Biology: Principles and Mechanisms	Credits: 20
Level: I	Semester: 2	Staff responsible: Dr Mary Blanchard	
Module Description:	<p>The central theme of this module is to cover aspects of comparative Zoology. Animals display specific adaptations in their morphology, physiology, and behaviour to the environments they live in. These adaptations reflect the ecological diversity and adaptive radiation of animals. During this module we will explore how environmental adaptation has. It will also consider animals' responses to human related environmental changes, such as those caused by climate change and urbanisation.</p> <p>The module consists of lectures, practicals and interactive tutorials, i.e. workshops that will build the foundation for the practical work and encourage independent active learning.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of different animal systems and how they are morphologically, physiologically, and behaviourally adapted to the environments they live in. • Demonstrate an understanding of how animals adapt to cope with environments human altered environments . • Collect, record, handle, interpret and write-up scientific data and be able to apply skills this knowledge to novel problems. 		
Delivery:	Lectures, tutorials, practical classes, workshops and independent study		
Assessment Methods:	<p>Continuous Assessment: Coursework (50%) Sessional Examination: Exam (Centrally Timetabled) - Written Unseen (50%)</p> <p>Continuous assessment comprising of; Practical report write-up with a formative and summative element and a component of peer-marking (20%) Project proposal summary – 500 words (20%) Examination in May.(60%).</p> <p>A 2 hour examination comprising essay and short-answer questions. Reassessment: Supplementary Examination.</p>		

Banner Code - 30145		Critical Issues for 21st Century Ecosystems	Credits: 20
Level: I	Semester: 2	Staff responsible: Dr Nigel Maxted	
Module Description:	<p>Module Aim: To provide core skills in ecosystem knowledge and lead into for third year research led-modules.</p> <p>Module background: This module will provide a second-year module that bridges the generalised first year and research-focussed third year modules in ecology/conservation. It will provide you with an ecosystem approach which is truly dynamic in its content and delivery, reacting to issues of the 'moment'. It is an opportunity for you to experience research-led teaching as the themes taught in the module are directly related to core College research themes.</p> <p>Module structure: The module would be structured around four semi-independent topics related to critical issues in biosystems/ecosystems that map onto expertise within both BIOS and GEES. The topics covered each year may include for example: Climate change, Food security, Pollution, Over-harvesting, Threatened ecosystems, Anthropomorphic ecosystems, Ecosystem valuation & conservation.</p> <p>Lectures will be based around case studies that promote skills training but not exam assessment.</p> <p>Practical/skills session: These will include off site visits and will allow you the opportunity to collect and analyse ecological data</p> <p>Mini-projects: Students will select one of the four topics and undertake the mini-project. Students will work in groups containing a deliberate mix of Bio and GEES students to get diversity of skills and perspectives.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Explain key scientific, political and ethical issues associated with global and local ecosystem valuation, threats and maintenance. • Design and organise experiments, collect, record, analyse and interpret data. • Discuss strategies and techniques to sustain ecosystem services for humankind in the future. • Present results orally and in written format suitable for a scientific paper or conference presentation, individually or as a group, so as to contribute to the existing scientific knowledge base. 		
Delivery:	Lectures, seminars, tutorials, project supervision, practical classes, workshops and independent study		
Assessment Methods:	<p>Continuous Assessment: Coursework (50%)</p> <p>Sessional Examination: Exam (Centrally Timetabled) - Written Unseen (50%)</p>		

Banner Code - 36076		Animal Behaviour: From Theory to Application	Credits: 20
Level: H	Semester: 1	Staff responsible: Dr Steve Unwin	
Module Description:	<p>This challenging module will enable students to study a number of cutting-edge topics in Animal Behaviour, following each from its underlying theoretical concepts right through to the practical application. In particular, the module will focus on the way that recent tools, techniques, methods and technologies have revolutionised our understanding of animal behaviour, resulted in practical applications or had cross-disciplinary impacts in other fields.</p> <p>The module is assessed entirely by in-course assessment and is structured around student enquiry-led or problem-based learning in four different topic areas. This means that there are relatively few lectures: these introduce each topic and enable students to get their bearings in the literature. Lecturers then guide students in developing their own learning (individually and in groups), culminating in discussion sessions with peers and lecturers. The assessments include both individual and group assessments. This will also improve student transferable skills necessary for critical analysis and successful science communication</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Demonstrate an awareness of the research literature underpinning advances in animal behaviour, largely through independent study. • Demonstrate an ability to reflect on your own knowledge, identify gaps and undertake appropriate measures to improve that understanding. • Find, interpret and critically analyse information from the primary literature at an advanced level. • Discuss subjects intelligently and argue a point of view logically, critically and coherently in the face of conflicting theories or divergent methodologies. • Understand and be able to explain the role of new tools and technologies in elucidating mechanisms in animal behaviour and evaluate areas of theory in which there continue to be significant shortfalls in knowledge. • Explain science to a public audience by independently writing a piece for the news on a recent peer-reviewed study, highlight the key points, discuss where it slots into previous research and identify future research areas. 		
Delivery:	Lectures, practical classes, workshops and independent study		
Assessment Methods:	<p>100% in-course assessment</p> <ul style="list-style-type: none"> • Online news piece 40% (individual assessment) • e-Portfolio report on one of the problem-based learning topics. Mixed content but equivalent to ~3000 words. 60% overall, with 50% allocated to the report (group assessment) and 10% to a reflective component (individual assessment) synthesising material across the module to reflect on how new tools, techniques 		

	<p>and technologies have enabled us to tackle theoretical questions which would have been impossible previously.</p>
--	----------------------------------------------------------------------------------------------------------------------

Reassessment:

Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected

Banner Code - 11221		Eukaryotic Gene Expression	Credits: 20
Level: H	Semester: 1	Staff responsible: Dr Steve Minchin	
Module Description:	<p>Regulation of gene expression in eukaryotes is essential for development and physiological function in health and disease. The undoubted complexity of multicellular organisms arises from the differential expression of the genetic material, which is essentially the same in all cells. What makes humans different to other mammals is not major difference in gene content, but differences in the expression of homologous genes.</p> <p>The module will initially cover generic features of the transcription machinery, the role of regulatory proteins in controlling gene transcription and the importance of chromatin structure. This will lead into a more detailed analysis of the control of gene transcription and its role in development, health and disease.</p> <p>It will then cover the mechanisms of post-transcriptional pre-mRNA processing, mRNA degradation and translation. More in depth coverage will discuss the how post-transcriptional processes can be controlled to regulate gene expression. Students will also learn about the importance of non-coding RNAs including miRNAs. The biological importance of post-transcriptional control will be illustrated by discussions of topics including gene imprinting, X-chromosome inactivation, nonsense mediated decay.</p> <p>The course is taught as a series of lectures. In addition, communication and examination skills will be developed in a series of workshops in which students will develop the ability to research, critically evaluate, and assimilate and précis information this will help students develop the skills to write high-quality examination essays introducing information from outside the lecture. The element of continuous assessment for this module will give students the opportunity to demonstrate their examination skills by writing an essay in examination conditions.</p> <p>One of the in course assessments is in the form of an examination style essay. This gives the opportunity to practice examination skills, particularly how to structure an essay, to answer an examination question and how to use additional material in your answer. The feedback on this assessment will help develop these skills further.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Recognise, recall and define terms relevant to the study of: • Nuclear organisation • Gene transcription by RNA Polymerases II • Control of gene transcription by activator and repressor proteins, co-activators and co-repressors • Epigenetics • Pre-mRNA processing (5' capping, polyadenylation and splicing) • mRNA translation and turnover • Post-transcriptional control of gene expression. • Define the key molecular mechanisms that control the expression of eukaryotic genes; 		

	<ul style="list-style-type: none"> • Describe nuclear organisation and its role in gene expression; • Explain the regulation of gene transcription of eukaryotic genes, including critically evaluating the roles of different factors during the transcription cycle; • Explain and contrast different epigenetic mechanisms used to control gene expression; • Discuss the role of gene expression in development, health and disease; • Describe pre-mRNA processing and discuss how transcription and pre-mRNA processing are coupled; • Discuss how gene expression can be controlled post-transcriptionally (editing, alternative splicing and polyadenylation); • Describe and evaluate current approaches in gene therapy for correcting RNA processing defects; • Explain and contrast the role of miRNAs and siRNA in control of gene expression; • Analyse, interpret, précis and comment on the impact of the scientific literature.
Delivery:	Lectures, practical classes, workshops and independent study
Assessment Methods:	<p>News and Views : Coursework (50%) Examination : Exam (Centrally timetabled) - Computer based (50%)</p> <p>Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected</p>

Banner Code - 14675		Molecular and Cellular Immunology	Credits: 20
Level: H	Semester: 2	Staff responsible: Dr Klaus Futterer	
Module Description:	<p>The emphasis of this module is on how the immune system works, with a focus on molecular and cellular aspects. The main areas covered include (but are not limited to): (i) the evolution of the immune system, (ii) innate immunity and the role of phagocytes, inflammatory responses and intracellular killing mechanisms, (iii) adaptive immunity and the role of B cells, T cell subsets, antigen presenting cells, interleukins and cell surface receptors, (iv) immunity and infection killer cells and killing mechanisms, (iv) the structures, signalling pathways, cell biology and interactions involved in antigen recognition, T and B cell responses, antibody-antigen complexes, (v) immunological disorders, including hypersensitivity, and autoimmune diseases and transplantation, (vi) vaccines and therapeutic antibodies.</p> <p>The aim of the module is to develop a knowledge in immunology and the methods used to investigate the subject. This will be achieved by a combination of (i) lectures, (ii) data interpretation sessions, (iii) practicals on leukocyte identification using microscopy and (v) student reading material available on e-journals and in the library.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • demonstrate a body of knowledge of physiological, cellular and molecular features of the immune systems in humans and other organisms; • link molecular and cellular components of the immune system to physiological outcomes in protection against infection, and autoimmune conditions; • Interpret data based on experiments in molecular and cellular immunology in terms of cellular and molecular features of the immune system; • Present a topic in molecular and cellular immunology in the form of a critical evaluation of a controversy in immunology • understand through practical training how cell staining and microscopy can be used to identify cells of the immune system in blood smears. 		
Delivery:	Lectures, practical classes, workshops and independent study		
Assessment Methods:	<p>Controversies Assignment with Data Interpretation : Coursework (50%) Examination : Exam (Centrally timetabled) - Computer based (50%)</p> <p>Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected</p>		

Banner Code - 21893		Cancer Biology	Credits: 20
Level: H	Semester: 1	Staff responsible: Prof John Heath	
Module Description:	<p>This module will consider multiple aspects of Cancer Biology and therapeutic opportunities that are arising for the treatment of these diseases.</p> <p>At one level we will consider the pathways that regulate cell division and survival that become subverted in malignant cells. Major advances in this area have occurred as a result of biochemical and genetic investigations in a wide range of organisms. These have revealed a core set of molecular mechanisms which are highly conserved between species. The essential elements include specific extracellular signals which coordinate cell proliferation by activating specific signalling pathways inside the cell. These pathways converge upon the transcriptional activation of a number of genes whose activity is required to induce the processes leading to the replication of DNA and subsequent completion of the cell cycle.</p> <p>In parallel analysis of genetic alterations that occur in the formation of tumours has revealed a class of genes with fundamental significance for cell multiplication in higher eukaryotes such as man. Loss of tumour suppressor gene function permits cells to proliferate under conditions where their normal counterparts cannot.</p> <p>The expansion of a population of cells involves a balance between cell division and cell death. Programmed cell death is an important feature of normal physiology and inhibition of cell death can facilitate the growth of tumours. Recent advances suggest that active cell death - apoptosis - involves a specific set of biochemical processes which have many analogies to those involved in normal cell proliferation. This module will consider how tumours develop and progress and how recent advances in understanding these processes have identified new ways of targeting cancers.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • the biology of cell multiplication in vitro and in vivo, including phases of the cell cycle, and how the cell cycle progression is regulated by cyclin/cyclin dependent kinases • growth factors and how they signal via cell surface receptors to effect gene transcription and progress through the cell cycle • the role of oncogenes and tumour suppressor genes in normal cell cycle control and in cancer • DNA damage and repair mechanisms • the biological features of naturally occurring tumours • the mechanisms involved in malignant tumour formation, including angiogenesis and metastasis • the biochemical mechanisms involved in programmed cell death (apoptosis) and its relevance to development of cancer 		

	<ul style="list-style-type: none">• epidemiology, cancer risk and prevalence• genetic predisposition to tumour formation• recent developments in cancer diagnosis, therapy and prevention• Communicate a complex scientific article to a non specialised scientific audience.
Delivery:	Lectures, practical classes, workshops and independent study
Assessment Methods:	News and Views Essay : Coursework (50%) Examination : Exam (Centrally timetabled) - Computer based (50%) Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected

Banner Code - 30948		Omics for Biomedical Research	Credits: 20
Level: H	Semester: 2	Staff responsible: Dr Debbie Cunningham	
Module Description:	<p>The aim of this module is to familiarise students with the 'state-of-the-art' omics approaches used in biomedical research and to demonstrate how omics technologies have led to identification of novel biomarkers that will enable a future medical need for personalised/stratified medicine.</p> <p>During this module the students will cover the following topics:</p> <ol style="list-style-type: none"> 1. Introduction to 'omic' technologies 2. Genomics 3. Transcriptomics 4. Epigenomics 5. Proteomics 6. Metabolomics 7. Integration of multi-omics data <p>Standard lecture formats will be used to introduce the students to various omics approaches and technologies and will include research-led teaching tutorials from leading experts to discuss current leading research. Furthermore, students will be presented with a series of assessed case studies focusing on several omics-based approaches to achieve a better understanding of how omics technologies are applied to specific areas of research. In addition, the students will have the opportunity to answer specific scientific questions using appropriate omics technologies in a series of assessed computer based workshops. This will provide the students with first-hand experience of learning about the multiple steps (e.g. experimental design, experimental step, data analysis and interpretation) involved in using omics platforms in research.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Compare and critically evaluate a range of cutting edge omics technologies and platforms and assess their application to biomedical research • Apply the knowledge they have gain throughout the course to critically compare different technologies and choose the most appropriate tools to answer specific biological questions • Critically evaluate the criteria of a great experimental design for different omics technologies and formulate an ideal omics experiment • Select and apply appropriate resources for analysis, visualisation and interpretation of omics data 		
Delivery:	Lectures, practical classes, workshops and independent study		
Assessment Methods:	<p>Coursework (100%)</p> <p>Assessments:</p> <p>Four short reports (1000 words) of the workshop sessions. One of the reports will be a formative assessment (60%)</p> <p>1 recorded PowerPoint presentation, 30%</p> <p>Interaction in three Case studies during research seminars 10%</p>		

	<p>Reassessment:</p>
--	----------------------

	<p>Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected</p>
--	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Banner Code - 36113		Bacterial Pathogenesis: methods and applications	Credits: 20
Level: H	Semester: 2	Staff responsible: Dr Luke Alderwick	
Module Description:	<p>The aim of the module is to enable students to become more familiar with research methods used in microbiology, with a focus on important human bacterial pathogens. The module will be delivered via three key streams.</p> <ol style="list-style-type: none"> 1. Bacterial pathogens. During this module, students will gain a detailed mechanistic understanding of how these bacteria cause infection at the molecular level. 2. Methods. Drawing on a range of state-of-the-art experimental and analytical approaches, including analysis of genome sequence data, students can expect to discover a more in-depth approach to pathogen biology. Students will be specifically taught the methods in standard lecture format supported by independent study, and will also have an opportunity to see them applied in specific research contexts, through attendance at a series of workshops with components of group work (below). 3. Applications. Through workshops, case studies and computer- and lab-based practical classes students will become familiar with the principles and practice of research addressing the molecular basis of bacterial infection and how this thriving area of science underpins our major research objective of discovering the next generation of antibiotics. <p>Students will be presented with a series of research problems encompassing examples from the following areas:</p> <ul style="list-style-type: none"> - antimicrobial resistance and drug discovery - microbial pathogenesis and biodiversity <p>An assessed practical will be used to illustrate some of these methods, and to allow students to become more familiar with data analysis and good scientific writing style.</p> <p>Students will thus gain an integrated view of the subject which will equip them for postgraduate research in this area and for employment as clinical scientists</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • From a selection of important bacterial pathogens, describe the molecular mechanisms used to cause disease, including the evolution, ecology, genetics and regulation of virulence; • Demonstrate and apply an advanced level of understanding of relevant methods which are used in microbiological research, by analysing and interpreting data from them, and evaluating the limitations of these methods; • Explain the biogenesis of the bacterial cell envelope and its components, highlighting their roles in virulence and interactions with the metazoan immune system; • Evaluate different relevant methods and choose the appropriate ones to tackle specific scientific questions, and justify this choice; • identify, justify, and critically appraise the use of specific methods when they have been used in the scientific literature; 		

	<ul style="list-style-type: none">• Analyse data and present it in a written report in appropriate academic style• Extract and analyse genetic information from bacterial genomes, perform comparative analysis (BLASTp, Clustal Omega) and to make predictions of gene function.• Understand the mode of action of current antimicrobial treatments and how they are discovered.
Delivery:	Lectures, practical classes, workshops and independent study
Assessment Methods:	Continuous Assessment : Coursework (50%) Examination: Exam (Centrally timetabled) – Written unseen (50%) Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected

Banner Code - 36118		Responses to Global Environment	Credits: 20
Level: H	Semester: 2	Staff responsible: Dr Scott Hayward	
Module Description:	<p>Since its inception, life on earth has had to adapt to changing environmental conditions, either through phenotypic plasticity (across rapid, diurnal or seasonal timescales), or through evolution (across multiple generations). This module investigates how organisms detect and respond to variable environments, including anthropogenic (human-made) change, and reviews the different molecular signalling pathways and physiological mechanisms underpinning adaptation to changing conditions. Examples are provided from a range of organisms, but with a specific focus on plants and insects. Case studies highlight different research techniques employed in examining responses to environmental change, as well as how to potentially manipulate these responses in order to develop mitigation strategies/enhance resilience at species, population and ecosystem levels, as well as for food security.</p> <p>The main aims of this module are to provide students with information, guidance, and access to resources, that will allow them to:</p> <p>(a) Gain an in-depth understanding of how organisms respond and adapt to changes in their environment.</p> <p>(b) Recognize that the term “environment” covers a continuum of spatial scales from molecular environments within cells, to broad-scale geographic environments and climatic zones.</p> <p>(c) Appreciate that adaptation to environmental change for an individual organism is transient and occurs across a temporal spectrum of seconds to seasons. For species, adaptation is long-term, but not fixed/permanent, and occurs across a timescale of generations.</p> <p>(d) Interpret the potential impact of climate change on species (including crops), communities and ecosystems, as well as the provision of food security.</p> <p>(e) Become effective independent learners, capable of interpreting and critically analysing the scientific literature to help formulate and express their own ideas and develop mitigation strategies against the negative impacts of climate change and extreme environments.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Recognize, recall and define terms relevant to the study of molecular, physiological and behavioural strategies of environmental adaptation. • Explain and contrast the signalling pathways and adaptive mechanisms by which organisms respond to rapid changes in their environment, seasonal transitions, regional climates and global climate change. • Interpret and critically analyse the scientific literature to provide an evidence base supporting the achievement of learning outcomes 1 & 2, and in set exercises. • Evaluate experimental strategies that could be applied to address specific problems associated with mitigating against the impacts of climate change, e.g. in enhancing food security. 		

	<ul style="list-style-type: none">• Formulate and express their own ideas through independent learning and writing skills including writing for a non-scientific audience.
Delivery:	Lectures, practical classes, workshops and independent study
Assessment Methods:	<p>Assessment: Examination: (34%%) Continuous assessment (66%): Policy document (33%), Analysis of scientific paper (33%)</p> <p>Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected</p>

Banner Code - 30790		Current Developments & Advances in Eukaryotic Genetics	Credits: 20
Level: H	Semester: 2	Staff responsible: Dr Eugenio Sanchez-Moran	
Module Description:	Genetics underpins all aspects of biology and recent developments in genomics together with novel analytical approaches are providing new insights into the molecular basis and evolution of genetic variation. This module will examine genetic variation from the chromosomal level through to populations focusing on humans and relevant examples from model organisms. The module will study the dynamics of chromosome organisation during mitosis and meiosis; how chromosome variation is related to ageing, cancer and genome instability and chromosome evolution. The genetic control of qualitative and complex quantitative traits such as intelligence, body weight and hypertension will be considered together with the methodologies that have been developed to identify the genes involved. Students will be given tutorials and workshops to help you with this part of the module.		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Demonstrate an awareness of the importance of genetic variation; • Understand the theoretical framework underpinning the analysis of genetic variation; • Understand the implications of genetic variation in regard to genetic disease; the identification of quantitative traits and genome evolution; • Describe the experimental approaches that are used to investigate genetic variation at all levels ranging from chromosomes to populations; • Analyse and interpret data produced by these experiments 		
Delivery:	Lectures, practical classes, workshops and independent study		
Assessment Methods:	<p>QTL Data Analysis : Coursework (50%) Examination : Coursework (50%)</p> <p>Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected</p>		

Banner Code - 25349		Human Evolution	Credits: 20
Level: H	Semester: 2	Staff responsible: Dr Mary Blanchard	
Module Description:	The module will cover differing but complementary aspects of modern thinking about human evolution. Students will learn about the theories for the development of some of the most important features of human evolution, such as bipedalism, as well as considering aspects of behavioural evolution including the evolution of language, society and racism. The module will also consider to what extent human evolution is still occurring and what influences this. This component will include aspects of evolutionary pressure between humans and their pathogens and to what extent modern medicine interferes with these processes.		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Understand concepts and knowledge relevant to the study of the behavioural , morphological and genetic components of human evolution. • Analyse and interpret the scientific literature to compare and critically assess contrasting theories of key controversial issues in human evolution • Understand key limitations in our ability to interpret the fossil record and the methods utilised to assist our interpretation. 		
Delivery:	Lectures, practical classes, workshops and independent study		
Assessment Methods:	<p>Poster : Coursework (50%) Examination : Computer based (50%)</p> <p>Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected</p>		

Banner Code - 25343		Bacterial Gene Regulation	Credits: 20
Level: H	Semester: 2	Staff responsible: Prof Steve Busby	
Module Description:	<p>The ability of bacteria to survive in a variety of environments depends on their ability to regulate gene expression in response to various environmental signals. In this module, students will learn how proteins regulate transcription by their interaction with DNA, resulting in changes in metabolism, transposition, differentiation and phage. Particular attention is paid to the process of transcription by RNA polymerase, the role of sigma factors in controlling transcription specificity how environmental signals are transmitted across the cytoplasmic membrane, and the way that sequential expression of sigma factors determines cascades of gene expression during differentiation. This module introduces students to (i) the different levels of regulation during gene expression in bacteria and the mechanisms whereby control is exerted (ii) current methods for studying gene expression and regulation. It also provides opportunities for students to prepare work based on original scientific literature, and to present the material through formal delivery and informal discussion. Student's problem solving ability is developed through data handling classes.</p>		
Module Outcomes:	<p>By the end of the module students should be able to:</p> <ul style="list-style-type: none"> • Understand the different levels of gene control in bacteria, including the circuits that allow differentiation and multicellular behaviour; • Be conversant with the current methodology for studying gene expression and control; • Be able to work in groups and alone to solve problems relating to gene expression and regulation; • Be able to analyse and explain orally current work based on the primary scientific literature. 		
Delivery:	Lectures, practical classes, workshops and independent study		
Assessment Methods:	<p>Class Test : Class Test (50%) Examination : Exam (Centrally timetabled) - Computer based (50%)</p> <p>Reassessment: Reassessment is not available for modules taken in the final year of an undergraduate programme. Extenuating Circumstances impacting on coursework or in year assessment will normally be dealt with by an extension being granted where appropriate to the date for submission or completion of the piece(s) of work affected</p>		