



UNIVERSITY OF  
LEICESTER

**Study Abroad**

**Biological Sciences**

2022/23 Academic Year



**MODULE NAME:** Research Project

**MODULE CODE:** BS3901

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 120

**PERIOD:** Academic Year

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the project, students are expected to be able to:- test a hypothesis by appropriate experimental

or computer-based techniques; conduct experimental procedures and demonstrate good laboratory or bioinformatics practice; analyse and present experimental or bioinformatics data; locate appropriate literature sources and interpret their findings in relation to other work in their subject area; discuss the project report and be aware of its wider context; produce a well written and presented dissertation that complies with the guidelines for presentation of the project.

**COORDINATOR:** Noel Davies

**TEACHING AND LEARNING METHODS:**

Directed reading, Project supervision, Independent research.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 1200

**ASSESSMENT METHODS:**

Assessment of performance, individual research project.

PLEASE NOTE: Applicants may only apply for this project if they can submit a letter of confirmation from an academic who has agreed to supervise their project.

Your home university will be asked to confirm whether you should be assessed by Assessment Group E1 or E2. E2 is based upon the assumption that the overall grading for your period of study will be determined via your report to your home university.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

**MODULE NAME:** Laboratory, Mathematical and Scientific Skills II

**MODULE CODE:** NT2003

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Academic Year

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

[Maths] Carry out basic matrix manipulations including transpose, determinants and inverse.

[Maths] Manipulate vectors using Dot and Cross Products and the del operator.

[Maths] Solve first and second order ordinary differential equations.

[Maths] Carry out basic algebraic calculations with complex numbers and represent them using exponential and De Moivre's theorem. Find the Fourier Series of a function.

[Skill] Reflect on and articulate motivations, strengths and skills in relation to a future, work-related learning opportunity (e.g. placement, internship, employer-led project).

[Laboratory] Demonstrate advanced analysis techniques on data collected from experiments and present this analysis in an appropriate format in written reports (e.g. graphically, qualitatively, quantitatively)

[Laboratory] Reflect upon and apply core scientific knowledge from other modules within an experimental context

[Laboratory] Detail experimental accounts with sufficient clarity and completeness that the report would enable other experimentalists to reproduce the experiment. Formulate experimental plans for testing models and hypotheses by experimental means

Analyse Python code: predict what a section of Python code computes when executed.

Compare Python code written by different individuals to implement a given task.

Implement a given task in Python code writing in VS Code and Jupyter Notebooks.

Construct Python programs that can be executed by other users.

Handle Python debugging in order to test Python code and correct errors during code development.

Operate Python code for plotting, data analysis and modelling

**COORDINATOR:** Sarah Gretton

**TEACHING AND LEARNING METHODS:**

[Maths] Seminars

[Maths] Coursework: Short answer sets

[Maths] 24 hours open book assessment

[Skills] Workshop sessions: The module will provide explicit guidance on how to relate strengths, transferable skills and motivations to a professional opportunity, how to evaluate results from a psychometric test, and how to produce a tailored application (e.g. tailored CV and cover letter). This will be delivered through a combination of course materials and appropriately contextualised instruction.

[Laboratory] Laboratory Practical sessions

[Laboratory] Coursework: Experimental Summary and Formal Laboratory Reports

Lectures implementing ignite principles

**PRE-REQUISITES:**

**TOTAL MODULE HOURS: 300**

**ASSESSMENT METHODS:**

D01 Application Questions: Submission of short and long answer question set

D02 End of Module Assessment: 24 hour open book assessment

Python computing coursework 25%

Interdisciplinary Laboratories coursework 25%

Personal development portfolio (10%)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

[Maths] Preparation for workshops (including reading, short answer exercise sets )

[Maths] Short Answer exercise sets

[Skills] On-line materials to support completion of Leicester Award Gold qualifying activities. Workshops on exploring career options and application and selection processes

[Laboratory] Multiple Choice Question sets (Pre-Laboratory Questions)

[Laboratory] Preparatory reading for experiment

[Laboratory] Additional analysis required for Experimental Summaries

[Laboratory] Short Answer exercise sets that support data analysis skills

**MODULE NAME:** Introductory Analytical and Physical Chemistry

**MODULE CODE:** NT2007

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Academic Year

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to: Discuss the role of ethics in the pursuit of scientific discovery and be familiar with some of the underlying philosophical principles of science Coursework (Analytical) Describe the different types of analytical problems, the methods that can be used to solve them and the errors associated with each method and how they can be dealt with; use this knowledge to select the best technique to solve specific analytical problems Coursework (Analytical) Know the basic principles of electrochemical, chromatographic and UV/Vis and elemental spectroscopic techniques and discuss and evaluate their application in qualitative and quantitative analyses Coursework (Analytical) Know the principles and underlying chemistry of titrimetric and gravimetric quantitative methods of analysis Coursework (Analytical) Evaluate and interpret the results from qualitative and quantitative analyses and solve problems involving analytical data Coursework (Analytical) Describe and explain the aims and terminology of thermodynamics including the first and second laws, basic thermochemistry, enthalpy and entropy, Gibbs energy, acid-base equilibria, simple statistical mechanics and phase diagrams. Discuss electrochemical processes and how they relate to thermochemistry Coursework, Exam (Physical Chemistry) Describe and explain the properties of ideal and non-ideal gases Coursework, Exam (Physical Chemistry) including the use of virial coefficients, Maxwell distributions and collision rates. Know the basic principles of reaction kinetics and how they can be measured; use these principles to calculate the effect of various parameters on the rates of chemical reactions. Perform qualitative and quantitative analyses of and solve problems involving thermodynamic and kinetic data Apply the principles of core analytical and physical chemistry to interdisciplinary contexts (e.g. the role of thermodynamics and kinetics in metabolic pathways).

**COORDINATOR:** Hanna Kwon

**TEACHING AND LEARNING METHODS:**

Research-based learning, Lectures, example problems, tutorials, marked work, group problem solving classes & VLE directed activities

**PRE-REQUISITES:** -

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Coursework (Analytical) Coursework (Physical Chemistry) Coursework (Interdisciplinary)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for tutorials (including reading, videos), directed reading, set problems, group problem solving exercises, formative quizzes

**MODULE NAME:** Introductory Organic and Inorganic Chemistry

**MODULE CODE:** NT2008

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Academic Year

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to: Recognise functional groups, anticipate their reactivity and interconversions and the reagents required for these transformations Identify and explain the relationships between isomers and conformers of organic molecules. Rationalise and predict reactivity based on curly arrow mechanisms and diagrams; explain how structure and bonding controls the outcome and rate of organic reactions Interpret and discuss the differences between a variety of reaction mechanisms including nucleophilic substitution, elimination reactions, reactions of alkenes, reactions of carbonyls and electrophilic aromatic substitution Predict and interpret spectroscopic data for organic molecules whose structures are known; deduce structures of molecules using spectroscopic and analytical data Calculate oxidation states and d<sup>n</sup> configurations for transition metal complexes and identify the common types of ligand and methods of complex preparation Describe bonding in transition metal complexes using ionic (crystal field theory) and covalent (molecular orbital) models; calculate crystal field stabilisation energies and use these to explain and predict magnetic and spectroscopic properties of transition metal complexes Predict the geometries of complexes, recognising rotational axes, mirror planes and centres of inversion and draw these on diagrams of molecules; use these to assign point groups to molecules and identify the possibility of distortions from ideal geometries and isomerism Describe the inorganic chemistry of a range of main group compounds and discuss the broader applications of descriptive inorganic chemistry Interpret solid state structures in terms of the type of unit cell adopted, the coordination number and coordination geometry of each atom, the radius ratio, and the relevant bonding models for ionic and metallic solids. Apply the principles of core organic and inorganic chemistry to interdisciplinary contexts (e.g. the role of organic chemistry in drug synthesis and the role of solid-state chemistry in rationalising the bulk properties of materials)

**COORDINATOR:** Hanna Kwon

**TEACHING AND LEARNING METHODS:**

Research-based learning, Lectures, example problems, tutorials, marked work, group problem solving classes & VLE directed activities

**PRE-REQUISITES:** -

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Coursework (Organic Chemistry, Inorganic Chemistry) Coursework (Interdisciplinary)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for tutorials (including reading, videos), directed reading, set problems, group problem solving exercises, formative quizzes

**MODULE NAME:** Spectroscopy and Physical Chemistry

**MODULE CODE:** NT3008

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Academic Year

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

"On successful completion of the module, students should be able to:~ Identify and explain at a quantum level the nature of the transitions induced when specific wavelengths of electromagnetic radiation interact with molecules.~ Interpret or predict data (from more than one spectroscopic technique) and hence identify structural or bonding characteristics and/or determine the full structure of molecules.~ Analyse molecular spectroscopic data and conduct calculations relating to the properties of molecules.~ Choose appropriate physical methods to solve chemical identification and characterisation problems.~ Recognise elements of symmetry and use these to determine point groups of molecules; use this analysis to predict vibrational spectra.~ Describe the thermodynamics of solution formation. Distinguish the different ways a species can be transported through a solution. Explain the factors that affect ion migration and diffusion.~ Describe what a colloid is and how gravitational and Brownian motion control colloidal stability. Explain how different techniques are used to determine the size and shape of colloidal particles. Discuss the formation of electric double layer around charged surfaces and describe the interplay between the attractive and repulsive interactions between colloidal particles.~ Know the principles of collision theory and transition state theory. Describe the different methods use in the determination of reaction rates in fast reactions. Discuss the different variety of reactions and their associated mechanisms.~ Describe how the kinetics of chemical reactions are influenced by homogenous and heterogeneous catalysts. Discuss the mechanisms associated with homogenous and heterogeneous catalytic processes. Describe different techniques used to monitor and model catalytic processes. ~ Perform qualitative and quantitative analyses of and solve problems involving the movement of charged and neutral species in solutions and kinetic data.~ Apply relevant chemical approaches and theories to the measurement and description of molecules of interdisciplinary relevance (e.g. the use of spectroscopy in drug design)."

**COORDINATOR:** Hanna Kwon

**TEACHING AND LEARNING METHODS:**

- Research-based learning~ Lectures~ Example problems~ Tutorials~ Marked work~ Group problem solving classes~ VLE directed activities

**PRE-REQUISITES:** "NT2008, NT2009"

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Exam - Spectroscopy Chemistry

Exam - Physical Chemistry

Coursework - Spectroscopy Chemistry

Coursework - Physical Chemistry

Coursework - Interdisciplinary

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

"- Preparation for tutorials (including reading, videos)~ - Directed reading~ - Set problems~ - Group problem solving exercises~ - Formative quizzes"



**MODULE NAME:** Organic and Inorganic Chemistry

**MODULE CODE:** NT3009

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Academic Year

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

"On successful completion of the module, students should be able to:~ Discuss the structure and reactivity of amino acids and the application of this chemistry for the synthesis and structure determination of peptides.~ Represent important conformations of alicyclic systems (especially 6-membered); predict and rationalise their relative stability and their influence on the stereoelectronic requirements of reaction pathways.~ Interpret and discuss the differences between a variety of reaction mechanisms including nucleophilic substitution, elimination reactions, reactions of alkenes, reactions of carbonyls and electrophilic aromatic substitution.~ Discuss and explain the electronic structure of aromatic carbocycles and heterocycles and its effect upon reactivity; use this information to propose effective reaction sequences to synthesise and interconvert aromatic species.~ Rationalise and predict reactivity based on curly arrow mechanisms and diagrams; explain how structure and bonding controls the outcome and selectivity of organic reactions.~ State the methods of preparation, and describe the bonding, relative stability and reactivity of metal-carbonyls, -alkyls, -carbenes, -hydrides; as well as alkene, diene, allyl, cyclopentadienyl and benzene complexes.~ Be able to use spectroscopic (IR, NMR and Mass Spectrometry) microanalytical data and structural methods in the characterisation of organometallic species.~ Apply the concepts of chemical kinetics to inorganic chemistry including making connections between the kinetics of a process and the mechanism of a reaction.~ Appreciate the importance of inorganic chemistry in catalysis and describe the mechanistic steps in a number of industrially important catalytic cycles.~ Apply a range of synthetic approaches in contexts relevant to biology (e.g. drug synthesis) and material science (e.g. the role of transition metal catalysts in the synthesis valuable commodities)."

**COORDINATOR:** Hanna Kwon

**TEACHING AND LEARNING METHODS:**

- Research-based learning~ Lectures~ Example problems~ Tutorials~ Marked work~ Group problem solving classes~ VLE directed activities

**PRE-REQUISITES:** "NT2008, NT2009"

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Exam - Organic Chemistry

Exam - Inorganic Chemistry

Coursework - Organic Chemistry

Coursework - Inorganic Chemistry

Coursework - Interdisciplinary

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

"- Preparation for tutorials (including reading, videos)~ Directed reading~- Set problems~- Group problem solving exercises~- Formative quizzes"

**MODULE NAME:** The Molecules of Life - An Introduction to Biochemistry and Molecular Biology

**MODULE CODE:** BS1030

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain the basic chemical principles that underpin biochemistry
- Describe the structures of biological macromolecules and their components
- Explain the basic mechanisms of DNA replication, transcription and translation
- Discuss concepts of gene expression and control in prokaryotes and eukaryotes
- Discuss the relationship between protein structure and function
- Outline the key metabolic processes in cells and identify important mechanisms of metabolic regulation
- Demonstrate an ability to analyse experimental data
- Use and assess literature to produce written reports
- Reflect on and articulate motivations, strengths and experience of developing one or more transferable skills

**COORDINATOR:** Mark Leyland

**TEACHING AND LEARNING METHODS:**

Lectures, laboratory practical sessions, review sessions and group work, small group tutorials, revision sessions

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Practical report, essay, final assessment, engagement

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation of laboratory reports, completion of pre-lab tests, reading practical books in preparation for laboratory classes, researching and evaluating scientific literature, preparation of formative talks/presentations for small-group tutorials, problem-solving in support of small group tutorials, guided reading to support module material.

**MODULE NAME:** The Cell - An Introduction to Cell Biology and Microbiology

**MODULE CODE:** BS1040

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Discuss and explain the basic structure and function of cells and cellular organelles, membrane transport and cellular homeostasis.
- Discuss and explain some of the diversity of life on earth including some of the similarities and differences in structures and replication between viruses and other subcellular infectious agents, archaea, bacteria, unicellular and multicellular microbial eukaryotes.
- Describe how micro-organisms cause disease, are used in biotechnology and influence geochemical cycles.
- Discuss and explain the principles of systematics and classification, especially as they apply to micro-organisms.
- Demonstrate the use of techniques to study and handle cells and micro-organisms appropriately.
- Demonstrate competency in oral and written communication, numeracy, basic statistical skills, IT skills, problem solving, and group working.
- Demonstrate awareness of the importance of microbiology within economic, ecosystem and health sustainability issues.
- Use relevant sources to inform academic writing and demonstrate academic integrity in their submitted work through appropriate use of academic citation and referencing conventions.

**COORDINATOR:** Catherine Pashley

**TEACHING AND LEARNING METHODS:**

Lectures, tutorials, practical classes, workshops, problem solving classes.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Practical coursework book, essay and end of module assessment.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Reading recommended literature and text books, reviewing lectures, preparing the essay and other written work, revising for the exam. Online tutorials on avoiding plagiarism provided by the School of Biological Sciences and by the University.

**MODULE NAME:** Genomes

**MODULE CODE:** BS2009

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- describe how prokaryotic and eukaryotic genomes are organised
- discuss mechanisms operating to influence this organisation
- explain basic processes of genome maintenance
- analyse experimental data
- perform simple bioinformatic analyses
- propose experimental strategies to study and manipulate genomes

**COORDINATOR:** Celia May

**TEACHING AND LEARNING METHODS:**

Asynchronous lectures; synchronous discussion groups, tutorials and clinics; laboratory and computer practical classes.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical analysis, end-of-module assessment (open book).

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for lectures and reviewing lecture presentations. Reading based on lecture topics. Preparation for tutorials and review of tutorials. Analysing experimental and bioinformatic data and considering experimental design. Preparing Practical Analysis (including experimental and bioinformatic components) for submission. End-of-Module Assessment preparation.

**MODULE NAME: Physiology and Pharmacology**

**MODULE CODE:** BS2013

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe the basic structure of the various classes of cell surface receptors, explain the intracellular signalling pathways regulated by such receptors, provide examples of receptors that possess multiple subtypes for a given hormone or neurotransmitter (agonist).
- Undertake a quantitative analysis of drug-receptor interactions and interpret the information; describe how drugs can modify agonist-receptor interactions and be able to quantify these effects.
- Discuss the mechanisms by which drugs can modify the function of the cardiovascular system to treat disease states such as hypertension.
- Plan experiments and generate data using either a biological sample or a computer-based simulation package in order to address the sites and mechanisms of drug action.
- Handle, graph, manipulate, tabulate and analyse pharmacological data derived from experiments.
- Demonstrate a range of transferable skills including written communication, information technology, numeracy, team working, problem solving, examination technique, information handling.

**COORDINATOR:** Martyn Mahaut-Smith

**TEACHING AND LEARNING METHODS:**

Asynchronous: understanding concepts and analytical/presentation skills

Synchronous: theory and concepts, analysis and presentation of data

Directed reading

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical report, MCQs based on practical tasks and end of module assessment

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for practical, preparation tasks. Practical report preparatory work and report generation. Looking through lecture material before and after lectures, reviewing lecture recordings. Completion of tasks for support sessions and tutorials that assess understanding of lecture material and develop skills related to learning and assessment. Additional reading around subject areas and revision for end of module assessment.

**MODULE NAME:** Physiology of Excitable Cells

**MODULE CODE:** BS2015

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

BS2015 extends material from BS1060. The module

aims to develop the student's understanding of:

1. structure, organization, and function of the nervous system and its components.
2. qualitative and quantitative aspects of membrane excitability, ion channel function, and axonal conduction.
3. Transmission at, and pharmacology of, chemical synapses.
4. qualitative and quantitative aspects of integration at synapses; synaptic plasticity.
5. the physiology of vision to demonstrate how the nervous system adapts or mal-adjusts in response to external factors.

In addition, BS2015 entails use of, and so aims to enhance the student's facility with, transferable skills: numeracy; data-handling/analysis; concise written communication.

**COORDINATOR:** Paul Glynn

**TEACHING AND LEARNING METHODS:**

Taught material will be delivered in a blend of synchronous (face-to-face) and asynchronous (recorded) modes.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

All assessment will be open-book. Memorisation is not required.

There is NO final exam.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Completion of worksheets. Data handling questions, Looking through lecture material before and after lectures, reviewing lecture recordings. Additional reading around subject areas and revision for examination.



**MODULE NAME: Principles of Microbiology**

**MODULE CODE:** BS2030

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain basic techniques for isolation, handling and identification of microbes, and demonstrate an ability to apply microbiology techniques in the laboratory.
- Demonstrate an awareness of microbial diversity and microbial cell structure.
- Evaluate ways in which genetic techniques can be applied to the study of bacteria and applications of these techniques in biotechnology.
- Describe the features of specific microorganisms that are important in infections disease and bioindustry.
- Communicate in writing an awareness of the concepts of microbiology, including the microbiology in health and environmental sustainability.

**COORDINATOR:** Hasan Yesilkaya

**TEACHING AND LEARNING METHODS:**

Lectures, laboratory practicals.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical report and end of module assessment.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Guided reading (text books and research journal articles), reviewing lectures, preparing written work.

**MODULE NAME:** Molecular Cell Biology

**MODULE CODE:** BS2092

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe the principles and outline the steps involved in common cell biology techniques.
- Explain how membrane and secreted proteins are post-translationally processed and targeted to different subcellular and extracellular locations.
- Explain how signalling pathways integrate extracellular signals to allow the regulation of complex cellular processes such as metabolism and cell proliferation.
- Explain the respective roles of microtubules, actin and intermediate filaments in the maintenance of cell architecture and function.
- Describe the processes involved in mitotic cell division and eukaryotic cell cycle control.
- Develop a strategy to address a specific scientific hypothesis and be able to critically analyse the results of such experiments.

**COORDINATOR:** Sue Shackleton

**TEACHING AND LEARNING METHODS:**

Recorded lectures, with associated activity sheets

Weekly review sessions

Practical

Tutorials

Formative multiple choice questions and experimental design test

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical Report (40%)

End of module assessment (60%)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Weekly tasks involving guided further reading from course text book and other materials, watching videos, answering associated questions and carrying out online laboratory simulation exercises.

Preparation of answers to tutorial questions and MCQ tests.

Analysis of data and preparation of practical report.

Formative exam-practice question.

Consolidation of information and revision for end of module assessment.

**MODULE NAME: Evolutionary Genetics**

**MODULE CODE:** BS3000

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Demonstrate an understanding of the process of mutation, drift and the molecular clock in phylogenetics and evolutionary genetic analysis.
- Discuss the methods used for inferring natural selection from molecular and experimental data.
- Discuss the role of gene duplication in evolution.
- Critically evaluate the various evolutionary pressures that gave rise to modern humans.
- Explain the in the genetic basis of body plan evolution.
- Critically evaluate research publications.
- Relate experimental evidence to its interpretation.

**COORDINATOR:** Ed Hollox

**TEACHING AND LEARNING METHODS:**

These topics will be covered in approximately 22 hours of asynchronous teaching material, combined with two 2 hour synchronous computer workshops and 11 hours of timetabled synchronous question and answer sessions.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

A two hour end of module open-book assessment conducted within a 24hr window - 60%. The remaining 40% of the module assessment will be based on a recent research paper in evolutionary genetics. You will produce a graphical abstract of the research paper, which will be formatively assessed (feedback only, not formally marked). You will then be assessed on a 2500 word essay based on the same recent research paper.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

**MODULE NAME: Gene Expression: Molecular Basis and Medical Relevance**

**MODULE CODE:** BS3010

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Acquire a thorough knowledge of the molecular mechanisms of gene expression and its control, in mammals, to enable them to pursue independent study in this area.
- Describe how gene expression can be perturbed and cause disease.
- Explain the role of creative thought and rigorous tests of hypotheses in science.
- Appraise published work and become independent thinkers in the planning and interpretation of experimental approaches to discovering how gene activity is controlled.
- Develop skills in assimilation and appraisal of data, reasoning and communication that will prepare them for more general employment.

**COORDINATOR:** Shaun Cowley

**TEACHING AND LEARNING METHODS:**

Lectures, discussing prepared answers, computer class, extensive guided reading

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Examination (final)

Debate content and performance

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for debates will require group organisation and planning, independent reading of research papers, and preparation of Powerpoint presentations illustrating published data and other key points in support of the case they are making in the debate (and illustrations of weaknesses in the data being presented by their opponents).

**MODULE NAME: Molecular and Cellular Immunology**

**MODULE CODE:** BS3015

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Demonstrate a detailed knowledge of the mammalian immune system, including specific and non-specific immune responses.
- Explain the molecular and cellular approaches used to investigate mechanisms of immunity.
- Demonstrate a capacity for critical analysis of a specialised or topical issue in immunology

**COORDINATOR:** Andrea Cooper

**TEACHING AND LEARNING METHODS:**

Lectures, seminars and tutorials including tutorials on data analysis and interpretation.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Data handling paper (final). Research papers will be provided by contributors and related to a module ILO topic. Task: present selected experiment in the context of the area (attendance of lectures necessary) and analyse results (individually).

News and views article - task: present research paper(s) related to module ILOs succinctly suitable for a broad (non-specialist) reader.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Reading a wide range of literature relevant to the overall content of the module. Practice for assessment: data handling (reading and analysing example papers) and practice for the scientific interview.

**MODULE NAME:** Human Genetics

**MODULE CODE:** BS3031

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Discuss the variety and complexity of the relationships between mutations in or near genes and the manifestation of disease phenotypes.
- Discuss the many ways that research in human genetics can be used.
- Solve problems in genetics and interpret the outcome.
- Critically assess research papers in the field of human genetics to extract essential information.

**COORDINATOR:** Celia May

**TEACHING AND LEARNING METHODS:**

Lectures and seminars. Problem-solving tutorials. Help clinics. Directed learning and self-directed learning

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Problem based assessment

Open book assessment

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Preparation for lectures -
- Reviewing lecture presentations
- Reading references associated with lectures
- Preparation for tutorials
- Reviewing tutorial material and preparing for problem-solving test
- End of module assessment preparation

**MODULE NAME:** Molecular & Cellular Pharmacology

**MODULE CODE:** BS3054

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain how receptors can be regulated by diverse ligands (agonists, antagonists, inverse agonists, allosteric modulators).
- Describe the structures and functions of the major classes of receptor and the key components of their signal transduction and regulatory cascades.
- Describe the different mechanisms of receptor signal transduction and desensitization and their physiological and pharmacological significance.
- Describe, both in general terms and through the use of real examples, how the pharmacological manipulation of different classes of protein (receptors, enzymes) can have specific therapeutic benefits.
- Explain how acute cell signalling events relate to longer-term changes in cell phenotype and cell fate.
- Apply pharmacological principles to analyse and identify potential 'druggable' targets relevant to specific diseases and to understand drug discovery strategies that might be pursued to develop new drugs.
- Utilize appropriate computer software accurately to analyse pharmacological datasets.

**COORDINATOR:** John Challiss

**TEACHING AND LEARNING METHODS:**

Lectures; tutorials; computer-based, supervised work-session; problem-solving exercises; directed reading, computer-based, on-line quizzes.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Quantitative pharmacology workbook

End of module assessment

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Each taught topic will be supported by Reading Lists, which will include recommended text books that can be used to provide basic support, as well as key reviews and original research articles. For some of these materials formative quizzes will be provided on-line so that students are able to test their understanding of key aspects of the recommended reading.



- To gain problem-solving skills in pharmacology the computer-based work-session will provide students with skills necessary to utilize a data-analysis programme such as GraphPad Prism. Students will then be expected to complete a workbook (as an assessment element) in which a number of datasets will require analysis and interpretation.

**MODULE NAME: Molecular & Cellular Neuroscience**

**MODULE CODE:** BS3055

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Summarise the properties of ion channels, receptors and signalling pathways involved in synaptic transmission.
- Explain the spatial and temporal sequence of events and signals that underlie the development of the nervous system.
- Explain dendritic propagation and the mechanisms underlying action potential generation.
- Explain the molecular organisation of a neurone and the role of receptor and signalling proteins in pre and post-synaptic regions.
- Identify the specialized features employed to transmit information between neurons and to understand how neuronal excitability is regulated.
- Analyse data series and interpret neuroscience experimental results.

**COORDINATOR:** Jonathan McDearmid

**TEACHING AND LEARNING METHODS:**

Lectures - providing introductory material and helping to guide independent study.

Tutorials - a combination of data interpretation/problem based learning and critical assessment of current literature.

Essays – an opportunity for students to research, in greater depth, a topic that is likely to be examined.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Essay (1500 words)

Examination (final)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Read a variety of relevant source material including textbooks and scientific articles. Specific reading tasks will be posted as part of the course material and on Blackboard

- Research scientific literature to answer coursework News and Views Tutorial
- Revise module content guided by module activities as well as external sources.
- Complete online activities provided

**MODULE NAME:** Comparative Neurobiology

**MODULE CODE:** BS3064

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Use evidence from different animal groups to demonstrate knowledge and understanding of the principles of operation of sensory-motor integration leading to the generation of behaviour. [Assessed in EoMA]
- Synthesize raw data and published information to demonstrate understanding of energy storage mechanisms involved in insect jumping. [Assessed in practical report and EoMA]

**COORDINATOR:** Tom Matheson

**TEACHING AND LEARNING METHODS:**

- Asynchronous mini-lectures supported by asynchronous pre-lecture and post-lecture material.
- Asynchronous practical exercise supported by asynchronous pre-practical and post-practical material.
- Asynchronous interactive quizzes and self-learning exercises.
- Synchronous online interactive review sessions (face-to-face if possible)
- Synchronous online small group and whole-class tutorials (face-to-face if possible)
- Face-to-face laboratory practical work (if possible)
- Guided study.
- Online Group work.
- Synchronous and asynchronous online Instructor feedback.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical report, end of module open book assessment

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Preparing for the practical by engaging with the supporting material and reading related research papers.

- If face-to-face teaching possible, carrying out laboratory practical to measure power output of locust leg muscle.
- Carrying out in-depth analyses of two large datasets of practical results. Interpreting the data and relating them to the relevant literature.
- Reading primary research literature and textbooks to support the framework provided in the course material.
- Preparing for tutorials by searching for and reading relevant research literature, and writing essay outlines based on this.
- Preparing for tutorials by working online in groups to develop material into a structured essay outline on the allocated topics.
- Peer marking group members' contributions to the tutorial preparation group work.
- Revising lecture notes, online course materials, material from the reading lists and material found independently to prepare for the online final assessment.
- Preparing for revision tutorial.

**MODULE NAME: Microbial Biotechnology**

**MODULE CODE:** BS3068

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

- Understand the commercial processes involved in development of microbial products.
- Describe the central theories and concepts of selected aspects of microbial biotechnology.
- Demonstrate an awareness of the importance of microbial biochemistry to industrial microbiological processes.
- Develop a reflective appreciation of the safety, social and ethical issues surrounding uses of micro-organisms in biotechnology.
- Communicate their knowledge of microbial biotechnology via poster and group presentations.

**COORDINATOR:** Primrose Freestone

**TEACHING AND LEARNING METHODS:**

Lectures, tutorials, mini-conference assessment.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Poster plus abstract

Enterprise assessment

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Guided reading of current research papers, reviewing lectures, preparing poster and abstract, reflecting on field trip, revising for the end of module exam.

**MODULE NAME:** Structural Biology

**MODULE CODE:** BS3070

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Quantitatively and qualitatively evaluate research literature where structural biology techniques have been used
- Discuss the basis, properties and applications of important biophysical techniques.
- Explain the basis and approaches of protein crystallography.
- Explain the basis and approaches of protein nuclear magnetic resonance.
- Explain the basis and approaches of Cryo Electron Microscopy.
- Discuss the scope and contribution of protein bioinformatics as a computational method.

**COORDINATOR:** Peter Moody

**TEACHING AND LEARNING METHODS:**

Pre-recorded video, interactive (F2F) question and answer and review sessions, computer-based workshops

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Examination (end of module assessment)

Literature analysis questionnaire

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Each topic has a reading list given to the students, with the expectation of viewing prior to, or following watching videos. The videos cover sub-topics and are released to students in timed tranches through the semester, they remain available until after the end of module assessment. Guided preparation for technique workshops is provided, and there are self-study exercises provided prior to review sessions.

**MODULE NAME:** Research Project

**MODULE CODE:** BS3902

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 60

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the project, students are expected to be able to:- test a hypothesis by appropriate experimental

or computer-based techniques; conduct experimental procedures and demonstrate good laboratory or bioinformatics practice; analyse and present experimental or bioinformatics data; locate appropriate literature sources and interpret their findings in relation to other work in their subject area; discuss the project report and be aware of its wider context; present the key findings in the form of an oral presentation; produce a well written and presented dissertation that complies with the guidelines for presentation of the project.

**COORDINATOR:** Noel Davies

**TEACHING AND LEARNING METHODS:**

Directed reading, Project supervision, Independent research

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 600

**ASSESSMENT METHODS:**

Assessment of performance.

PLEASE NOTE: Applicants may only apply for this project if they can submit a letter of confirmation from an academic who has agreed to supervise their project.

Your home university will be asked to confirm whether you should be assessed by Assessment Group E1 or E2. E2 is based upon the assumption that the overall grading for your period of study will be determined via your report to your home university.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**



**MODULE NAME: Medical Microbiology**

**MODULE CODE:** MB2020

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

At the completion of the course students are expected to be able to:

- Describe the basic principles of microbiology and microbial diagnostics;
- Know the characteristics of major human pathogens and explain how they adapt to different environments;
- Describe major infectious diseases and name corresponding causative agents;
- Know major antimicrobials used for treatment of infectious diseases and explain how they work;
- Explain major areas of preventive treatment;
- Conduct simple experiments for identification and characterisation of medically important bacteria.
- Demonstrate competency in oral and written communications, information sourcing, handling and referencing, numeracy, data analysis, basic statistical skills, problem solving, and group working.
- Demonstrate awareness of health sustainability.

**COORDINATOR:** Galina Mukamolova

**TEACHING AND LEARNING METHODS:**

Lectures, tutorials, practical classes, workshops, problem solving classes, live weekly clinic sessions.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Practical booklet: 40%
- Two-hour open book on-line assessment within a 24-hour window: 60%

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Reading, reviewing lectures, preparing workbook, presentation and revising for exam.

**MODULE NAME:** Applications of Medical Biochemistry

**MODULE CODE:** MB2050

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Outline selected techniques used in diagnosis and treatment of human disease.
- Give an overview of the process involved in the generation of a pharmaceutical product.
- Discuss molecular aspects of drug design and therapeutic protein production.
- Consider the potential impact of genomics on the diagnosis and treatment of disease.
- Discuss key social and ethical issues related to current development in biomedicine.
- Work as a team to design and produce a video to discuss a specific bioethical issue.
- Critically review the information available on a specific area of biology/medicine and summarise current knowledge in a written report.

**COORDINATOR:** Chris Willmott

**TEACHING AND LEARNING METHODS:**

Online lecture recordings and recommended reading, synchronous tutorials, computer-based sessions (on campus if regulations permit), team-based working, examples of previous student work provided.

**PRE-REQUISITES:** Indicative Activities

Independent research on science and ethics

Reading research articles written by Leicester staff (provided)

Recommended online resources, including recordings made locally using

Reflect lecture capture system and other tools.

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Bioethics Video - 30%
- Graphical Abstract - 30%
- Exam (1.25 hours) - 40%

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Independent research on science and ethics (for video)

- Research on biomedical research conducted at Leicester (provided for graphical abstract), starting with initial provided sources. Recommended online sources regarding video production; other audiovisual resources.
- Recorded lectures made available for review using Reflect lecture capture system.

**MODULE NAME:** Current Issues in Medical Genetics

**MODULE CODE:** MB2051

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the module a typical student should be able to:

- Explain the scientific basis of current controversies in medical genetics.
- Evaluate the arguments on both sides of an ethical topic
- Outline the procedures in place for the establishment of laws and guidelines governing one of the areas listed above.
- Work as part of a team to produce a variety of presentations.

**COORDINATOR:** Christopher Talbot

**TEACHING AND LEARNING METHODS:**

Seminars with mixture of tutor and student led discussions.

Feedback from assessment

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Website: 35%
- Dissertation (5,000 words): 65%

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Preparation for seminars
- Reading references from seminars
- Preparation for ethical matrix
- Team co-ordination and preparation of website
- Researching and writing the dissertation

**MODULE NAME:** Astrophysics, Astrochemistry and Astrobiology

**MODULE CODE:** NT2001

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the module, students should be able to:

- Discuss how the observable parameters of stars are measured; relate this to their formation and evolution along the Main Sequence.
- Describe the formation of the solar system and show how newly discovered planetary systems compare in terms of: system formation; planetary composition/structure; geological processes; stellar-planetary interactions.
- Explain the range of observing techniques that are currently being used to detect planets around other stars, and recall and apply Kepler's Laws to a variety of planetary systems.
- Describe what is currently understood about the chemical conditions under which life began on Earth, the processes that were required in order to produce the first life forms and how early life developed from unicellular to multi-cellular..
- Discuss how all of the above are related to the creation of suitable conditions for life and evolution of life on Earth and extrapolate these principles to exoplanets.
- Apply subject knowledge to address research problem/question.

**COORDINATOR:** Cheryl Hurkett

**TEACHING AND LEARNING METHODS:**

Problem-based learning

Lectures

Workshops

Group work

Tutorials

Coursework: Group and individual

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Coursework: Group and Individual

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for workshops (including reading, videos, online activities)

Short Answer exercise sets

**MODULE NAME:** The Molecules of Life - An Introduction to Biochemistry and Molecular Biology

**MODULE CODE:** NT2004

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the module, students should be able to:

- Explain the basic chemical principles that underpin biochemistry.
- Describe the structures of biological macromolecules and their components.
- Explain the basic mechanisms of DNA replication, transcription and translation.
- Discuss concepts of gene expression and control in prokaryotes and eukaryotes.
- Discuss the relationship between protein structure and function.
- Outline the key metabolic processes in cells and identify important mechanisms of metabolic regulation.
- Demonstrate an ability to analyse experimental data.
- Use scientific literature to produce written reports.
- Determine kinetic parameters of an enzyme catalysed processes in terms of Michaelis Menten theory.
- 

**COORDINATOR:** Sarah Gretton

**TEACHING AND LEARNING METHODS:**

Research-based learning

Lectures,

Laboratory practical sessions,

Review sessions and group work,

Small group tutorials

Revision sessions

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Practical report, essay, end of module assessment, engagement mark.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation of laboratory reports, completion of pre-lab tests, reading practical books in preparation for laboratory classes, researching and evaluating scientific literature, preparation of formative talks/presentations for small-group tutorials, problem-solving in support of small group tutorials, guided reading to support module material, Preparation for tutorials (including reading, videos)



**MODULE NAME:** Mechanics, Electricity and Magnetism

**MODULE CODE:** NT2009

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the module, students should be able to:

Be able to state mathematically the laws of classical dynamics, both linear and rotational.

Understand the definitions and use of concepts such as energy, momentum and angular momentum

Be able to state the properties of linear elasticity (Hooke's law, Young's modulus)

Be able to state the basic properties of fluids including Archimedes' principle and Bernoulli's theorem

Solve relevant problems at an appropriate level using these concepts

Be able to organise appropriate private study time, obtain new information from text books, communicate physics concepts and ideas to your peers and to staff.

State mathematically the laws of electric and magnetic fields and the use of related quantities such as field strength, potential, energy, charge and current.

Solve basic problems in electromagnetism, set out solutions to physics problems correctly and describe experiments and applications in clear, simple prose.

Understand basic circuit theory involving resistors and capacitors and solve basic circuit problems

Apply scientific knowledge from 'Mechanics' and 'Electricity and Magnetism' to provide unique insight, or deeper analysis, of an interdisciplinary topic related to these concepts. For example construct and apply mathematical models to demonstrate how fluid flow equations or electrical field theory can be applied to a range of systems in nature.

Conduct independent research of the literature in order to support such models/discussions

**COORDINATOR:** Cheryl Hurkett

**TEACHING AND LEARNING METHODS:**

Research-based learning

Tutorials

Lectures,

Real-time problem solving classes,

Assessed homework problems,

Discussions with peers and staff members,

Guided independent study

**PRE-REQUISITES:**

**TOTAL MODULE HOURS: 300**

**ASSESSMENT METHODS:**

End of Module Assessment

Coursework (Mechanics and Electricity and Magnetism)

Coursework (Interdisciplinary)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for tutorials (including reading, videos)

Working through the example problems, and practice problems.

Discuss problems and solutions with your peers,

Review other texts on the subject to find alternative strategies to problem solving and alternative descriptions of the material.

**MODULE NAME: Molecular Analysis and Design**

**MODULE CODE:** NT3002

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

"On successful completion of the module, students should be able to:~ Describe the role of enzymes as biological catalysts in terms of enzyme substrate interaction and kinetic models, and describe a range of enzyme inhibition mechanisms. Analyse kinetic data to predict which mechanism applies in a given situation. ~ Determine the structure of biological molecules from evidence collected using a variety of different analytical approaches.~ Recognise the modular nature of signalling proteins, and describe the components of a signalling system.~ Discuss the following principles in electrical and biological signalling pathways: noise; channel capacity; sensitivity and selectivity; optimal coding.~ Design a theoretical biological signalling circuit to sense a particular stimulus and produce a cellular response; discuss the ethical implications of the approach."

**COORDINATOR:** Hanna Kwon

**TEACHING AND LEARNING METHODS:**

- Problem-based learning~ Lectures~ Group work~ Coursework: podcast (group)~ Data analysis examination

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Coursework, departmental examination

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

"Preparation for seminars (including reading, videos, multiple choice questions)"

**MODULE NAME: Molecular Cell Biology and Genomes**

**MODULE CODE:** NT3004

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- describe how prokaryotic and eukaryotic genomes are organised
- discuss mechanisms operating to influence this organisation
- explain basic processes of genome maintenance
- analyse experimental data
- perform simple bioinformatic analyses
- propose experimental strategies to study and manipulate genomes
- Describe the principles and outline the steps involved in common cell biology techniques.
- Explain how membrane and secreted proteins are post-translationally processed and targeted to different subcellular and extracellular locations.
- Explain how signalling pathways integrate extracellular signals to allow the regulation of complex cellular processes such as metabolism and cell proliferation.
- Explain the respective roles of microtubules, actin and intermediate filaments in the maintenance of cell architecture and function.
- Describe the processes involved in mitotic cell division and eukaryotic cell cycle control.
- Develop a strategy to address a specific scientific hypothesis and be able to critically analyse the results of such experiments.

**COORDINATOR:** Sarah Gretton

**TEACHING AND LEARNING METHODS:**

Asynchronous lectures; synchronous discussion groups, tutorials and clinics; laboratory and computer practical classes. Recorded lectures with activity sheets, formative multiple choice questions and experimental design test. Weekly review sessions, practicals, tutorials.

**PRE-REQUISITES:** NT2004, NT2005

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Practical analysis, end-of-module assessments, practical report, coursework (interdisciplinary).

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for lectures and reviewing lecture presentations. Reading based on lecture topics. Preparation for tutorials and review of tutorials. Analysing experimental and bioinformatic data and considering experimental design. Preparing Practical Analysis (including experimental and bioinformatic components) for submission. End-of-Module Assessment preparation.

Weekly tasks involving guided further reading from course text book and other materials, watching videos, answering associated questions and carrying out online laboratory simulation exercises.

Preparation of answers to tutorial questions and MCQ tests. Analysis of data and preparation of practical report.

Formative exam-practice question.

Consolidation of information and revision for end of module assessment.

**MODULE NAME:** Genomes, Global Change and Conservation

**MODULE CODE:** NT3006

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

Describe how prokaryotic and eukaryotic genomes are organised and discuss the mechanisms operating to influence this organisation.

Explain basic processes of genome maintenance.

Analyse experimental data.

Perform simple bioinformatic analyses.

Propose experimental strategies to study and manipulate genomes.

Explain the major threats to global and UK biodiversity, including habit loss, invasive species, overexploitation and climate change.

Explain the legal and administrative basis for biodiversity conservation in the UK and Europe at species and ecosystem level.

Demonstrate, from both fieldwork and a review of the literature, how conservation management can ameliorate the threats to particular, important UK habitats.

Evaluate the management of habitats and ecosystems in terms of the perceived benefits for named species.

Explain the extinction risks faced by small, isolated and unconnected populations.

Make a balanced assessment, based on both fieldwork and the literature, of the conflicts between conservation and competing land issues.

Apply evolutionary/genetic algorithms to demonstrate the evolution is a generic process and applicable to a wide variety of disciplines.

**COORDINATOR:** Moya Burns

**TEACHING AND LEARNING METHODS:**

Asynchronous lectures, synchronous discussion groups, tutorials and clinics, laboratory and computer practical classes. Online lectures (including guest lectures from industry), asynchronous online activities, tutorials and online interactive activities.

**PRE-REQUISITES:** NT2004, NT2006

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Practical analysis, end of module assessments. Field course report, continuous participation assessment, coursework (interdisciplinary)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for lectures and reviewing lecture presentations. Reading based on lecture topics. Preparation for tutorials and review of tutorials. Analysing experimental data and considering experimental design. Preparing practical analysis (including experimental and bioinformatic components) for submission. End of module assessment preparation. Preparation of field course report. Follow up reading on lectures.

**MODULE NAME:** Electromagnetic Fields and Relativity, Quantum Physics and Particles

**MODULE CODE:** NT3010

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 1

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Solve problems involving the electric field and electric displacement, the magnetic field and magnetic intensity, polarisation and magnetisation.
- State mathematically the integral and differential forms of Maxwell's equations.
- Use Maxwell's equations to derive the wave equation for electromagnetic (EM) waves, to solve basic problems in electromagnetism.
- Solve problems involving calculations of electromagnetic energy density and electromagnetic energy propagation.
- Define and derive the boundary conditions for EM waves, and solve problems involving waves at boundaries under a number of geometries.
- State the concepts developed in Einstein's theory of Special Relativity, and apply basic formulae, including the Lorentz transforms, to predict behaviour in physical situations where velocities are high; use the energy-momentum relationship to solve problems involving the collision of relativistic particles ; explain the principles underlying the General Theory of Relativity.
- Describe the wave-like properties of matter at the quantum level; state the time dependent and time-independent Schrodinger equations; be able to solve simple 1-dimensional problems involving infinite and finite wells and barriers, including the calculation of expectation values and probability densities; use the De Broglie relations and Uncertainty principle to estimate physical properties in quantum systems.
- Demonstrate knowledge of the basis concepts of the Standard Model of particle physics, including stating the properties of elementary particles such as leptons and quarks; use the conservation laws to deduce whether a decay or reaction is allowed; be able to explain how quarks combine to form hadrons and mesons; be able to state the properties and use appropriate mathematical descriptions of Fermions and Bosons.
- Apply scientific knowledge from 'Electromagnetic Fields' and 'Relativity, Quantum Physics and Particles' to provide unique insight, or deeper analysis, of an interdisciplinary topic related to these concepts. For example construct mathematical models to demonstrate how electrical field theory or quantum mechanics can be applied to a range of systems in nature.
- Conduct independent research of the literature in order to support such models/discussions.
- Organise appropriate private study time, obtain supplementary information from text books to consolidate your understanding, and communicate the physical principles underlying Maxwell's equations and electromagnetic waves to your peers and to staff.

**COORDINATOR:** Cheryl Hurkett



**TEACHING AND LEARNING METHODS:**

In this course you will benefit from lectures, real-time problem solving classes, assessed homework problems, discussions with peers and staff members, guided independent study.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

End of module assessment

Coursework (Electromagnetic Fields and Relativity, Quantum Physics and Particles)

Coursework (Interdisciplinary)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

You will work through the course text, including working through the example problems, and practice problems. You will discuss problems and solutions with your peers, and review other texts on the subject to find alternative strategies to problem solving and alternative descriptions of the material. As part of the revision you should work through the past papers provide on blackboard and make reference to your course handouts and the numerical answers provided to ensure you have mastered the subject.

**MODULE NAME:** From Individuals to Populations - An Introduction to Genetics

**MODULE CODE:** BS1050

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain how chromosomes are inherited through mitosis and meiosis and how genetic variation is generated.
- Perform elementary genetic analyses.
- Perform elementary statistical analyses.
- Recognise genetic diseases and genetically influenced disorders and appropriate methods of screening.
- Explain genetic variation and methods to measure it.
- Explain what factors influence global patterns of genetic diversity.
- Describe basic elements of molecular evolution of genes and genomes
- Define DNA sequencing technologies and their use in modern genetics
- Demonstrate competence in data analysis

**COORDINATOR:** Ezio Rosato

**TEACHING AND LEARNING METHODS:**

A combination of synchronous and asynchronous delivery methods including slides presentations, exploration of specific topics, general summaries, tutor-led review sessions, problem solving and experimental analyses.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Coursework assessment and examination. Students earn engagement marks (10%) by submitting 5 out of 6 formative assessments (or 80% of the due number if they have mitigating circumstances).

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparing for and revising all synchronous and asynchronous material delivered through the module. Consulting textbooks to improve and widen understanding. Preparing for and producing coursework. Preparing for the final examination.

**MODULE NAME: Multicellular Organisation - An Introduction to Physiology, Pharmacology and Neuroscience**

**MODULE CODE:** BS1060

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe general aspects of the organisation, function and operating principles of the main physiological systems in the human body.
- Apply basic concepts of pharmacology to classes of cell surface receptors for neurotransmitter, hormones and local mediators.
- Describe the properties of cell surface receptors, their functions and relevant signalling pathways.
- Explain how individual physiological systems work together to achieve whole body homeostasis.
- Demonstrate understanding of human physiological measurements
- Handle, manipulate, display and statistically analyse physiological data.

**COORDINATOR:** Volko Straub

**TEACHING AND LEARNING METHODS:**

Lectures, practical classes, tutorials

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Tests x2, report and engagement

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Read a variety of relevant source material including textbooks and scientific articles. Specific reading tasks will be posted during the lectures and on Blackboard.
- Prepare report including data handling.
- Revise module content guided by lecture material and module workbook as well as external sources.
- Prepare and revise material covered in group work sessions (listed as tutorials).
- Prepare for practical sessions assisted by practical handbooks.
- Complete formative online tests to check understanding of material and prepare for summative online tests and exams.

**MODULE NAME:** Biodiversity and Behaviour - An Introduction to Zoology

**MODULE CODE:** BS1070

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe and discuss:

- Phylogeny and the tree of life
- Basic animal and plant development
- Animal and plant origins and diversity
- Biodiversity/ecology and its importance
- Animal behavioral/physiological adaptations
- Use appropriate statistical analysis software to analyse data
- Use appropriate skills and software to assess and present research

**COORDINATOR:** Sinead Drea

**TEACHING AND LEARNING METHODS:**

A combination of synchronous and asynchronous delivery methods including slides presentations, exploration of specific topics, general summaries, tutor-led sessions, statistical/data analyses.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Coursework assessment, engagement and end of module assessment.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparing for and revising all synchronous and asynchronous material delivered through the module. Consulting textbooks/papers. Preparing for and producing coursework. Preparing for the final end of module assessment.

**MODULE NAME:** Contemporary Techniques in Biological Data Analysis

**MODULE CODE:** BS2004

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

Understand various classical tests as examples of linear models - assessed by open book analyses

Understand the basic logic and set up of GLMs - assessed by open book analyses

Design a statistically robust experiment - assessed by open book analyses and MCQs

Explain how various complications (eg interactions) are implemented in GLMs - assessed by open book analyses

Choose the correct statistical model, ie model selection - assessed by open book analyses

Implement practical aspects of the above in the statistical programming language R - assessed by MCQs

**COORDINATOR:** Eamonn Mallon

**TEACHING AND LEARNING METHODS:**

Lectures and workshops

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Per sessions MCQ's and open book analyses

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Background reading, practice datasets, answering MCQs

**MODULE NAME:** Exercise Physiology and Pharmacology

**MODULE CODE:** BS2014

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain the structure and function of the neuromuscular junction.
- Explain the different elements of the musculoskeletal system and skeletal muscle contraction.
- Integrate and explain the control mechanisms responsible for regulating the musculoskeletal, cardiovascular and respiratory systems through a consideration of the acute and chronic effects of, for example, aerobic exercise at the metabolic, cellular and systems levels.
- Describe the limitations to exercise and selected relationships between exercise, health and disease.
- Explain the use and abuse of drugs in performance sport, including cellular and systems effects.
- Demonstrate the ability to handle, manipulate, display and statistically analyze physiological data.
- Use a range of transferable skills including written communication, information technology, numeracy, team working, problem solving, examination technique, information handling.

**COORDINATOR:** John Mitcheson

**TEACHING AND LEARNING METHODS:**

Asynchronous presentations with associated work activities. Synchronous summary and/or Q&A sessions at the end of each lecture topic. Tutorials with problem solving worksheets. Circumstances permitting - a laboratory based practical class. Data handling worksessions. Directed reading

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 152

**ASSESSMENT METHODS:**

Practical report and supporting work, aend of module assessment, and engagement. Engagement will be assessed by attendance (and participation) at tutorials and completion of tutorial worksheets. Marks will be recorded by tutors.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for practical class. Completion of worksheets for tutorials. Practical report preparatory work and report generation. Reviewing asynchronous presentations and completion of associated learning activities. Additional reading around subject areas and revision for examination.

**MODULE NAME:** Genes, Development and Inheritance

**MODULE CODE:** BS2026

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain the use of genetics to dissect gene regulation and function during development in vertebrates and plants.
- Interpret patterns of inheritance and understand the mechanisms underlying those inheritance patterns.
- Relate disruptions in the genome to expression of diseases and phenotypes.
- Understand the core concepts of population genetics and the contrast between quantitative traits and Mendelian traits.
- Frame a hypothesis and use open sources to gather and critically assess scientific data and test the hypothesis.
- Critically analyse and interpret experimental data.

**COORDINATOR:** Ed Hollox

**TEACHING AND LEARNING METHODS:**

Asynchronous teaching material; asynchronous data gathering and analysis, synchronous discussion groups, problem-solving tutorials; laboratory class, synchronous experimental analysis and design sessions.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical Portfolio, End of Module Assessment (Open Book)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Watching and understanding teaching material. Reading based on lecture topics. Preparation for problem-solving tutorials and follow-up of provided solutions. Data gathering from open source information, and statistical analysis. Preparing for experimental classes. Preparation for the end-of-module assessment.

**MODULE NAME:** Immunology and Eukaryotic Microbiology

**MODULE CODE:** BS2032

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe the major features of eukaryotic microbiology and immunology.
- Perform microbiological and immunological procedures.
- Present and interpret laboratory results.
- Demonstrate competence in acquiring information from the scientific literature and use of basic bioinformatics tools.
- Be able to work effectively in small groups.
- Demonstrate effective time management.
- Demonstrate awareness of health sustainability.

**COORDINATOR:** Andrea Cooper

**TEACHING AND LEARNING METHODS:**

Lectures

Laboratory practical classes

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Workbook: 40%
- Exam: 60%

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Reading a wide range of literature relevant to the content of the module, including current news, textbooks and scientific articles. Reviewing lectures, revising for assessment.



**MODULE NAME:** Immunology and Eukaryotic Microbiology (with Science Enterprise Trip)

**MODULE CODE:** BS2033

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe the major features of eukaryotic microbiology and immunology.
- Perform microbiological and immunological procedures.
- Present and interpret laboratory results.
- Demonstrate competence in acquiring information from the scientific literature and using basic bioinformatics tools.
- Be able to work effectively in small groups.
- Demonstrate effective time management.
- Demonstrate awareness of health sustainability.
- Demonstrate detailed knowledge of the mission and governance of selected public and private enterprise life science establishments, and awareness of current and future trends in selected sectors of life science industry.

**COORDINATOR:** Andrea Cooper

**TEACHING AND LEARNING METHODS:**

Lectures

Laboratory practical classes

Compulsory science and enterprise trip

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Workbook: 40%

End of module assessment: 60%

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Reading a wide range of literature relevant to the content of the module, including current news, textbooks and scientific articles. Reviewing lectures, completing workbook, revising for assessment.

**MODULE NAME:** Bioinformatics

**MODULE CODE:** BS2040

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

Use computer systems to access bioinformatic databases.

Explain the use of computers in analysing genomic data.

Describe how protein structures are determined and modelled.

Compare DNA and protein sequences to analyse gene structure and function.

Demonstrate competency in accessing information, organising references and writing and producing practical reports

**COORDINATOR:** Richard Badge

**TEACHING AND LEARNING METHODS:**

Video Presentations; Computer Practical Classes; Tutorials with group-work tasks and discussion; Formative online quizzes and computer practical report; Directed Study; Guided Independent Study.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical Reports; Open-Book End-of-Module Assessment

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Students will be directed to essential reading (textbooks; selected journal articles) and recommended reading (journal articles, books, webpages) to complement the video presentations and assist preparation for End-of-Module Assessment and Computer Practical reports. Preparation for computer practical, execution of practice computational analyses. Planning, drafting and preparation of Computer Practical reports. Problem solving in support of small-group tutorials. Formative online quizzes. Revising for End-of-Module Assessment.

Details of indicative activities subject to modification as required.

**MODULE NAME:** Behavioural Neurobiology

**MODULE CODE:** BS2066

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain and critically discuss the main topics with reference to appropriate source material, including primary research papers.
- Plan and carry out quantitative analyses of behaviour on existing video recordings, analyse and interpret the quantitative data, critically review the experimental paradigm, and write up as a formal report .
- Discuss the results of experiments in the context of the related research literature.
- Use a computer modelling environment to design and carry out tests of neural network function.
- Analyse the patterns of connectivity in a model neural network to explain its functional organisation.

**COORDINATOR:** Tom Matheson

**TEACHING AND LEARNING METHODS:**

- Asynchronous mini-lectures supported by asynchronous pre-lecture and post-lecture material.
- Asynchronous practical exercise supported by asynchronous pre-practical and post-practical material. The practical integrates critique of experimental design with training in quantification of behaviour and generic data analysis skills using existing research data as an example.
- Asynchronous interactive quizzes and self-learning exercises.
- Synchronous online interactive review sessions (face-to-face if possible)
- Synchronous online whole-class tutorials (face-to-face if possible)
- Online group work.
- Synchronous and asynchronous online Instructor feedback.
- Guided independent study.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Practical Report: 30%
- End of Module Assessment: 65%
- Engagement (participation in tutorial-associated activities): 5%

### **GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Reading textbooks and primary research papers from the reading list and found independently to support the framework set out in the course material.
- Preparing for the practical by engaging with the supporting material and reading related research papers.
- Analysing provided video recordings to generate quantitative behavioural data. Interpreting the data in light of the experimental design, and relating them to the relevant literature.
- Preparing for tutorials by engaging with relevant online material in advance, reading relevant literature, and preparing for group work.
- Developing knowledge and preparing for the final online assessment exam by: revising lecture notes, online learning resources, feedback materials (from tutorials and the practical reports), and material from the reading list as well as independently found sources.

**MODULE NAME: Neurobiology and Animal Behaviour**

**MODULE CODE:** BS2077

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Explain the principles of neuronal signalling that underpin the control of behaviour.
- Discuss different types of sensory processing that enable animals to sense their environment.
- Explain how experience shapes development of neural circuits within the brain.
- Discuss the role of genes and environment in shaping adaptive behaviour.
- Formulate and test specific hypotheses in behavioural ecology.
- Explain how individual economics and competition shape behaviour.
- Evaluate theories explaining parental care, family conflict and the evolution of altruistic and cooperative behaviours.
- Analyse and interpret quantitative experiments investigating different aspects of animal behaviour.
- Discuss the results of experiments in the context of the related research literature.

**COORDINATOR:** Swidbert Ott

**TEACHING AND LEARNING METHODS:**

- Asynchronous mini-lectures supported by asynchronous pre-lecture and post-lecture material.
- Asynchronous practical exercise supported by asynchronous pre-practical and post-practical material. The practical integrates critique of experimental design with training in quantification of behaviour and generic data analysis skills using existing research data as an example.
- Asynchronous interactive quizzes and self-learning exercises.
- Synchronous online interactive review sessions (face-to-face if possible)
- Synchronous online whole-class tutorials (face-to-face if possible)
- Online group work.
- Synchronous and asynchronous online Instructor feedback.
- Guided independent study.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Practical Report: 30%
- End of Module Assessment: 65%
- Engagement (participation in tutorial-associated activities): 5%

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Reading textbooks and primary research papers from the reading list and beyond to support the framework set out in the course material.
- Preparing for practicals and tutorials by engaging with the supporting material, reading relevant research papers and preparing for group work.
- Analysing provided video recordings to generate quantitative behavioural data. Interpreting the data in light of the experimental design, and relating them to the relevant literature.
- Developing knowledge and preparing for the final online assessment by: revising lecture notes, online learning resources, feedback materials (from tutorials and the practical report), and material from the reading list as well as independently found sources.

**MODULE NAME: From Genes to Proteins**

**MODULE CODE:** BS2091

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe how information encoded in DNA is transcribed into RNA and how primary transcripts are processed to achieve their final, functional form.
- Demonstrate the principles of the genetic code and translation of genetic information from messenger RNA into protein.
- Carry out and interpret simple experiments illustrating aspects of the above.
- Explain the principles underpinning the regulation of gene expression in prokaryotes and eukaryotes.
- Describe molecular mechanisms of DNA manipulation by specified enzyme(s).
- Develop transferable skills in writing and data analysis.

**COORDINATOR:** Olga Makarova

**TEACHING AND LEARNING METHODS:**

Lectures, interactive sessions, practicals, computer-based sessions, revision sessions

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- End of Module assessment: 60% (4 hours timed online assessment)
- Practical Report: 40%

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Guided reading, recommended audiovisual materials.

Lectures made available for review using Reflect.

Preparation for synchronous sessions.

Research for long-format writing task.

**MODULE NAME:** Protein Control in Cellular Regulation

**MODULE CODE:** BS2093

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Discuss the properties of enzymes and describe the different ways protein activity is regulated.
- Discuss the molecular properties of proteins involved in energy transduction.
- Explain the integration and regulation of metabolism.
- Demonstrate the ability to analyse the molecular features of proteins.
- Analyse experimental data to solve problems.

**COORDINATOR:** Mark Leyland

**TEACHING AND LEARNING METHODS:**

Lectures, interactive tutorials, practicals, computer-based sessions, revision sessions.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Computer modelling practical: 10%
- Presentation: 30%
- Exam: 60% - 2 hours

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Guided reading on key aspects of the module, preparation for laboratory practicals, analysis of data generated from laboratory practical, problem-solving in interactive tutorials, completion of online tests for formative assessment, reading of scientific literature to develop presentations, preparation of slides for presentations.



**MODULE NAME:** Cancer Cell and Molecular Biology

**MODULE CODE:** BS3003

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe the main features which distinguish malignant cells from normal cells, the mechanisms which regulate their proliferation and survival, and how this information can be used to design new therapies
- Integrate information from diverse sources to understand the origins of cancer and the processes involved on the progression into a full malignancy.
- Conduct a literature research project and write a critical appraisal of the subject, summarising the most important facts.

**COORDINATOR:** Salvador Macip

**TEACHING AND LEARNING METHODS:**

There will be 4 small group synchronous sessions (60-minute tutorials) spread over the length of the course. A work sheet outlining the aims and objectives of each session will be available on Blackboard prior to the tutorials and some preparation work will be needed. Tutorials are not marked, but attendance and participation are compulsory and will be monitored. The tutorials will be related to the contents of the lectures and the module assessments.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

BS3003 has no exam. There will be three forms of assessment: an infographic (38%), a 5000-word essay (56%) and three multiple choice question computer tests (MCQ). These MCQs tests will help guide the students through the curriculum. They will be spread over the weeks of the module and related to the topics delivered in the previous weeks.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Each topic has a list of essential papers which guides the students to extra reading. Preparation for tutorials is based on a list of questions that the students have to research and answer ahead of the session, thus guiding them through the acquisition of basic knowledge to reinforce what is taught in lectures. Information on how to write an essay is given to students in documents and in tutorial discussions, in order to guide them through the acquisition of the skills needed to complete the appropriate ILOs.

**MODULE NAME:** Microbial Pathogenesis and Genomics

**MODULE CODE:** BS3011

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Present in detail and explain the genetic mechanisms underlying selected processes in bacteria.
- Demonstrate knowledge of the molecular and genetic basis of strategies employed by microorganisms to invade host tissue, avoid host defence mechanisms and proliferate at sites of infection.
- analyse and interpret data and information from primary literature sources, and organise and communicate it in writing.

demonstrate, in writing, a capacity for critical analysis of a specialised or topical issue in microbiology.

- Design a research activity to determine the contributions of a virulence factor or other mechanism to an infectious disease.

Demonstrate use of bioinformatics tools to analyse and understand microbial virulence traits.

**COORDINATOR:** Christopher Bayliss

**TEACHING AND LEARNING METHODS:**

Lectures, tutorials, problem solving classes, formative assessment, attending Departmental and College external seminars to enhance understanding of the impact of scientific research and to increase scientific knowledge related to the module.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Online data analysis and bioinformatics test.

Written reports on experimental design and analysis.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Reading research literature, reviewing lectures, reviewing and understanding lecture material, analysing data and information for tutorials and seminars, preparing coursework.

**MODULE NAME: Human and Environmental Microbiomics**

**MODULE CODE:** BS3013

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Discuss how microbes play essential roles in planetary and human health and sustainability.
- Discuss how our understanding of microbiology has been transformed over the last decade by advances in sequencing technology, which has facilitated a deep understanding in microbial diversity and evolution and physiology both from whole genome and metagenome approaches.
- Identify the key roles played by microbes in human health and in the wider environment including aquatic and terrestrial environments.
- Demonstrate in the context of the above areas of environmental microbiology, experience of accessing information from the scientific literature in electronic and written form, and its organisation through oral presentation.
- Understand the roles viruses have in shaping microbial communities in both human and environmental microbiomes.

**COORDINATOR:** Martha Clokie

**TEACHING AND LEARNING METHODS:**

Lectures, seminars

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Presentation

End of module assessment (final)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Guided reading (research journal articles), reviewing lectures, preparing written work, revising for exam.

**MODULE NAME:** Neuroscience Futures

**MODULE CODE:** BS3016

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

Interrogate the primary neuroscience literature in current research areas and to develop critical understanding led by relevant academic staff.

Using specific examples, describe and explain recent advances in neuroscience with special reference to new and developing methodologies.

Read, analyse, and interpret data from the neuroscience literature.

Communicate complex ideas and research findings using a variety of appropriate media.

Integrate relevant information and critique research in the context of an appropriate neuroscience field.

**COORDINATOR:** Will Norton

**TEACHING AND LEARNING METHODS:**

We will use a blend of pre-recorded introductory lectures and face-to-face research seminars with journal clubs in which there will be oral discussion with questions and answers (as in tutorials); students will be given directed reading and study support sessions.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Journal Club Presentation (1500 words)

Examination (final)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

For each conference the students will read one research paper which will be discussed in the Journal Club. Their assessment (JCI) will take the form of an introduction to the research area of one Conference: the students will each collate a Virtual Journal of 5 research articles (provided by the lecturers) and write a 1500 word introduction, explaining the contribution of these articles to research in that Conference topic.

Activities include looking at lecture and seminar materials before and after each session. Conducting additional reading around subject areas, reading each research article in preparation for the Journal Club.

These will be preparation for their written journal critique (TE) and the DAQ assessments that will form the basis of the EoMA. Reviewing lecture recordings, and additional materials online.

**MODULE NAME:** Physiology, Pharmacology and Behaviour

**MODULE CODE:** BS3033

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Interpret the hierarchical and parallel processing of visual information by the brain and be able to relate this to the process of image extraction.
- Correlate the roles of the different brain structures involved in voluntary movement and be able to reconstruct, in overview, their interactions during movement generation.
- Evaluate the role of a variety of brain mechanisms in generating feeding behaviour and pursuit of other rewards.
- Describe some of the different approaches to investigating CNS function and compare their relative advantages and disadvantages.
- Relate the role of integration within the CNS with particular reference to sensori-motor integration, higher functions such as learning, memory and attention and to higher disorders of the CNS such as schizophrenia.
- Work individually and in groups, be able to discuss orally, or present in writing a critical analysis of a theory of some aspects of brain function based on the use of recent research reports.

**COORDINATOR:** Frank Proudlock

**TEACHING AND LEARNING METHODS:**

Lectures; critical analysis with peers of mainstream science documentary; practical classes, discussion, and preparation; directed reading

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Group presentation

Essay (2000 words)

End of module assessment (final)

Engagement

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Read a variety of relevant source material including textbooks and scientific articles. Specific reading tasks will be posted as part of the course material and on Blackboard.

- Research scientific literature to answer coursework essay.
- Research scientific literature relevant to group presentation.
- Revise module content guided by module activities as well as external sources.
- Prepare for practical sessions assisted by module activities.
- Complete formative online engagement activities.

**MODULE NAME:** Cellular Physiology of the Cardiovascular System

**MODULE CODE:** BS3056

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

Describe the cardiovascular system and the general control mechanisms involved in regulating the cardiovascular system including the exchange of solutes between blood and tissue.

Explain the mechanisms of ion transport at the cell membrane and understand how ion channel structure relates to function. Discuss the molecular processes involved in regulating ion channels and contractile proteins within the cardiovascular system. Describe the cellular mechanisms leading to the generation and regulation of the cardiac action potential.

Explain the mechanisms that lead to contraction of both cardiac and smooth muscle and how these processes are controlled by the regulation of intracellular  $\text{Ca}^{2+}$ .

Discuss disorders of cardiac rhythm and appreciate the consequences of impaired blood supply (ischaemia).

Discuss the mechanisms and importance of receptor-operated  $\text{Ca}^{2+}$  increases in blood cells such as platelets and Lymphocytes.

Critique scientific information from a range of sources including the interpretation of data. Communicate biological information by writing and by means of tables, diagrams, drawings and graphs.

**COORDINATOR:** Noel Davies

**TEACHING AND LEARNING METHODS:**

Asynchronous: presentations and associated material

Synchronous: presentation support, computer simulation work-sessions, tutorials with problem solving worksheets.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Combines essay with computer generated data

End of module assessment

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Sourcing, reading and interpreting literature relevant to the combined essay.



Analysing, interpreting and presenting data obtained from running the ionic current simulation programme.

Interpreting the literature sources and simulated data to write the combined essay.

Preparing for the tutorials using pre-circulated tutorial questions.

Reviewing presentation topics and reading literature relevant to these topics to gain further insight into the module content.

Participate in a formative data-handling exercise aimed at improving understanding of key concepts.

**MODULE NAME:** Conservation and Ecological Genetics

**MODULE CODE:** BS3073

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Describe the various types of molecular marker and their properties
- With a knowledge of underlying theory, describe and explain how molecular markers can be used to understand aspects of behaviour, ecology and evolution
- Apply their knowledge of molecular markers to conservation and environmental issues.

**COORDINATOR:** Robert Hammond

**TEACHING AND LEARNING METHODS:**

Lectures/online lectures, Tutorials/online tutorials (discussions of primary research papers), analysis workshops, drop-in help sessions, formative quizzes/tests, guided reading, independent reading.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Practical report (written as research paper)

End of module assessment (24 hour completion window)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Directed reading, with particular emphasis on the primary literature

**MODULE NAME:** Research Project

**MODULE CODE:** BS3902

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 60

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the project, students are expected to be able to:- test a hypothesis by appropriate experimental

or computer-based techniques; conduct experimental procedures and demonstrate good laboratory or bioinformatics practice; analyse and present experimental or bioinformatics data; locate appropriate literature sources and interpret their findings in relation to other work in their subject area; discuss the project report and be aware of its wider context; present the key findings in the form of an oral presentation; produce a well written and presented dissertation that complies with the guidelines for presentation of the project.

**COORDINATOR:** Noel Davies

**TEACHING AND LEARNING METHODS:**

Directed reading, Project supervision, Independent research

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 600

**ASSESSMENT METHODS:**

Assessment of performance.

PLEASE NOTE: Applicants may only apply for this project if they can submit a letter of confirmation from an academic who has agreed to supervise their project.

Your home university will be asked to confirm whether you should be assessed by Assessment Group E1 or E2. E2 is based upon the assumption that the overall grading for your period of study will be determined via your report to your home university.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

**MODULE NAME:** Introduction to Medical Bioscience

**MODULE CODE:** MB1080

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On completion of the module, students should be able to:

- Describe the molecular basis of atherosclerosis
- Discuss the importance of genomics to cancer diagnosis and prognosis
- Describe the role of the microbiome in disease
- Demonstrate awareness of the key features of an accessible written explanation of a recent scientific development
- Carry out basic numerical manipulations of scientific measurements, and critically analyse experimental data
- Prepare effective visual aids (e.g. PowerPoint slides), accompanied by narration

**COORDINATOR:** Chris Willmott

**TEACHING AND LEARNING METHODS:**

Asynchronous lecture recordings, demonstration of calculations, synchronous lectures, synchronous tutorials

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

- Lay explanation of scientific issue: 30%
- Narrated PowerPoint presentation: 30%
- Data-handling and Scientific Report: 40% (consisting of 3x online tests on statistical understanding at 5% each and 1x written report at 25%)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Recommended reading (for essay).

Independent research (for oral presentation).

Practice activities (for data handling task).

Additional reading and recommended audiovisual resources (viewing list).

**MODULE NAME:** Pathophysiology of Disease

**MODULE CODE:** MB2080

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Discuss the underlying physiological and biochemical mechanisms and disease-induced changes associated with a range of human conditions
- Outline the symptoms, prevalence, morbidity, mortality, and risk factors associated with the range of human disease states covered.
- Make effective use of electronic sources of information, including the PUBMED and OMIM databases and disease specific web sites, to find out detailed information about the physiology, aetiology and epidemiology of a particular disease.
- Critically evaluate the use of laboratory data in the identification, aetiology and pathogenesis of selected diseases processes.

**COORDINATOR:** Jonathon Willets

**TEACHING AND LEARNING METHODS:**

Lectures, tutorials with problem-solving worksheets, laboratory practical class, work session, directed reading, study support session(s).

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Coursework essay, computer-based multiple choice test and examination (final).

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Read a variety of relevant source material including textbooks and scientific articles. Specific reading tasks will be posted as part of the course material and on Blackboard.

Complete the work session to become proficient in the use of online literature resources and thus effectively find background material to support writing of course work early.

Revise module content guided by module activities as well as external sources

Prepare and revise material covered in tutorials

Prepare for practical sessions assisted by module activities.

**MODULE NAME:** Biochemical Mechanisms of Human Disease

**MODULE CODE:** MB3001

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Appraise the pathophysiology and current mechanistic theories underpinning a range of human diseases.
- Discuss the methodologies and model systems used for studying these diseases.
- Evaluate potential therapeutic strategies for treatment of disease.
- Critically evaluate data from scientific papers and apply the principles of experimental design.

**COORDINATOR:** Sue Shackleton

**TEACHING AND LEARNING METHODS:**

Lectures, Tutorials, Guided reading, Independent research.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Examination (final)

Coursework – data analysis

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Guided reading associated with lectures

Directed critical analysis of recent scientific paper(s) on topic associated with the lectures

**MODULE NAME:** Advanced Topics in Medical Microbiology

**MODULE CODE:** MB3020

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Critically assess current views on the molecular mechanisms underlying bacterial virulence, drawing on evidence from the studies of host-pathogen interactions, immune responses, and lessons from history.
- Describe the key virulence factors and systems of major bacterial pathogens, and mechanisms of their acquisition and exchange.
- Define host responses to bacterial infections and approaches used to diagnose bacterial infections and to create effective vaccines; to demonstrate awareness how these approaches contribute to sustainable health care.
- Have gained, in the context of the above areas of microbiology, experience of accessing information from the scientific literature in electronic and written form, to be able to perform analysis of a hypothetical clinical case and to provide an overview of microbial pathogenicity through an oral presentation.

**COORDINATOR:** Edouard Galyov

**TEACHING AND LEARNING METHODS:**

Lectures, seminars, tutorials, directed reading

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Case presentation

Examination (final)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Reading recent research papers and review articles; assessing relevant on line education materials, self-testing, reviewing lectures, preparing clinical case presentation seminar, revising for examination.

**MODULE NAME:** Medical Genetics

**MODULE CODE:** MB3050

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Assess how genetics has impacted upon the practice of medicine
- Outline the problems and advances in using genetics to understand complex diseases
- Demonstrate a knowledge of the contribution of genetics to the study of various diseases, eg neurological, cardiovascular and cancer.
- Appraise a current research paper and give an oral presentation on it.

**COORDINATOR:** Christopher Talbot

**TEACHING AND LEARNING METHODS:**

Lectures, Tutorials, Seminars, Tutor and peer-reviewed presentations, essay and feedback, pre-exam clinic, exam

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

End of Module Assessment (open book)

Presentation

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for lectures

Reviewing lecture presentations

Reading references from lectures

Researching, preparing and practicing the presentation



**MODULE NAME:** Current and Future Therapeutics

**MODULE CODE:** MB3057

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Appraise the underlying pathophysiology of a range of human diseases.
- Appraise current treatment strategies for a range of human diseases, showing a knowledge of inadequacies and unmet clinical need.
- Using specific examples, appraise current research aims, models and methods designed to facilitate the understanding, diagnosis or treatment of disease.
- Use a range of transferable skills that may include written communication, information technology, numeracy, team working, problem solving, information handling.

**COORDINATOR:** Gary Willars

**TEACHING AND LEARNING METHODS:**

Lectures, tutorials, directed reading

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Data handling, analysis and interpretation

News and Views article

Essay (1500 words)

Engagement

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Working through provided material and directed tasks before and after lectures. Gathering of information to extend knowledge

beyond the provided and directed reading. Revision and work towards in-course assessments.

**MODULE NAME:** Evolution

**MODULE CODE:** NT2002

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Discuss how variation arises in evolution and provide examples of its significance.
- Discuss the following concepts: Hardy-Weinberg law, genetic drift, Wright-Fisher model, gene flow, speciation, natural selection.
- Describe how molecular changes in these developmental genes underpins evo-devo (evolution of development) at the levels of macro- and microevolution.
- Apply mathematical approaches to interpret Evolution and Ecology.
- Describe and critically appraise the different theories of hominid evolution.
- Evaluate DNA evidence to interpret hominid evolution

**COORDINATOR:** Sarah Gretton

**TEACHING AND LEARNING METHODS:**

Problem-based learning

Lectures

Group work

Tutorials

Coursework:

Short Answer exercise sets

Podcast (Group)

Report (Group)

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

Coursework: Short Answer exercise sets, Report

(Group) Podcast (Group)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for seminars (including reading, videos, multiple choice questions)

Short Answer exercise sets

**MODULE NAME:** Physiology, Pharmacology and Neuroscience

**MODULE CODE:** NT2005

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

Describe general aspects of the organisation, function and operating principles of the main physiological systems in the human body.

Apply basic concepts of pharmacology to classes of cell surface receptors for neurotransmitter, hormones and local mediators.

Describe the properties of cell surface receptors, their functions and relevant signalling pathways.

Explain how individual physiological systems work together to achieve whole body homeostasis.

Demonstrate understanding of human physiological measurement.

Handle, manipulate, display and statistically analyse physiological data.

Apply subject knowledge to address a research problem/question.

**COORDINATOR:** Katherine Clark

**TEACHING AND LEARNING METHODS:**

Research-based learning

Lectures,

practical classes,

tutorials

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Tests

Report

Coursework - Interdisciplinary

Engagement

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Read a variety of relevant source material including textbooks and scientific articles. Specific reading tasks will be posted as part of the course material and on Blackboard.
- Prepare report including data handling.
- Revise module content guided by module activities as well as external sources.
- Prepare and revise material covered in tutorials.
- Prepare for practical sessions assisted by module activities.
- Complete formative online tests to check understanding of material and prepare for summative online test

**MODULE NAME:** Genetics, Biodiversity and Behaviour

**MODULE CODE:** NT2006

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

Describe and discuss:

Phylogeny and the tree of life

Basic animal and plant development

Animal and plant origins and diversity

Biodiversity/ecology and its importance

Animal behavioural/physiological adaptations

Use appropriate statistical analysis software to analyse data

Use appropriate skills and software to assess and present research

Explain how chromosomes are inherited through mitosis and meiosis and how genetic variation is generated.

Perform elementary genetic analyses.

Perform elementary statistical analyses.

Recognise genetic diseases and genetically influenced disorders and appropriate methods of screening.

Explain genetic variation and methods to measure it.

Explain what factors influence global patterns of genetic diversity.

Describe basic elements of molecular evolution of genes and genomes

Define DNA sequencing technologies and their use in modern genetics

Identify simple bioinformatics tools

Demonstrate competent skills in data analysis and in the preparation and presentation of written work

Apply the Hardy-Weinberg principle to determine whether a population is evolving.

**COORDINATOR:** Moya Burns

**TEACHING AND LEARNING METHODS:**

Research-based learning

A combination of synchronous and asynchronous delivery methods including slides, presentations, exploration of scientific topics, general summaries, tutor-led sessions, statistical/experimental/data analyses

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Coursework assessment, engagement and end of module assessments

Coursework (Interdisciplinary)

Students earn Genetics engagement marks by submitting 5 out of 6 formative assessments (or 80% of the due number if they have mitigating circumstances)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for tutorials (including reading, videos)

Preparing for and revising all synchronous and asynchronous material delivered through the module. Consulting textbooks/papers. Preparing for and producing coursework. Preparing for the final end of module assessments.



**MODULE NAME:** Light and Matter, Waves and Quanta

**MODULE CODE:** NT2010

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Know the simple properties of matter, heat and light, the laws of thermodynamics and the basic laws which describe the behaviour of light.
- Know where the basic laws come from and how they are derived.
- Know the laws in mathematical form and define all the terms used.
- Be able to derive mathematical relationships which describe the properties and behaviour of heat and light.
- Be able to solve simple problems involving thermodynamics and optics.
- Be able to state the basic language and equations used to describe oscillations and oscillators; apply this knowledge to solve basic problems in simple harmonic motion, damped simple harmonic motion, forced oscillations and resonance.
- Be able to demonstrate the need for a quantum theory of matter, as evidenced by the photo-electric effect, UV catastrophe, Compton scattering and electron diffraction.
- Be able to demonstrate knowledge of the wave and particle natures of light and matter as described by De Broglie and Heisenberg, including the description of wave functions, expectation values and probability densities.
- Be able to state and apply the basic theory of the Bohr atom and quantized electron energy levels, in order to demonstrate the origin of spectral lines.
- Have gained experience in the use and organization of private study time including background reading, and the discussion of physical ideas and problems with your peers and staff
- Connect scientific knowledge from 'Light and Matter' and 'Waves and Quanta' to provide unique insight, or deeper analysis, of an interdisciplinary topic related to these concepts. For example construct and apply mathematical models employing thermodynamical concepts and wave-particle theory to biochemical scenarios.
- Conduct independent research of the literature in order to support such models/discussions.

**COORDINATOR:** Cheryl Hurkett

**TEACHING AND LEARNING METHODS:**

Research-based learning

Tutorials

Lectures,

Real-time problem solving classes,

Assessed homework problems,

Discussions with peers and staff members,

Guided independent study

**PRE-REQUISITES:**

**TOTAL MODULE HOURS: 300**

**ASSESSMENT METHODS:**

End of Module Assessment

Coursework (Light and Matter, Waves and Quanta)

Coursework (Interdisciplinary)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for tutorials (including reading, videos)

Working through the example problems, and practice problems.

Discuss problems and solutions with your peers,

Review other texts on the subject to find alternative strategies to problem solving and alternative descriptions of the material.

**MODULE NAME:** Interdisciplinary Research Journal

**MODULE CODE:** NT3003

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of this module, students should be able to:

To engage with academic literature by preparing an assigned academic paper for presentation to peers. This presentation should: clearly highlight the importance of the research topic; the underlying theory and how this relates to modules already studied; the research methodology and analysis used; key conclusions.

Write short scientific papers, based on their synoptic knowledge of the course so far, using existing knowledge in novel situations for publication in an open access, online undergraduate journal.

Reviewing peers' papers and presenting their critique and decision regarding publication in a clear and concise manner so that their review is an effective resource for an editorial board.

Participate in editorial board duties (chairperson, note keeper and ordinary member) and make unbiased, critical decisions on which papers should be published in light of referee comments.

Reflect on scientific literature encountered and use this to inform their own writing style.

Plan their time effectively to meet the editorial board deadlines for this module in tandem with other module commitments.

**COORDINATOR:** Cheryl Hurkett

**TEACHING AND LEARNING METHODS:**

Work environment (Project-based):

- The cohort will convene to form a research group supported by academics.
- Students will be supported to engage with recent scientific literature not previously encountered in other modules. Students will present these academic papers to their peers within a research seminar format and respond to questions posed by both peers and academics. Students will critique the scientific literature encountered and reflect upon how this can inform their own writing style. This activity aims to replicate the real experience of presenting new discoveries and scientific data within a research group environment, without having to conduct original research.
- Building upon the experiences of engaging with existing scientific literature students will be supported in generating their own short academic papers, either individually or in groups up to three in size. These papers should use existing scientific knowledge from other modules but applied to new contexts, including new mathematical models or calculations in support of the conclusions drawn. These papers will be submitted via an online journal portal of the type used by professional academic journals.
- Students will critically evaluate their peers' papers and write referee reports suggesting improvements where necessary and summarizing whether the paper should be accepted for publication.

- Students will participate in editorial board meetings and take responsibility for assigning referees to papers and deciding whether individual papers meet the publication standards of the journal according. Students will be expected to formulate a forward planning proposal to demonstrate how they will meet all of the commitments listed above. This activity aims to replicate the experience of the academic publishing process and will provide students with a starting portfolio of peer-reviewed work to showcase in their CV and future job applications.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

(Journal Seminar / coursework): Presentation of two papers from the recent scientific literature to our peers in research seminars; respond to questions from your peers and academics on these papers.

(Professional Development Portfolio / coursework): Write a reflective statement critiquing the style and content of the scientific literature encountered.

(Journal / coursework): Publication of short scientific papers in an online undergraduate journal.

(Journal / coursework): Writing referee reports on scientific papers submitted by peers.

(Professional Development Portfolio / coursework): Writing a forward planning proposal for individual contributions to the undergraduate journal highlighting how you will complete these task in tandem with other modules. Identify good practice that will contribute to future project work and career goals.

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Preparation for workshops (including reading, videos)

Production of referee's reports and short scientific papers

Engage with the University Press Office if a student paper is selected for a Press release or is otherwise picked up by the wider media.

**MODULE NAME:** From Genes to Proteins and Bioinformatics

**MODULE CODE:** NT3005

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Use computer systems to access bioinformatic databases.
- Explain the use of computers in analysing genomic data.
- Describe how protein structures are determined and modelled.
- Compare DNA and protein sequences to analyse gene structure and function.
- Demonstrate competency in accessing information, organising references and writing and producing practical reports.
- Describe how information encoded in DNA is transcribed into RNA and how primary transcripts are processed to achieve their final, functional form.
- Demonstrate the principles of the genetic code and translation of genetic information from messenger RNA into protein.
- Carry out and interpret simple experiments illustrating aspects of the above.
- Explain the principles underpinning of the regulation of gene expression in prokaryotes and eukaryotes.
- Describe molecular mechanisms of DNA manipulation by specified enzyme(s).
- Develop transferable skills in writing and data analysis.
- Investigate biophysical approaches to research gene expression.

**COORDINATOR:** Sarah Gretton

**TEACHING AND LEARNING METHODS:**

Lectures, interactive sessions, practicals, computer-based sessions, revision sessions. Video presentations, computer practical classes, tutorials with group-work tasks and discussion, formative online quizzes, directed study, guided independent study.

**PRE-REQUISITES:** "NT2004, NT2005"

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

Bioinformatic analysis (16%)

Bioinformatics examination (24%)

From Genes to Proteins examination (24%)

From Genes to Proteins lab practical report (16%)

Coursework - interdisciplinary (20%)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Students will be directed to essential reading (textbooks; selected journal articles) and recommended reading (journal articles, books, webpages) to complement the video presentations and assist preparation for End-of-Module Assessment and Computer Practical reports. Preparation for computer practical, execution of practice computational analyses. Planning, drafting and preparation of Computer Practical reports. Problem solving in support of small-group tutorials. Formative online quizzes. Revising for End-of-Module Assessment. Details of indicative activities subject to modification as required.

Guided reading, recommended audiovisual materials. Lectures made available for review using Reflect. Preparation for synchronous sessions. Research for long-format writing task.

**MODULE NAME:** Neurobiology, Animal Behaviour and Evolution in the Field

**MODULE CODE:** NT3007

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:~

- Explain the principles of neuronal signalling that underpin the control of behaviour.
  - Discuss different types of sensory processing that enable animals to sense their environment.
  - Explain how experience shapes development of neural circuits within the brain.
  - Discuss the role of genes and environment in shaping adaptive behaviour.
  - Formulate and test specific hypotheses in behavioural ecology.
  - Explain how individual economics and competition shape behaviour.
  - Evaluate theories explaining parental care, family conflict and the evolution of altruistic and cooperative behaviours.
  - Analyse and interpret quantitative experiments investigating different aspects of animal behaviour.
- Discuss basic ecological phenomena as they relate to communities, including biodiversity, succession and inter-specific interaction.
- Explain species concepts and speciation mechanisms in the context of natural selection, population differentiation and~adaptive radiation.
- Design observational and experimental approaches to study aspects of evolutionary biology:
- a) Formulate and test hypotheses, using rigorous statistical techniques on data collected in observational field surveys or experiments.
  - b) Master quantitative survey skills and sampling techniques for different organisms.
  - c) Operate appropriate collection, recording and documentation protocols.
- Operate appropriate health and safety protocols in fieldwork.
- Prepare and deliver oral and written reports.
- Appraise mathematical approaches to understanding ecology.

**COORDINATOR:** Moya Burns

**TEACHING AND LEARNING METHODS:**

- Asynchronous mini-lectures supported by asynchronous pre-lecture and post-lecture material.

- Asynchronous practical exercise supported by asynchronous pre-practical and post-practical material. The practical integrates critique of experimental design with training in quantification of behaviour and generic data analysis skills using existing research data as an example.
- Asynchronous interactive quizzes and self-learning exercises.
- Synchronous online interactive review sessions (face-to-face if possible)
- Synchronous online whole-class tutorials (face-to-face if possible)
- Online group work.
- Synchronous and asynchronous online Instructor feedback.
- Guided independent study.
- Synchronous and asynchronous lectures Synchronous small group teaching Directed reading
- Seminars
- A virtual field course with students working remotely in their homes and being supervised remotely via Blackboard Collaborate. The course is comprised of virtual exercises using web-based resources, experiments conducted in back gardens, independent literature study and supervised, statistical data handling and analysis.

**PRE-REQUISITES:** "NT2004, NT2006"

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

End of module assessment - Neurobiology and Animal Behaviour

End of module assessment - A Field Guide to Evolution

Practical report - Neurobiology and Animal Behaviour

Engagement - Neurobiology and Animal Behaviour

Coursework from Field Course - A Field Guide to Evolution

Coursework - Interdisciplinary

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

- Reading textbooks and primary research papers from the reading list and beyond to support the framework set out in the course material.
- Preparing for practicals and tutorials by engaging with the supporting material, reading relevant research papers and preparing for group work.
- Analysing provided video recordings to generate quantitative behavioural data. Interpreting the data in light of the experimental design, and relating them to the relevant literature.
- Developing knowledge and preparing for the final online assessment by: revising lecture notes, online learning resources, feedback materials (from tutorials and the practical report), and material from the reading list as well as independently found sources.
- Reading based on lecture topics.
- Preparation for researching, conducting, presenting and writing report. Exam preparation.



**MODULE NAME:** Condensed Matter and Statistical Physics

**MODULE CODE:** NT3011

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 30

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

On successful completion of the module, students should be able to:

- Sketch simple crystal structures adopted by solid materials; perform simple calculations relating to crystal structures.
- Describe simple models for lattice vibrations.
- State and apply the laws governing the behaviour of electrons in various condensed matter environments including metals, insulators, semiconductors and superconductors relations.
- Derive the three distribution functions appropriate to fermions, bosons and classical particles; use the partition function to obtain the properties of simple systems.
- Describe mathematically and solve problems involving electrons in the free electron gas.
- Solve simple problems involving the magnetic properties of matter.
- Connect scientific knowledge from 'Condensed Matter' and 'Statistical Physics' to provide unique insight, or deeper analysis, of an interdisciplinary topic related to these concepts. For example construct and apply mathematical models employing condensed matter approaches and statistical approaches to biochemical scenarios.
- Carry out independent research of the literature in order to support such models/discussions.
- Organise appropriate private study time; obtain new information from text books; apply mathematical techniques to solving problems in statistical physics; be able to discuss basic physics and communicate mathematical ideas with your peers and staff; be able to set out solutions to problems clearly and correctly.

**COORDINATOR:** Cheryl Hurkett

**TEACHING AND LEARNING METHODS:**

In this course you will benefit from lectures, small group tutorial classes, workshops, discussions with peers and staff members, and guided independent study.

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 300

**ASSESSMENT METHODS:**

End of module assessment

Coursework (Condensed Matter and Statistical Physics)

Coursework (Interdisciplinary)

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

You will work through the course, including working through the example problems, and practice problems. You will discuss problems and solutions with your peers, and review other texts on the subject to find alternative strategies to problem solving and alternative descriptions of the material.

**MODULE NAME:** Independent Project III

**MODULE CODE:** NT3201

**MODULE DESCRIPTION:** [Click to open.](#)

**CREDITS:** 15

**PERIOD:** Semester 2

**DEPARTMENT:** Biological Sciences

**INTENDED LEARNING OUTCOMES:**

"On successful completion of the module, students should be able to:~- Demonstrate independent research/study skills including: locate relevant (additional) research materials, time management, maintain a record of written sources, organise regular meetings with your supervisor, obtain a greater depth of knowledge in a discipline specialism.~- Critically analyse a variety of written sources.~- Prepare and deliver a lecture that focuses on an aspect of your research.~- Demonstrate core presentation skills.~- Construct a report that synthesises information from a variety of sources."

**COORDINATOR:** Pietro Roversi

**TEACHING AND LEARNING METHODS:**

- Guided independent research~- Review report~- Presentation

**PRE-REQUISITES:**

**TOTAL MODULE HOURS:** 150

**ASSESSMENT METHODS:**

**GUIDED INDEPENDENT LEARNING: INDICATIVE ACTIVITIES:**

Directed reading