

School of Biological Sciences

About the department

The School of Biological Sciences offers an exciting range of single honours degree programmes in organismal and molecular biosciences. All our modules are taught by specialist staff with high professional standards and international reputations. We take great pride in our approachability, friendliness and the support that we offer our students. In the National Student Survey 2017, the School received a satisfaction rating of 93% from final year students.

Entry requirements

The courses listed below are open to all Study Abroad and International Exchange students, subject to any required previous knowledge or qualifications, as stated in the course outlines below.

Each full course is 15 credits and starts in either the Autumn Term (September) or the Spring Term (January). Some courses run over both terms, and can be taken as a 7.5-credit half-course option in Autumn Term only.

The information contained in the course outlines on the following pages is correct at the time of publication but may be subject to change as part of our policy of continuous improvement and development.



Course options for visiting students

Course code	Course name	7.5 or 15 credits	Start date	Course description/pre-requisites
BS1031	Chemistry of Life	15	Sep-18	Students should achieve a sound knowledge of fundamental chemistry essential to the proper understanding of life processes and laboratory experiments. Students learn the basics of biological chemistry. These include the chemical bonding and structure of important biomolecules, the relationship between different isomers of a molecule, and acid/base chemistry. Students also learn basic biochemical lab techniques and carry out consequent data analysis. Pre-requisite: A-level Chemistry or equivalent
BS1032	Fundamental Biochemistry	15	Jan-19	Students learn the basics of biochemistry. These include the energetics, kinetics and analysis of biological reactions. The course unit involves understanding some of the techniques for biochemical analysis, including spectroscopy, and the fundamentals of protein structure. The course unit also introduces energetics, kinetics and analysis of biological reactions. Pre-requisite: A-level Chemistry or equivalent
BS1041	Biology in a Changing World	15	Jan-19	Planet Earth faces many major challenges in the 21 st Century, with humans placing ever-increasing pressures on limited resources. This course unit provides an introductory understanding of how biological and ecological principles can help develop sustainable solutions to the problems encountered in our changing world. Through a combination of lectures, practical laboratory classes and field trips students are introduced to these challenges. Practical skills related to sampling techniques, biostatistical analyses and experimental design are taught as part of this applied course unit. The course unit will use a case-study approach to tackle the major challenges facing the planet and will use ecological principles to explain how sustainable solutions are being developed. Topics will range from climate change to invasive species and the course unit will cover a range of habitats from tropical forests to aquatic environments. Pre-requisite: A-level Biology or equivalent
BS1042	Vertebrate Evolution and Diversity	15	Jan-19	The course unit explores the diversity, function and evolution of vertebrates, from the early vertebrates, through to fishes and amphibians to reptiles and birds and ending with mammals. Topics will range from the origin of jawed vertebrates, to living on land and the evolution of mammals. Through a combination of lectures, practical laboratory classes and field trips students are introduced to the study of the evolution and diversity of vertebrates, as well as fostering an understanding of their adaptations to the environment. Pre-requisite: A-level Biology or equivalent
BS1043	Green World: Plant Evolution, Form and Function	15	Jan-19	The course unit provides an introduction to basal photosynthetic eukaryotes and to two crown kingdoms of multicellular organisms, fungi and plants (fungi being a eukaryotic kingdom traditionally studied by botanists, albeit more closely related to animals). The development of life cycles will be one particular focus. Features of main groups will be examined. This will be followed by the analysis of form, development and function (including photosynthesis) of higher plants. The relevance of plants to humans will be explored. Practicals will include handling and observation of preserved and live specimens, preparation of taxonomic keys, drawing, data analysis, interpretation and presentation.

Course options for visiting students

				Pre-requisite: A-level Biology or equivalent
BS1051	Ecology and Conservation	15	Sep-18	The course unit applies a “bottom-up” approach, from individuals to biomes, covering many important themes which include: ecological hierarchies, adaptation, behaviour, population distributions, species interactions, community structure, biodiversity and conservation. Through a combination of lectures, practical laboratory classes and field trips students are introduced to the study of the distribution and abundance of organisms, as well as fostering an understanding of ecological methods. Practical skills related to sampling techniques, biostatistical analyses and experimental design are taught as part of the major ecological themes. Pre-requisite: A-level Biology or equivalent
BS1052	Biomes and Ecosystems	15	Jan-19	The course unit covers variation in climate around the globe, global biomes, aquatic and terrestrial ecosystems, biogeochemical processes (including Nitrogen, Phosphorus and Carbon cycles) and ecosystem services. Practical skills related to sampling techniques, biostatistical analyses and experimental design are taught as part of the major ecological themes. Pre-requisite: A-level Biology or equivalent
BS1061	Introductory Animal Physiology	15	Jan-19	This course unit explores fundamental physiological processes required for communication, obtaining and distributing nutrients and maintaining the internal environment within multicellular organisms. The course unit begins by considering the mechanisms, organisation, functions and integration of the nervous and endocrine systems to show how neural (somatic and autonomic) and hormonal signalling enable an animal to sense and respond both consciously (e.g. movement) and unconsciously (e.g. internal homeostasis). This is followed by an overview of the evolution of closed circulatory system separated into pulmonary and systemic circuits and driven by a four chambered heart, essential for the body-wide distribution of nutrients, oxygen and hormones, and for the removal of waste products. How animals obtain oxygen from different environments how the respiratory system integrates with the circulation in terms of blood gas transport will be discussed. The course unit concludes by considering the integrated roles of the excretory and circulatory systems in maintaining an appropriate internal environment for cellular function throughout the body. Pre-requisite: A-level Biology or equivalent
BS1062	Pathophysiology	15	Jan-19	BS1062 builds on and expands some of the topics covered in BS1061 to illustrate the consequences of disease (inherited or acquired) on physiological function. The course unit will begin by explaining how special sensory systems convert light, sound and position/movement into electrical signals that are transmitted to the brain and how our ability to sense the environment can be disrupted by diseased or damaged receptors. This will be followed by an introduction to skeletal muscle function, how movement is controlled and sensed by the somatic nervous system and the causes and consequences of selected muscle and nerve disorders. The course unit will then cover aspects of basic haematology; the fluid and formed elements of blood and their roles in inflammation and the control of bleeding following vessel damage. The final section of the course unit will focus on kidney disorders to illustrate the wide-ranging consequences of water and ion imbalance. Pre-requisite: A-level Biology or equivalent

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BS1071	Cell Biology and Evolution	15	Sep-18	<p>Cell Biology and Evolution focuses on the structure and function of prokaryotic and eukaryotic cells. The origin of life is considered, as well as the principles that drive evolution and speciation. The course unit explores subcellular organisation and the relationship between the structure and function of the main organelles. This course unit also incorporates essential numeracy skills for biological scientists which includes consideration of hypothesis testing, experimental design and basic statistical comparisons. The course unit also provides a foundation in microscopy skills.</p> <p>Pre-requisite: A-level Biology or equivalent</p>
BS1072	Genetics	15	Sep-18	<p>Genetics aims to provide a basic understanding of genes that spans their behaviour in individual organisms, in populations, and at the molecular level within the cell. Genetics covers the structure and organisation of: chromosomes, mitosis, meiosis and recombination, the structure and inheritance of DNA, transcription, translation, the regulation of gene expression, the organisation of prokaryotic and eukaryotic genomes, and techniques and applications of recombinant DNA technology.</p> <p>Pre-requisite: A-level Biology or equivalent</p>
BS1091	Protein Biochemistry and Enzymology	15	Jan-19	<p>This course unit will provide a general understanding of the main concepts of classic protein biochemistry. The course unit includes protein purification, enzyme kinetics, enzyme structure, regulation of enzyme activity, biochemical buffers as well as relevant analytical methods and their practical applications. Practical classes demonstrate the techniques and approaches taught in the lectures.</p> <p>Pre-requisite: A-level Chemistry, BS1032 or equivalent</p>
BS2005	Microbiology	15	Jan-19	<p>The course aims to introduce key concepts in microbiology, which encompasses studies in bacteria, viruses, and eukaryotic microbes. The historical milestones in this field of research will be considered, as well as the background of the important methodologies used in microbiology research. The course will include information on how microbes are classified, and how the different types of microbes are distinguished. We will discuss bacterial growth and differentiation, including genetic regulation. The course will explain the importance of microorganisms in health and disease, including human welfare issues such as opportunistic infections and the role of microorganisms in cancer. We will also consider how microorganisms can be used in research. This course is an essential prerequisite for the third year course BS3510 Molecular and Medical Microbiology.</p> <p>Pre-requisite: BS1071 or equivalent</p>
BS2010	Invertebrate Biology: Structure, Behaviour and Evolution	15	Sep-18	<p>The course involves a broad and in-depth study of the invertebrate phyla. The main focus will be on understanding body-plans, how structure relates to behaviour, and evolutionary relationships. The course will also examine invertebrate diversity and ecological importance. The practicals are an integral part of the course, and are designed to introduce techniques relevant to the study of invertebrates. These include experiments, dissection, microscopy, and preparation of whole mounts and staining sections for microscopical study.</p> <p>Pre-requisite: BS1041 or equivalent</p>

Course options for visiting students

BS2020	Plant Life: from Genes to Environment	15	Jan-19	<p>The course examines primarily the most advanced (flowering) plants, their evolution, developmental and functional biology. In part one, the origin and diversification of flowering plants is discussed, as it is reflected in their reproductive biology. In the second part the 'building' of a plant is analysed, with reference to the meristems, pools of 'stem cells' in which it primarily takes place. Part three reviews mechanisms by which the photosynthetic apparatus adapts to current light conditions or to water/CO₂ availability. Part four examines some case studies of the role and mode of action of plant hormones. Part five reviews plant environmental sensors of abiotic and biotic factors, key to adapt plant development and behaviour to the prevailing conditions. The mode of action of such sensors, and the responses that they evoke, are discussed. Part six touches upon plants in the context of their domestication ("accelerated evolution") in the hands of humans and in relation to global environmental change, the impact it has on plants and of the role plants can play in reducing it.</p> <p>Pre-requisite: BS1043, BS1072 or equivalent</p>
BS2040	Cell Dynamics: Division and Movement	15	Jan-19	<p>The course will focus on the following key areas of modern cell biology: cell cycle, cell growth and differentiation, apoptosis, cell senescence, cell polarity, cell shape and cell motility, organelle origin and functions. Will give theoretical knowledge in modern cell biology methods, including microscopy and live cell imaging. Will introduce basic concepts on evolutionary constraints in cellular functions and links between cellular functions and development.</p> <p>Pre-requisite: BS1071 or equivalent</p>
BS2050	Human Physiology in Health and Disease	15	Sep-18	<p>The course will focus on the functions and integration of selected human physiological systems and how these are disrupted by disease.</p> <p>The endocrine system: The thyroid gland will be used to explain the role of the hypothalamo-pituitary axis, feedback loops and multi-system response; the stress response to illustrate endocrine and nervous system integration in long- and short-term physiological response. How hormonal and neural signals integrate to regulate gastrointestinal activity, secretion and transit to ensure efficient digestion, and then to maintain blood glucose homeostasis in the absorptive and postabsorptive states will be discussed.</p> <p>Skeletal muscle: The specialised structure of the skeletal muscle cell and the molecular basis of contraction will be discussed, including excitation-contraction coupling, the role of Ca²⁺, cross-bridge cycling, tetanic contraction and fibre types. Aspects of nerve/muscle communication including the neuromuscular junction, Golgi tendon organs and spindles will be covered, together with the significance of motor units and recruitment for whole muscle function.</p> <p>Cardiovascular system: The structure and function of cardiac muscle will be covered together with aspects of cardiovascular physiology including cardiac output and the control of arterial pressure, together with cardiac failure, arrhythmia and cardiomyopathy. The composition of blood will be discussed, including examples of blood disorders along with the haemostatic mechanisms that prevent blood loss following vessel damage.</p> <p>The respiratory system: This topic will include respiratory surfaces and surfactant, the mechanics of respiration and gas exchange and the integration of respiration and cardiovascular output.</p> <p>Pre-requisite: BS1061, BS1062 or equivalent</p>

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BS2060	Developmental Biology	15	Sep-18	Multicellularity has allowed living things to achieve levels of complexity and sophistication impossible at the single cell level. This course will explore the mechanisms by which zygotes establish or make use of basic body plan axes, and how subsequent cellular differentiation and interaction is achieved and results in the variety of tissues and organs that build an animal body. The course will focus on model organisms in which both embryological and genetic approaches have been developed, and will explore axis establishment, segmentation, cellular differentiation, organ development, and the widely-shared signaling pathways that underpin them. Pre-requisite: BS1061, BS1071 or equivalent
BS2090	Insects, Plants and Fungi: Ecology and Applications	15	Jan-19	The course will cover the effects of herbivorous insects on plants and the ways in which plants defend themselves against attack. Beneficial effects such as pollination will also be addressed. The ecology of fungi pathogenic on insects and plants will be covered as well as fungi that are beneficial to plants (endophytes and mycorrhizas). Pre-requisite: BS1043, BS1051, BS1052 or equivalent
BS2120	Biological Data Analysis and Interpretation	15	Sep-18	This course provides an introduction to the use of statistical methods in biological sciences. Emphasis is placed on understanding how questions in biology can be answered quantitatively using statistics. The most important and widely used descriptive, associative and comparative statistical tests are illustrated, especially how and when they can be used. Key concepts of statistical sampling and experimental design in biology are introduced. Exercises give students hands-on experience of using statistical techniques.
BS2140	Animal Behaviour	15	Jan-19	The course demonstrates the great variety of animal behaviour occurring across the range of animal taxa and in different ecological situations. The course outlines the major theories that seek to explain animal behaviour, such as kin selection, cooperation and altruism. In-depth case studies will be used to illustrate the advantages of the main methods used to study animal behaviour, and how they can be applied to studying different types of behavioural questions. Pre-requisite: BS1042 or equivalent
BS2150	Applications of Molecular Genetics in Biology	15	Sep-18	This course outlines the molecular tools currently available for the exploration of genetic diversity in a range of organisms, and for the genetic manipulation of micro-organisms, plants, and animals, and describes how genetically modified, transgenic organisms can be produced by a variety of transformation methodologies. Examples of the application of molecular genetic strategies in basic biological and biomedical research and in areas as diverse as crop improvement, pest management, vaccine development, microbial evolution, human inherited disease and cancer are presented and discussed. Pre-requisite: BS1072 or equivalent
BS2160	Evolution	15	Jan-19	Evolution is the study of how the genotypic and phenotypic compositions of populations change through time. This course covers the foundation of evolutionary biology and the mechanisms that have shaped organisms since life began. How the evolutionary synthesis came to be; the origin of variation; the allelic composition of a population and how different processes, including natural selection, modify this composition; and adaptation. These topics lead to considering how we can study evolution using phylogenetic methods. Finally, we consider the mechanisms of speciation and the special topic of human evolution. Pre-requisite: BS1052 or BS1042 or equivalent

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BS2510	Bioenergetics, Biosynthesis and Metabolic Regulation	15	Sep-18	<i>Basic bioenergetics and respiratory electron transport</i> , including concepts of oxidative phosphorylation and chemiosmotic theory; proton-translocating ATPase; structure and function of the respiratory chain. <i>Biosynthetic pathways and their regulation</i> , covering sugar nucleotides, storage polysaccharides, amino sugars and glycoproteins; the regulation of carbohydrate metabolism (including caloric homeostasis); the distribution and biosynthesis of isoprenoids, cholesterol, lipids and fat soluble vitamins; protein prenylation and glycosylation. Pre-requisite: BS1031, BS1032, BS1091 or equivalent
BS2520	Protein Structure and Function	15	Sep-18	The course covers the principles of protein structure, including secondary structure, motifs and domains, and protein folding <i>in vivo</i> . Methods for separation, purification, detection, structural and functional analysis of proteins are considered. The course also covers protein-protein interactions, and the principles of protein engineering and design, as well as the mechanisms of enzyme catalysis and regulation, with specific examples. The practical class will provide experience in using fundamental techniques in protein separation and analysis such as SDS-PAGE and Western blotting. The coursework also involves the structure and function prediction of an unknown protein sequence using bioinformatics tools. Pre-requisite: BS1031, BS1032, BS1091 or equivalent
BS2530	Molecular Biology	15	Sep-18	The course covers the physical and chemical structure of DNA, recombinant DNA technology, DNA replication, gene organisation and structure, RNA and protein synthesis. The laboratory experiments cover a range of molecular biology techniques based on the theme of gene characterisation. This course also includes sessions in numeracy for molecular biologists and statistical skills. Pre-requisite: BS1072, BS1091 or equivalent
BS2540	Molecular and Cellular Immunology	15	Sep-18	This course examines the specific immune system at the molecular level, dealing with the structure and function of the soluble and cell surface proteins involved. Subjects include: the immune response and acquired immunity; antibody structure and function; antibody diversity and clonal selection; genetics of immunoglobulin expression; the complement system; antibody techniques; monoclonal antibodies hypersensitivity reactions (allergies); the activity of T cells; major histocompatibility complexes, their role in transplant rejection and non-self-recognition; and, HIV and AIDS. Pre-requisite: BS1071, BS1072 or equivalent
BS2550	Neuronal and Cellular Signalling	15	Sep-18	This course covers the principles of signalling in the nervous system, including electrical signalling along neurons and synaptic transmission. Different types of neurotransmitters will be considered and their receptors and intracellular signal transduction pathways will be studied. We will study the role and action of Acetylcholine, GABA and glutamate. The role of voltage-gated and ligand-gated ion channels will be discussed, including the role of potassium and calcium ion channels. The second term of the course will focus on central cell signalling pathways. Lectures include an introduction to drug development from an industrial and research perspective. The course will also cover the basis of cell signalling, from the outside of the cell (membrane receptors) to key intracellular mechanisms. These will include kinase (and phosphatase) activity, the second messengers' heterotrimeric G proteins and small GTPases, cAMP, calcium and two important families of inositol-containing compounds. Examples of disease-related signalling will be highlighted throughout. Finally the course will introduce a range of model systems for neuroscience research.

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BS2560	Pharmacology and Toxicology	15	Jan-19	<p>The course aims to explain the chemical, physiological and biochemical factors which influence the efficacy of drugs. Topics covered include: drug-receptor interactions and the principal methods for receptor identification and characterisation, routes of administration of drugs, physico-chemical and physiological aspects of drug absorption and distribution, pathways of drug metabolism and excretion, renal clearance and ultra-filtration, mechanism of action of the major classes of analgesic and anti-depressant drugs, principles of toxicology and the major mechanisms of free radical induced tissue damage, pharmacology of the autonomic nervous system and the neuromuscular junction, general and local anaesthetic agents.</p> <p>Pre-requisite: BS1031, BS1032, BS1061, BS1062 or equivalent</p>
BS2570	Physical Biochemistry for Life Scientists	15	Sep-18	<p>The course aims to provide the theoretical basis and examples of applications of physical methods for the study of biological molecules. The course considers the behaviour of macromolecules in solution, electronic spectroscopy methods such as fluorescence, phosphorescence and circular dichroism, mass spectrometry and its application to studies of biological macromolecules; MS, MS-MS, quantitative MS, Surface Plasmon Resonance, interferometry, biocalorimetry, scanning force microscopy and an introduction to nanobiotechnology.</p> <p>Pre-requisite: BS1031, BS1032, BS1091 or equivalent</p>
BS3030	Biology of Parasitic Diseases	15	Sep-18	<p>This course explores the principles of parasitism and the protective mechanisms employed by immuno-competent hosts to limit the spread of infection. It outlines the biological strategies used by a range of unicellular and multicellular organisms to colonise its host causing disease in human and non-human hosts. Case studies on the pathology and the cellular immunity elicited by various parasites are explored. The immune evasion strategies used by widely distributed human parasites to protect themselves from immune attack are also reviewed. The principles and prospects of anti-parasitic vaccination in the 21st century are presented and discussed.</p> <p>Pre-requisite: BS2005, BS2150, BS2530 or equivalent</p>
BS3060	Conservation Science	15	Jan-19	<p>The course covers the scientific basis of the great threats to biodiversity – habitat loss and fragmentation, intensive agriculture, over-harvesting and natural resource exploitation, alien species, disease and global climate change – and the approaches developed by conservation scientists to overcome these threats at local and global scales. The potential for subjectivity in conservation decision-making and the crucial importance of science-based conservation is stressed. Practical work is part of the assessment and involves writing an invasive species management plan.</p> <p>Pre-requisite: BS1041, BS1051 or equivalent</p>
BS3090	Entomology: Pure and Applied	15	Sep-18	<p>The course aims to provide students with a sound understanding of insect biology, addressing aspects of their physiology and biology. Insects are the most numerous animals on the planet and the basic information will enable students to appreciate why this is so. Insects are of conservation importance and part of the course will focus on beneficial insects such as pollinators and saproxylic (dead wood feeding) species and focus on the reasons for their decline. The course also aims to introduce students to practitioners in entomology, showcasing research at the School, CABI and Rothamsted Research. The final aim of the course is to improve students' communication skills. Students will improve their verbal skills through the making of a podcast and their written skills through the production of an information leaflet for the general public.</p>

Course options for visiting students

				Pre-requisite: BS2010 or equivalent
BS3120	Population and Community Ecology	15	Sep-18	In this course the principles of population and community ecology are explained, using examples from animal and plant assemblages. It focuses on population growth, inter- and intra-specific competition, trophic relations and the factors which regulate populations. The ecological processes that contribute to community organisation, such as food web structure, body size, succession and natural disturbances are considered. The role of population and community ecology in the maintenance of biodiversity is emphasised. A proposal writing exercise and assignments, which will involve the use of computer simulations, are included. Pre-requisite: BS1051, BS1052 or equivalent
BS3160	Behavioural Ecology	15	Jan-19	The course demonstrates how the behaviour of animals can be explained in an ecological and evolutionary framework. The emphasis is upon functional and evolutionary hypotheses and testing models that seek to explain how animals find and use key resources (such as food, breeding territories, mates). Pre-requisite: BS2140 or equivalent
BS3180	Marine Ecology and Biodiversity	15	Jan-19	The course will begin with a brief introduction to the marine environment and oceanography. Following on from this a number of topical subjects will be used to illustrate recent developments in the field of marine ecology. The biodiversity and biogeography in the marine environment will be illustrated with reference to selected habitats, namely coral reefs and the deep ocean. The biology of the deep ocean, in particular the biology of mid-water and hydrothermal vent communities, will include consideration of technological advances in deep ocean exploration. This theme will be developed further in lectures on tracking studies, behaviour and conservation of marine megafauna, e.g sharks, sea birds and marine mammals. The topical issues of marine pollution (including plastics pollution), ocean acidification and global climate change will be considered with respect to effects on marine biodiversity. Topicality is also maintained during coursework: pairs of students prepare a poster based on a recently published paper from a highly rated marine biological journal. Pre-requisite: BS1042, BS2010 or equivalent
BS3190	Climate Change: Plants and the Environment	15	Jan-19	The course will give an advanced treatment of the effect of global climate change on the interaction between plants and the environment and will provide new opportunities to consider at various levels (ecological, physiological and molecular) the reaction of plants to environmental changes. Topics include a historical perspective on plants and humanity, microbial science and crop improvement. Pre-requisite: BS1043, BS2020 or equivalent
BS3210	Evolutionary Ecology of Vertebrates	15	Sep-18	Building on material from BS2160 (Evolution), this course introduces a range of advanced and current topics in evolutionary ecology with a strong focus on studies using vertebrate systems. Evolutionary ecologists investigate the interactions between and within species, and, for example, consider the evolutionary effects of competitors, mutualists, predators, prey and pathogens. Pre-requisite: BS2160 or equivalent

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BS3220	Extreme Animal Physiology	15	Sep-18	<p>The course demonstrates how vertebrate animals perform major feats within their annual cycles, focusing on those species either living in extreme environments, or exhibiting extreme behaviours. In depth case studies will be used to illustrate how physiology, morphology and anatomy combine to allow survival in harsh environments, and make extreme behaviours possible. Each lecture will include detail on the techniques used to examine animal physiology.</p> <p>Pre-requisite: BS1061, BS2050, BS2140 or equivalent</p>
BS3230	Circadian Biology	15	Sep-18	<p>The course will look at rhythms throughout biology: in microbes, plants and animals. It will look at the impact of the internal circadian clock on behaviour, physiology, environmental responses and its wider implications for fitness. It will look at how the clock interacts with environmental signals. How the clock can be set to the right time; how the clock can moderate environmental responses; or how the clock can allow measurement of day length for the timing of annual events. The emphasis will be upon the study of the real experimental data that have led to our understanding of the regulation of biological processes by clock and of the mechanism by which it works. This will include an examination of the methodology and analytical approaches used by circadian biologists. A wide range of organisms will be covered here.</p> <p>Pre-requisite: BS1072 or equivalent</p>
BS3510	Molecular and Medical Microbiology	15	Sep-18	<p>This course will present advanced topics in molecular microbiology with particular emphasis on bacteria and pathogenic eukaryotes. Topics include pathogen mechanisms for infection, the host immune response to infection, vaccine development, gastrointestinal health and disease, resistance to antibiotics, anti-parasite chemotherapy and the genetic and biochemical validation of parasite drug targets in the kinetoplastidae.</p> <p>Pre-requisite: BS1071, BS2005, BS2540 or equivalent</p>
BS3520	Seed Biology	15	Sep-18	<p>Plant seeds and fruits are of central importance to human existence as they constitute the beginning and the end of most food supply chains (food security and sustainability). They are the delivery systems of agricultural biotechnology and a cornerstone of ecosystem conservation (seed banking). Topics of the lectures include a solid introduction into the fundamental processes of seed development and food reserve deposition, germination and reserve mobilisation, as well as the utilisation of seeds for molecular pharming. The evolution of the seed habit and the biomolecular paleobotany of fossil seeds focus on the key advantages and diversity of seeds and fruits which evolved in interaction with climate change. The morphological diversity of seeds and fruits includes a one-day visit and practical at Kew's Millennium Seed Bank. This is followed by the biophysics of seed dispersal and the developmental biomechanics of seed fibres and seed germination. Further topics include a deeper insight into the molecular mechanisms underlying seed dormancy, germination and persistence in the soil bank, and their environmental control including by abiotic and biotic stress factors. The course also covers technologies used by the seed industry to improve crop seed quality and the research in agricultural biotechnology of wheat of Rothamsted Research at Harpenden. The lecture is complemented by course work in small groups on selected topics from the actual literature which is presented at the "seed conference". Websites: 'The Seed Biology Place' - www.seedbiology.eu, 'Kew's Millennium Seed Bank' - www.kew.org/science-conservation/save-a-seed-prosper/millennium-seed-bank/, 'Rothamsted Research' - www.rothamsted.ac.uk</p> <p>Pre-requisite: BS1043, BS2020, BS2150 or equivalent</p>

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BS3530	Applications of Genetic Engineering in Health and Disease	15/7.5*	Sep-18	<p>The ability to manipulate genes provides one of the most important advances in modern research since the discovery of the structure and function of DNA. This process, called genetic engineering, is critical for biomedical research, since it has enabled an improved understanding of the role of proteins at both a cellular and organismal level – through gene deletion or through the introduction or removal of disease-associated mutations. This course will provide an advanced-level course on genetic engineering. The course will focus on the use of genetic engineering in a range of systems including a simple non-animal model (<i>Dictyostelium</i>), and both in vitro and in vivo animal systems. The course will describe the use of these models for Genetic Engineering research, the underlying principles in the research, and the practical application this research to in areas of human health and disease, particular focussing on current advances.</p> <p>Pre-requisite: BS1072, BS2530 or equivalent</p> <p>*Full course runs over two terms, but half course can be taken in term 1 only as 7.5 credit course.</p>
BS3540	Cell and Molecular Biology of Cancer	15/7.5*	Sep-18	<p>This course will cover selected topics in molecular cell biology relevant to cancer, including: cell-cell adhesion and signalling; stem cells. We cover the importance of the cytoskeleton, including microtubule structure and their functional roles for cell division, cell cycle and polarity, cell dynamics and diseases. Additional topics on cancer biology include oncogenes, tumour suppressor genes, caretaker genes and the signalling and regulatory pathways these are involved in. The course covers the cellular, tissue and developmental barriers that have to be broken for the development of cancer. These will include apoptosis, senescence, angiogenesis and metastases. The course will also include case studies and novel research avenues for diagnosis and the rational treatment of cancer.</p> <p>Pre-requisite: BS1071, BS2040, BS2530 or equivalent</p> <p>*Full course runs over two terms, but half course can be taken in term 1 only as 7.5 credit course.</p>
BS3560	Functional Genomics, Proteomics and Bioinformatics	15/7.5*	Sep-18	<p>The course will give an advanced treatment of structure-function relationships in proteins and of new opportunities for the use of genome-wide analyses in dissecting regulation in biological systems. Gene and protein networks will also be discussed. Topics include, post-genomic science; modes of specific recognition in mediating protein interactions; domains and functions; and, protein engineering. Students complete a guided introduction to bioinformatics resources. This assesses individual competencies and practical skills as each student will have to analyze separate datasets and develop own conclusions on the function of a gene/protein within a network through the analysis of databases and literature.</p> <p>Pre-requisite: BS2520, BS2530 or equivalent</p> <p>*Full course runs over two terms, but half course can be taken in term 1 only as 7.5 credit course.</p>
BS3570	Human Embryology and Endocrinology	15/7.5*	Sep-18	<p>This course will cover select aspects in the development of human embryos and the function of particular endocrine systems. Topics covered in detail include early embryonic development, with formation of the three cell layers during gastrulation and the specification of anterior-posterior and left-right axes. The formation and patterning of the brain and spinal cord will be discussed, including the cellular and molecular processes involved. The effects of genetic and environmental insults in causing birth defects will be considered and the preventative action of folic acid treatment will be discussed. Techniques for deciphering the cause of birth defects will be considered, including the role of model organisms and the process of positional cloning. Other topics include the embryonic processes involved in craniofacial development and craniofacial defects. The development of the</p>

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				<p>thyroid, parathyroid and adrenal glands will be covered, with detail on the synthesis, regulation and action of parathyroid and adrenocortical hormones. Sexual determination and differentiation will be discussed. Reproductive endocrinology will cover the regulation of reproductive function in males and females, including the hormonal changes associated with pregnancy. The processes of egg and sperm maturation and fertilization will be covered, leading us back to early preimplantation development. This course is three quarters Embryology.</p> <p>Pre-requisite: BS1062, BS2050, BS2060, BS2550 or equivalent</p> <p>*Full course runs over two terms, but half course can be taken in term 1 only as 7.5 credit course.</p>
BS3580	Cell and Molecular Neuroscience	15/7.5*	Sep-18	<p>This course covers brain development, function and disorders. We discuss the cellular and molecular mechanisms of brain development with particular reference to the cerebral cortex. We discuss in detail the synthesis, storage and release of neurotransmitters. We will review the molecular basis of learning and memory. We will also study the cellular and molecular basis of brain disorders, including neurodegenerative disorders, particularly Alzheimer's disease, as well as epilepsy and bipolar disorder. The course also includes lectures from a clinician, on the cellular and molecular basis of neuroprotection in preterm babies and infants.</p> <p>Pre-requisite: BS1062, BS2530, BS2550 or equivalent</p> <p>*Full course runs over two terms, but half course can be taken in term 1 only as 7.5 credit course.</p>
BS3590	Molecular Basis of Inherited Disease	15	Sep-18	<p>The course provides an introduction to the theory, technology, and clinical practice of human molecular genetics: the metabolic and molecular bases of human inherited disease, mapping disease genes, the human genome project, bioinformatics, clinical aspects of the biochemistry of inborn errors of metabolism, and therapeutic approaches. The course is taught in relation to a selected range of illustrative genetic disorders and inborn errors of metabolism such as muscular dystrophies, cystic fibrosis, haemophilia, lysosomal storage disorders, haemoglobinopathies, mitochondrial respiratory chain disorders, neurotransmitter synthesis disorders, lipoprotein diseases and primary immunodeficiencies. This course is taught primarily by external lecturers who are experts in the field.</p> <p>Pre-requisite: BS1062, BS1072, BS1091, BS2530 or equivalent</p>