



**Swansea University  
Prifysgol Abertawe**

**FACULTY OF SCIENCE AND  
ENGINEERING**

**UNDERGRADUATE STUDENT  
HANDBOOK**

**YEAR 1 (FHEQ LEVEL 4)**

**BSC BIOLOGY  
DEGREE PROGRAMMES**

**SUBJECT SPECIFIC  
PART TWO OF TWO  
MODULE AND COURSE STRUCTURE  
2023-24**

## **DISCLAIMER**

The Faculty of Science and Engineering has made all reasonable efforts to ensure that the information contained within this publication is accurate and up-to-date when published but can accept no responsibility for any errors or omissions.

The Faculty of Science and Engineering reserves the right to revise, alter or discontinue degree programmes or modules and to amend regulations and procedures at any time, but every effort will be made to notify interested parties.

It should be noted that not every module listed in this handbook may be available every year, and changes may be made to the details of the modules. You are advised to contact the Faculty of Science and Engineering directly if you require further information.

## The 23-24 academic year begins on 25 September 2023

Full term dates can be found [here](#)

### **DATES OF 23-24 TERMS**

25 September 2023 – 15 December 2023

8 January 2024 – 22 March 2024

15 April 2024 – 07 June 2024

### **SEMESTER 1**

25 September 2023 – 29 January 2024

### **SEMESTER 2**

29 January 2024 – 07 June 2024

### **SUMMER**

10 June 2024 – 20 September 2024

## **IMPORTANT**

Swansea University and the Faculty of Science of Engineering takes any form of **academic misconduct** very seriously. In order to maintain academic integrity and ensure that the quality of an Award from Swansea University is not diminished, it is important to ensure that all students are judged on their ability. No student should have an unfair advantage over another as a result of academic misconduct - whether this is in the form of **Plagiarism, Collusion** or **Commissioning**.

It is important that you are aware of the **guidelines** governing Academic Misconduct within the University/Faculty of Science and Engineering and the possible implications. The Faculty of Science and Engineering will not take intent into consideration and in relation to an allegation of academic misconduct - there can be no defence that the offence was committed unintentionally or accidentally.

Please ensure that you read the University webpages covering the topic – procedural guidance [here](#) and further information [here](#). You should also read the Faculty Part One handbook fully, in particular the pages that concern Academic Misconduct/Academic Integrity.

## **Welcome to the Faculty of Science and Engineering!**

Whether you are a new or a returning student, we could not be happier to be on this journey with you.

At Swansea University and in the Faculty of Science and Engineering, we believe in working in partnership with students. We work hard to break down barriers and value the contribution of everyone.

Our goal is an inclusive community where everyone is respected, and everyone's contributions are valued. Always feel free to talk to academic, technical and administrative staff, administrators - I'm sure you will find many friendly helping hands ready to assist you. And make the most of living and working alongside your fellow students.

During your time with us, please learn, create, collaborate, and most of all – enjoy yourself!

**Professor David Smith**  
**Pro-Vice-Chancellor and Executive Dean**  
**Faculty of Science and Engineering**



<b>Faculty of Science and Engineering</b>	
Pro-Vice-Chancellor and Executive Dean	Professor David Smith
Director of Faculty Operations	Mrs Ruth Bunting
Associate Dean – Student Learning and Experience (SLE)	Dr Laura Roberts
<b>School of Biosciences, Geography and Physics</b>	
Head of School	TBC
School Education Lead	Dr Wendy Harris and Dr Sarah Roberts
Head of Biosciences	Professor Luca Borger
Biosciences Programme Director	Dr Ed Pope
Year Coordinators	Head of Foundation Year: Dr Kayleigh Rose Head of Level 1: Dr Chris Lowe Head of Level 2: Dr Kevin Arbuckle Head of Level 3: Dr Penny Neyland Head of MSc: Dr Aisling Devine Head of MRes: Dr Nicole Esteban

## STUDENT SUPPORT

The Faculty of Science and Engineering has two **Reception** areas - Engineering Central (Bay Campus) and Wallace 223c (Singleton Park Campus).

Standard Reception opening hours are Monday-Friday 8.30am-4pm.

The **Student Support Team** provides dedicated and professional support to all students in the Faculty of Science and Engineering. Should you require assistance, have any questions, be unsure what to do or are experiencing difficulties with your studies or in your personal life, our team can offer direct help and advice, plus signpost you to further sources of support within the University. There are lots of ways to get information and contact the team:

**Email:** [studentsupport-scienceengineering@swansea.ac.uk](mailto:studentsupport-scienceengineering@swansea.ac.uk) (Monday–Friday, 9am–5pm)

**Call:** +44 (0) 1792 295514 (Monday-Friday, 10am–12pm, 2–4pm).

**Zoom:** By appointment. Students can email, and if appropriate we will share a link to our Zoom calendar for students to select a date/time to meet.

The current student **webpages** also contain useful information and links to other resources:

<https://myuni.swansea.ac.uk/fse/>

## READING LISTS

Reading lists for each module are available on the course Canvas page and are also accessible via <http://ifindreading.swan.ac.uk/>. We've removed reading lists from the 23-24 handbooks to ensure that you have access to the most up-to-date versions.

We do not expect you to purchase textbooks, unless it is a specified key text for the course.

## THE DIFFERENCE BETWEEN COMPULSORY AND CORE MODULES

**Compulsory modules** must be **pursued** by a student.

**Core modules** must not only be **pursued**, but also **passed** before a student can proceed to the next level of study or qualify for an award. Failures in core modules must be redeemed.

Further information can be found under “Modular Terminology” on the following link -

<https://myuni.swansea.ac.uk/academic-life/academic-regulations/taught-guidance/essential->

[info-taught-students/your-programme-explained/](#)

# Year 1 (FHEQ Level 4) 2023/24

## Biology

BSc Biology[C101,C104]

BSc Biology with a Year Abroad[C106]

BSc Biology with a Year in Industry[C152]

### Compulsory Modules

Semester 1 Modules	Semester 2 Modules
<b>BIO104</b> Cellular & Microbial Biology 20 Credits Dr EC Sonnenschein/Dr SP Slocombe	<b>BIO108</b> Evolution and Genetics 20 Credits Dr HJ Nichols/Dr AJ King
<b>BIO109</b> Core Skills for Biological Sciences 20 Credits Dr SC Hocking	<b>BIO112</b> Life in the Oceans 20 Credits Dr MJ Perkins/Dr CD Lowe
<b>BIO111</b> Botany and Ecology 20 Credits Dr PJ Neyland/Dr JN Griffin/Dr MJ Perkins	
<b>Total 120 Credits</b>	

### Optional Modules

Choose exactly 20 credits

<b>BIO114</b>	Animal Diversity and Behaviour	Dr GR Thomas/Dr DW Forman/Dr WE Harris/..	TB2	20
<b>BIO114C</b>	Amrywiaeth ac Ymddygiad Anifeiliaid	Dr GR Thomas	TB2	20



# BIO104 Cellular & Microbial Biology

**Credits: 20 Session: 2023/24 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr EC Sonnenschein, Dr SP Slocombe

**Format:** 23 hours of lectures, including revision lectures; 9 hours practical sessions (2.5hrs, 1.5hrs, 1hr and 2x 2hrs). Contact hours will be delivered through live activities on-campus activities, and may include, for example, lectures, seminars and practical sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live activity, with live on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Blended learning; in classroom and laboratory lectures, small group discussion and quizzes, laboratory practicals, and e-learning (online resources such as videos, animations, and scientific papers). Primarily on campus.

**Module Aims:** This module provides a broad introduction to fundamental concepts in cell biology, including the biochemistry and structure of the cell and cell diversity. Life is more abundant than what we can see with our eyes. Plants, animals and humans are a small minority among living organisms because there is no niche on earth which is not colonized by microbes (i.e., archaea, bacteria, fungi, protists, and viruses). As part of this module, you will learn that microbes were the first form of life on earth, support all kinds of life, and play a vital role in shaping the planet. Students will gain practical experience in handling and culturing microorganisms, microscopy and spectroscopy.

**Module Content:** The following distribution of lecture material is indicative; due to the interactive mode of teaching it is subject to modification.

Cellular Biology

- Cell theory and types (eukaryotes and prokaryotes)
- Chemical components of cells: chemical bonds, structures and assembly of macromolecules (nucleic acids, proteins, carbohydrates, lipids)
- Biomembranes and Organelles (structures and functions)
- Membrane transport: cellular recognition and signal transduction mechanisms
- Metabolic pathways (glycolysis, TCA cycle and ATP as an energy currency)
- Cytoskeletal elements
- Cell birth, life and death (necrosis, apoptosis)

Microbial Biology:

- Introduction: a microbial world.
- Prokaryote cell exterior and appendages.
- Prokaryote cell interior.
- Microbial cell growth, division and metabolism.
- Viruses.
- Inheritance and information flow among microbes.
- Cell differentiation and development.
- Bacterial and archaeal diversity.
- Protists
- Filamentous and unicellular fungi.
- The human microbiome
- Microbial pathogenesis.

Practical classes: bacterial culture and chemistry, microscopy & staining, growth conditions, bacterial identification, spectrophotometry and protein standard curves

**Intended Learning Outcomes:** By the end of the module students should be able to:

LO1) Recognise different cell types

LO2) List the (sub)cellular structures of prokaryotic and eukaryotic cells

LO3) Describe the role of molecules in different biochemical pathways (Glycolysis, ATP synthesis, Krebs Cycle, fermentation), and their regulating mechanisms

LO4) Discuss mechanisms of cellular recognition and signal transduction

LO5) Undertake a series of laboratory experiments to develop skills in aseptic technique, culturing of microbes, and cellular staining.

LO6) List the variety of bacterial shapes and morphologies

LO7) Discuss the importance of microbes in the environment, their ecology and evolution

LO8) Produce a series of laboratory reports, including data in tabular and graphical formats

LO9) Gain practical experience in the use of micropipettes, microscopes and spectrophotometers

LO10) Estimate microbial growth, explain the molecular basis of microbial cell division, and identify how growth is fuelled in microbes.

LO11) Comprehend human-microbe interactions

**Assessment:**  
Examination (50%)  
Coursework 1 (16%)  
Coursework 2 (17%)  
Coursework 3 (17%)

**Assessment Description:** Examination: 100 multiple choice questions (MCQ) (50%)  
Coursework: 3 practical components outlined in the syllabus (50%)

**Moderation approach to main assessment:** Not applicable

**Assessment Feedback:** Formative feedback on coursework and examinations. Contact lecturer as required.

**Failure Redemption:** Resit examination and re-submission of coursework.

**Reading List:** Neil A. Campbell 1946-2004 author., Lisa A. Urry author.; Michael L Cain (Michael Lee), 1956- author.; Steven Alexander Wasserman author.; Peter V. Minorsky author.; Rebecca B. Orr author., *Biology : a global approach / Neil A. Campbell, Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Rebecca B. Orr., Harlow : Pearson Education Limited, 2021.*ISBN: 9781292341699

Neil A. Campbell 1946-2004, author., Lisa A. Urry author.; Michael L Cain (Michael Lee), 1956- author.; Steven Alexander Wasserman author.; Peter V. Minorsky author.; Jane B. Reece author., *Biology : a global approach / Neil A. Campbell, Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Jane B. Reece., Harlow : Pearson Education Limited, 2018.*ISBN: 9781292170442

Michele Swanson author., Gemma Reguera author.; Moselio Schaechter author.; Frederick C Neidhardt (Frederick Carl), 1931-2016, author.; Rachel Horak contributor., *Microbe / Michele Swanson, Gemma Reguera, Moselio Schaechter, Frederick Neidhardt ; with Rachel Horak., Washington, DC : ASM Press, 2016.*ISBN: 9781555819132

Harvey F. Lodish author., Arnold Berk author; Chris A. Kaiser author; Monty Krieger author; Anthony Bretscher author; Hidde Ploegh author; Angelika Amon author; Kelsey C. Martin author, *Molecular cell biology / Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Hidde Ploegh, Angelika Amon, Kelsey C. Martin., New York : W.H. Freeman-Macmillan Learning, 2016.*ISBN: 9781464183393

Karp, Gerald, author., Iwasa, Janet, author.; Marshall, Wallace, author., *Cell and molecular biology, Wiley, 2021.*ISBN: 9781119834908

Madigan, Michael T., 1949- author., Bender, Kelly S., 1977- author.; Buckley, Daniel H. (Daniel Hezekiah), author.; Sattley, W. Matthew, 1975- author.; Stahl, David Allan, 1949- author., *Brock biology of microorganisms, Pearson Education, 2021.*ISBN: 9780134874401

Madigan, Michael T., 1949- author, Bender, Kelly S., 1977- author; Buckley, Daniel H. (Daniel Hezekiah) author; Sattley, W. Matthew, 1975- author; Stahl, David Allan, 1949- author; Brock, Thomas D., *Brock biology of microorganisms, Pearson, 2019 - 2019.*ISBN: 9781292235196

Jeff Hardin author., Gregory Bertoni author., *Becker's world of the cell / Jeff Hardin and Gregory Bertoni., Harlow : Pearson Education Ltd, 2018.*ISBN: 1292177691

Webster, John., Weber, Roland., *Introduction to fungi / John Webster and Roland Weber., Cambridge University Press., 2006.*ISBN: 9780521014830

Robert J. Brooker author., Eric P. Widmaier author.; Linda E. Graham 1946- author.; Peter D. Stiling editor., *Biology / Robert J. Brooker, Eric P. Widmaier, Linda E. Graham, Peter D. Stiling., New York, NY : McGraw-Hill Education, 2020.*ISBN: 1260569985

Robert J. Brooker, *Biology / by Robert J. Brooker ... [et al.], McGraw-Hill Higher Education, 2017.*ISBN: 9781260084115

Jones, A. M. (Allan M.), 1945- author., Reed, Rob (Robert H.), author.; Weyers, Jonathan D. B., author., *Practical skills in biology, Pearson, 2022.*ISBN: 9781292397078

Jones, A. M. (Allan M.), 1945- author., Reed, Rob (Robert H.), author.; Weyers, Jonathan D. B., author., *Practical skills in biology , Pearson Education Limited, 2016 - 2016.*ISBN: 1292094362

**Additional Notes:** Delivery of both teaching and assessment will be blended including live activities on-campus.

Normally available to elective, visiting or exchange students. Please note that any failures are redeemed during the August resit period, so you must ensure your availability.

# BIO108 Evolution and Genetics

**Credits: 20 Session: 2023/24 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr HJ Nichols, Dr AJ King

**Format:** 21h lectures  
14h practical sessions  
5h feedback sessions

Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Variety of learning methods (lectures, discussion groups, practicals and e-learning)

**Module Aims:** "Nothing in Biology makes sense except in the light of evolution" was the title of a 1973 essay by the evolutionary biologist Theodosius Dobzhansky. The module links fundamental understanding of molecular biology and genetics to a broader appreciation of evolution and how it shapes the natural world around us.

**Module Content:** Should be updated to the following:

Lectures:

Part 1 Evolution

- Defining biological evolution, natural selection
- Mechanisms of change
- Micro-evolution, Macro-evolution
- Speciation
- Sexual selection
- Phylogenetic ("family") trees
- Explaining specific evolutionary events
- Evolutionary responses to environmental change and extinction
- Human evolution

Part 2 Genetics

- The genetic material: DNA, chromosomes and chromatin
- DNA replication, mitosis
- Meiosis and sex determination
- Transcription
- Translation: using the genetic code
- Mutation
- Inheritance (genetic and non-genetic)
- Epigenetics
- Population and conservation genetics

Practical sessions (subject to change):

- (1) Perform experimental genetic techniques;
- (2) Use basic molecular techniques.
- (3) In small groups, discuss the breadth, depth and power of evolutionary thinking using examples from: The fossil record; Habitats; Molecular processes and present this to the class;
- (4) Design and carry out a study to explore the evolution of sexually selected traits in birds.

**Intended Learning Outcomes:** At the end of the module students will be able to:

LO1: Define biological evolution and distinguish among of the mechanisms of evolution (e.g. mutation, migration, genetic drift, natural and sexual selection).

LO2: Interpret phylogenetic ("family") trees and use them to explain specific evolutionary events, micro-evolution, macro-evolution, and speciation.

LO3: Use Darwin's basic conception of evolutionary change and diversification to explain phenomena across the many sub-disciplines of biology and deal with objections to evolution.

LO4: To acquire knowledge regarding the basic molecular mechanisms of evolution, including the cell cycle, the genetic material, DNA replication, transcription and translation, and how molecular events such as DNA damage, repair and mutation relate to evolution.

LO5: Develop an understanding of genetic and non-genetic inheritance, and how these relate to evolution.

LO6: Appreciate the wider applications of genetics, for example to medicine and conservation.

<b>Assessment:</b>	Examination (50%) Coursework 1 (10%) Coursework 2 (15%) Coursework 3 (25%)
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**Assessment Description:** CW1: Evolution gems, 10%, February

CW2: Sexual selection report, 15%, March

CW3: Genetics lab practical report, 25%, April

Exam: multiple choice, 50%

**Moderation approach to main assessment:** Not applicable

**Assessment Feedback:** Formative feedback on coursework and examinations. General feedback sessions and Individual feedback with lecturer as appropriate.

**Failure Redemption:** Re-submission of coursework, re-sit of examination

**Reading List:** James Morris (James R.) author., Daniel Hartl author.; Andrew Knoll, Biology : how life works / James Morris [and fourteen others]., New York, NY : Macmillan International Higher Education, 2019.ISBN: 9781319248055

Benjamin A. Pierce author., Genetics : a conceptual approach / Benjamin A. Pierce., New York, NY : Macmillan Learning, 2020.ISBN: 9781319325466

Jocelyn E. Krebs author., Elliott S. Goldstein author.; Stephen T. Kilpatrick author., Lewin's genes XII / Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick., Burlington, MA : Jones & Bartlett Learning, 2018.ISBN: 9781284104493

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

Normally available to elective, visiting or exchange students. Please note that any failures are redeemed during the August resit period, so you must ensure your availability.

# BIO109 Core Skills for Biological Sciences

**Credits: 20 Session: 2023/24 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr SC Hocking

**Format:** 23 lectures, 6 workshops, 3 PC labs, 1 laboratory chemistry practical, 1 feedback lectures. Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for self-directed online activity, with live and self-directed on-campus activities each week.

Students may also have the opportunity to engage with online versions of sessions delivered on-campus. The module consists of lectures, ICT workshops, 1 lab practical and e-learning

**Module Aims:** This module is divided into three sections, scientific writing, data analysis and chemistry, which will equip students with the core skills needed throughout their degree program. The content of the module includes understanding the different types of data that can be measured and collected, the tools to formally present and analyse data and data analyses, and practical applications of spreadsheet software. There is a 'hands on' focus on dealing with data and developing basic mathematical and statistical analytical skills. Furthermore this module introduces first year undergraduates to the key skill of scientific writing, developing their ability to locate, understand, evaluate and communicate scientific information. Basic chemistry will be covered as a foundation to its importance to biological processes.

**Module Content:** The module will comprise of the following subjects:

- Using maths in Science
- Understanding data
- Types of data
- Units and measurement
- Using data bases
- Preparing figures, graphs and tables
- Sampling concepts
- Hypothesis testing
- Descriptive statistics
- Basic inferential statistics
  
- Basic rules to scientific writing
- Writing essays and practical reports
- Introduction to sources of scientific information and science in the public domain
- Essay writing
- Referencing
  
- Organic chemistry
- Stereochemistry
- Transition metal chemistry
- laws of kinetics
- chemical equilibria

#### Careers Development

- Resilience
- Developing Self Awareness
- Career options
- action planning
- CV's cover letters
- creating a LinkedIn page

The module is supported by both lectures and guided / self directed computer sessions and workshops which include:

- Introduction to Spreadsheets & Databases
- Plotting data in Spreadsheet Packages
- Displaying data visually
- Simple Statistics by Hand
- Basic rules to scientific writing
- Essays and practical reports
- Utilising internet sources and search engines
- Referencing

**Intended Learning Outcomes:** LO1) Classify the different type of data and describe how they are measured

LO2) Recognise and apply standard units of measurement.

LO3) Demonstrate how and when to present data in tables or different types of figures and graphs.

LO4) Demonstrate practical knowledge of the use of databases and spreadsheet applications.

LO5) Apply knowledge of the use of descriptive and inferential statistics, including parametric and non-parametric tests to evaluate statistically significant relationships and/or differences.

LO6) Differentiate between the different statistical analyses associated with different types of data.

LO7) Identify and evaluate different forms of scientific communications and their applications.

LO8) Locate and utilise internet sources of scientific information such as peer reviewed journal articles using appropriate search engines.

LO9) Communicate, structure and format scientific information in a number of different writing styles encompassing essay writing and practical reports.

LO10) Utilise, format and structure references in a scientific essay

LO11) Recognise the problems and risks associated with different forms of academic misconduct.

LO12) Explain why chemistry is important to biology

LO13) Describe the basic structure of atoms, molecules etc

LO14) Describe different types of chemical bond and have a basic understanding of chemical reactions.

LO15) Know how to make up molar solutions

LO16) Understand what pH is and how it is important in biological reactions

LO17) Explain the basic chemical structure of proteins, fats and carbohydrate

LO18) Describe the role of different metals in biology.

LO19) Understand the importance of self-reflection and career development skills

<b>Assessment:</b>	Coursework 1 (25%)
	Coursework 2 (25%)
	Coursework 3 (40%)
	Coursework 4 (10%)

**Assessment Description:** CW1: Essay

CW2: Chemistry assignment

CW3: Statistics report

CW4: Careers quizzes

**Moderation approach to main assessment:** Not applicable

**Assessment Feedback:** Feedback is given directly on submitted continuous assessment assignments through annotated scripts, feedback forms and via a feedback lecture session as appropriate

**Failure Redemption:** Resit examination, resubmission of coursework of failed element

**Reading List:** Whitlock, Michael C.; Schluter, Dolph, Schluter, Dolph., The Analysis of Biological Data (International Edition), Macmillan Learning, 2020.ISBN: 9781319325350

Whitlock, Michael, author., Schluter, Dolph, author., The analysis of biological data, Macmillan Learning, 2020.ISBN: 9781319226237

Jones, A. M. (Allan M.), 1945- author., Reed, Rob (Robert H.), author.; Weyers, Jonathan D. B., author., Practical skills in biology, Pearson, 2022.ISBN: 9781292397078

Jones, A. M. (Allan M.), 1945- author., Reed, Rob (Robert H.), author.; Weyers, Jonathan D. B., author., Practical skills in biology, Pearson Education Limited, 2016 - 2016.ISBN: 1292094362

Stuart Johnson 1973- author., Jon Scott author., Study and communication skills for the biosciences / Stuart Johnson and Jon Scott., Oxford : Oxford University Press, 2019.ISBN: 9780198791461

Boyle, Jennifer, author., Ramsay, Scott, \$e author., Writing for science students, Palgrave in the UK is an imprint of Macmillan Publishers Limited, 2017 - 2017.ISBN: 9781137571526

Crowe, Jonathan (Science writer) author., Bradshaw, Tony (Tony K.), author., Chemistry for the biosciences : the essential concepts, Oxford University Press, 2021.ISBN: 9780198791041

**Additional Notes:** Delivery of both teaching and assessment will be blended including live activities on-campus and self-directed activities online.

Normally available to elective, visiting or exchange students. Please note that any failures are redeemed during the August resit period, so you must ensure your availability.



# BIO111 Botany and Ecology

**Credits: 20 Session: 2023/24 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr PJ Neyland, Dr JN Griffin, Dr MJ Perkins

**Format:** 24 hours in person live lectures (or Zoom if necessary)  
12 hours laboratory practicals  
3 hours field practical  
Additional Zoom sessions for Q and A.  
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Blended learning: Synchronous and asynchronous online lectures, laboratory and field practicals, eLearning, Canvas VLE used to disseminate information, short lectures, Zoom interactions and quizzes

**Module Aims:** Botany lectures cover the structure, life cycles and morphology of the major living Divisions of the Plant Kingdom. Floral structure, pollination, fruit dispersal and seed germination are discussed with particular reference to plant/animal interactions. This is followed by lectures that cover the basic anatomy of higher plants, from the cellular to the whole organism level. Lectures on plant physiology will emphasise flowering plants as whole organisms and concentrate particularly on plant-environment interactions. The topics covered are: photosynthesis; water relations; mineral nutrition; organic translocation; growth; developmental physiology. Aspects of plant ecology, plant-herbivore interactions and the importance of plants in medicine will also be covered. The lectures on plants are complemented by two laboratory practical sessions; Lower plant classification is studied by development of a dichotomous key; Basic anatomy and cell structure are studied microscopically; Physiological experiments illustrate aspects of plant water relations. Additionally, taxonomy and classification of species from the major divisions are studied by demonstrations displaying a wide range of specimens, along with examples of flower structure, pollination types and seed/fruit dispersal.

Ecology lectures cover the study of the interactions of organisms with their environment. The topic is divided into four key themes: the individual (conditions and resources, population distribution and abundance, population growth and regulation, population dynamics), species interactions (competition and predation), communities (patterns in space and time) and ecosystems (flux of energy and matter, food webs and patterns in species richness). A field practical looking at individuals (adaptation to ecological conditions and species area relationships) will develop skills in species identification, ecological sampling and ecological data analysis.

A lecture in plant ecology draws these two concepts together.

Note - lectures here refer to material that is presented on Canvas pages and delivered as live in-person lectures.

## **Module Content: Syllabus**

The following distribution of lecture material is indicative; due to the interactive mode of teaching it is subject to modification.

### **Botany**

- Classification, evolution and life cycles of non-vascular and vascular plants
- Pollination, fertilisation and dispersal in seed plants
- Plant biotechnology, genetic engineering
- Plant growth regulators (hormones)
- Plant growth and responses to light
- Water relations
- Mineral nutrition
- Mycorrhiza
- Photosynthesis, translocation
- Photosynthesis and global climate change
- Herbivory, plants, secondary metabolites and medicine

### **Ecology**

- Conditions, resources and the ecological niche
- Population distribution, abundance and life histories
- Population growth, regulation and dynamics
- Competition
- Predation and herbivory
- Communities; patterns in space and time
- Ecosystems; flux of energy and matter
- Food webs
- Patterns in species richness

### **Final lecture**

- Plant ecology; populations, habitats, ecosystems and biomes

### **Practicals**

Botany - Plant anatomy

Botany - Plant physiology experiment

Botany - Plant Kingdoms: taxonomy and classification, bryophytes, pteridophytes, gymnosperms and angiosperms

Ecology - Rocky shore ecology: individuals to communities

(Note order of practicals may change according to weather)

<p><b>Intended Learning Outcomes:</b> By the end of the module, the student should be able to:</p> <p>LO1) Describe the evolution, classification and morphology of plants and recognise typical specimens from the Divisions</p> <p>LO2) Compare and contrast the reproductive strategies and life cycles of plants from the major divisions (vascular and non-vascular plants).</p> <p>LO3) Describe and illustrate the physical structure of flowering plants from the cellular to the whole plant level.</p> <p>LO4) Summarise the physiological functioning of flowering plants, their interactions with the environment and their importance in the biosphere.</p> <p>LO5) Have knowledge of ecology and biological diversity, including structure, function, physiological constraints, evolution and adaptations to the environment</p> <p>LO5) Become proficient in microscopy and scientific illustration of cells</p> <p>LO6) Undertake, record, analyse and discuss some basic experiments in plant physiology</p> <p>LO7) Utilise taxonomic keys and guides to identify and classify organisms across a broad range of phyla during practical investigations</p> <p>LO8) Utilise field based ecological sampling techniques</p> <p>LO9) Work as a team and be able to utilise appropriate sampling and surveying techniques so that they can be employed in ecological research and monitoring</p> <p>LO10) Draw links and identify themes between the range of scientific subject investigated within constructing meaning from oral, written, and numerical information through interpretation and summarising key component</p> <p>LO11) Analyse and interpret data derived from experimental observations in terms of their significance and in the context of established knowledge utilising appropriate statistical techniques.</p> <p>LO12) Use relevant literature, information and programme resources to support the design, execution and analysis of practical investigations.</p>	
<b>Assessment:</b>	<p>Coursework 1 (10%)</p> <p>Coursework 2 (15%)</p> <p>Coursework 3 (25%)</p> <p>Exam - Multiple choice questions (50%)</p>
<b>Assessment Description:</b>	<p>Coursework 1: Anatomical drawings of plant cells (microscopy)</p> <p>Coursework 2: Ecology poster from field practical (adaptations and species-area relationships)</p> <p>Coursework 3: Laboratory practical report on plant physiology experiment (chemistry and water relations)</p> <p>Examination: (January) 100 Multiple Choice Questions based on all material taught in Botany and Ecology lectures</p>
<b>Moderation approach to main assessment:</b>	Not applicable
<b>Assessment Feedback:</b>	<p>Formal feedback in practical classes and lectures</p> <p>Individual comments on submitted coursework</p> <p>One to one discussion available in drop-in sessions upon request</p> <p>Electronic feedback on work submitted online</p> <p>Formative feedback on Canvas quizzes</p>
<b>Failure Redemption:</b>	<p>Resit of examination</p> <p>Re submission of coursework</p>
<b>Additional Notes:</b>	<p>Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.</p> <p>Normally available to elective, visiting or exchange students. Please note that any failures are redeemed during the August resit period, so students must ensure their availability. Field practical material may be subject to change depending on weather conditions.</p>

# BIO112 Life in the Oceans

**Credits: 20 Session: 2023/24 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr MJ Perkins, Dr CD Lowe

**Format:** 25 h of lectures

6 h laboratory work

4 h of fieldwork

Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Blended learning: lectures, laboratory practicals, fieldwork, eLearning.

**Module Aims:** This module introduces students to the largest biome on the planet and the huge variety of life it contains; over 71% of the Earth's surface is covered by ocean and its health is intricately connected with our own. Lectures will consider the formation of ocean basins and key oceanographic processes within them before moving onto the chemical and physical properties of water. The module will introduce students to primary production in the ocean, the huge diversity of life within marine food chains, and key processes in nutrient cycling. Marine ecosystems will be discussed in detail, with focus on those found around the UK, before considering the interaction between humans and the oceans and the challenges faced by marine organisms in an ocean changing because of our activities.

**Module Content:** Lecture themes:

1. Introduction to the oceans
2. Waves, tides and currents
3. Chemical and physical properties of seawater
4. Plankton and productivity in marine ecosystems
5. Nutrient cycling
6. Microalgae definitions and taxonomy
7. Marine invertebrates
8. Marine fish
9. Marine reptiles, birds and mammals
10. Introduction to marine ecology
11. Estuarine and intertidal systems
12. Shallow seas
13. Deep sea
14. Tropical seas
15. Polar seas
16. UK marine habitats
17. Humans and the oceans
18. The changing oceans

**Intended Learning Outcomes:** LO1 Describe how oceans form and describe oceanic processes;

LO2 Safely undertake fieldwork in the intertidal habitat;

LO3 Comprehend the physiological functioning of micro- and macroalgae, their interactions with the environment and their importance both in aquatic ecosystems and to humans;

LO4 Explain the drivers of the diversity of marine animal life;

LO5 Describe the variety of marine ecosystems, with particular reference to UK habitats;

LO6 Define concepts underpinning the ecology and diversity of marine ecosystems;

LO7 Explain the interplay between society and the oceans;

LO8 Produce detailed laboratory reports, including data analysis and use of other research to strengthen arguments;

LO9 Discuss the importance of correctly citing academic work;

<b>Assessment:</b>	Examination (50%) Coursework 1 (10%) Coursework 2 (15%) Coursework 3 (25%)
<b>Assessment Description:</b>	Examination: 100 Multiple Choice Questions based on all material taught in lectures. Coursework 1: construction of standard curve; Coursework 2: mussel feeding; Coursework 3: rocky shore short exercises.
<b>Moderation approach to main assessment:</b>	Not applicable
<b>Assessment Feedback:</b>	Personal feedback provided on coursework submitted. Direct general feedback during lectures and practical sessions. Formal feedback session to discuss examination results.
<b>Failure Redemption:</b>	Resit of examination Re submission of coursework
<b>Reading List:</b>	Peter Castro author., Michael E. Huber author.; William C. Ober illustrator.; Claire E. Ober illustrator., Marine biology / Peter Castro, Ph.D., Michael E. Huber, Ph.D. ; original artwork by William C. Ober, M.D. and Claire E. Ober, B.A., R.N., New York, New York : McGraw-Hill Education, 2019.ISBN: 1260289249
<b>Additional Notes:</b>	Delivery of both teaching and assessments will be in-person and on-campus.  Normally available to elective, visiting or exchange students. Please note that any failures are redeemed during the August resit period, so you must ensure your availability. Lecture and practical material may be subject to change depending on staff availability and weather conditions.

# BIO114 Animal Diversity and Behaviour

**Credits: 20 Session: 2023/24 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr GR Thomas, Dr DW Forman, Dr WE Harris, Dr AJ King

**Format:** 22 hours lectures  
12 hours practicals  
Drop in sessions  
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus; lectures, workshop, practicals, eLearning

**Module Aims:** This 20 credit module is divided into two sections and broadly introduces students to the diversity of animal groups, and the study of animal behaviour. The first 12 lectures will consider the taxonomy and physiology of organisms within the animal kingdom, and will provide students with a broad understanding of all animal life, from single celled protozoa through to megafauna such as the blue whale and concluding with human evolution. The following 10 lectures will consider the evolutionary pressures that drive animal behaviour and give rise to the behavioural adaptations witnessed across the animal kingdom today, from learning and cultural transmission, to anti-predatory mechanisms and migration. The section is concluded with a lecture on human behaviour, determining how we are influenced by the same set of natural regulations that govern our wild counterparts. During this module, students will develop their understanding of animal classification, interrelationships and evolution, and will gain valuable practical experience of animal biology. A sister module, BIO114C, will provide the same content but delivered via the medium of Welsh.

**Module Content:** The following distribution of lecture material is indicative; due to the interactive mode of teaching it is subject to modification.

Introduction to the animal kingdom, evolutionary theories, molecular evolution and taxonomy

The invertebrates: form and function in sponges and radiate animals

Form and function in annelids, molluscs and echinoderms

Arthropod classification, form, function and diversity

Chordate characteristics and development

Fish diversity, form and function

Amphibians and reptiles: the evolution of terrestrial vertebrates

Mammalian diversity and physiology

Human evolution and behaviour

An introduction to ethology and the evolution of behaviour

Proximate mechanisms: senses, hormones and the Central Nervous System

Learning

Cultural transmission

Reproduction

Kinship, cooperation, signalling, and communication

Movements and migrations

Eating, and avoiding being eaten

Aggression and play

Human Behaviour

3 Practical sessions:

Museum practical

Fish dissection

Behavioural observations during practical

<p><b>Intended Learning Outcomes:</b> LO1) Knowledge of animal diversity, including classification, key physiological adaptations, their function, physiological constraints, evolution and adaptations in the environment</p> <p>LO2) Describe the behaviour of animals, with special regard to their ecology and evolution</p> <p>LO3) Describe the biology of parasites, predators and prey and their influence on host behaviour and population dynamics</p> <p>LO4) Work as a team and be able to utilise appropriate sampling and surveying techniques so that they can be employed in ecological and behavioural research and monitoring in the marine and terrestrial environment</p> <p>LO5) Draw links and identify themes between the range of scientific subject investigated within constructing meaning from oral, written, and numerical information through interpretation and summarising key components</p> <p>LO6) Analyse and interpret data derived from experimental observations in terms of their significance and in the context of established knowledge utilising appropriate statistical techniques.</p> <p>LO7) Use relevant literature, information and programme resources to support the design, execution and analysis of practical investigations.</p>	
<b>Assessment:</b>	<p>Examination (50%)</p> <p>Coursework 1 (15%)</p> <p>Coursework 2 (15%)</p> <p>Coursework 3 (20%)</p>
<p><b>Assessment Description:</b> Examination: 50% June</p> <p>Coursework 1: 15% June (museum assignment)</p> <p>Coursework 2: 15% June (fish dissection worksheet)</p> <p>Coursework 3: 20% June (ethogram)</p>	
<p><b>Moderation approach to main assessment:</b> Not applicable</p>	
<p><b>Assessment Feedback:</b> Formal feedback from lecturer, returned coursework with individual comments, summative assessment mark from exam</p>	
<p><b>Failure Redemption:</b> Re-sit exam; Re-submission of coursework</p>	
<p><b>Additional Notes:</b> Normally available to elective, visiting or exchange students. Please note that any failures are redeemed during the August resit period, so you must ensure your availability. Lecture and practical material may be subject to change depending on staff availability and weather conditions.</p>	

# BIO114C Amrywiaeth ac Ymddygiad Anifeiliaid

**Credits: 20 Session: 2023/24 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr GR Thomas

**Format:** 20 hours lectures, 16 hours practicals, 7 x 1 hour drop in sessions

**Delivery Method:** Addysgu cyfunol: darlithoedd, gweithdai, sesiynau ymarferol, e-Ddysgu

Blended learning: Lectures, workshops, practicals, eLearning

**Module Aims:** Mae'r modiwl 20 credyd hwn wedi'i rannu'n ddwy ran, gan gyflwyno myfyrwyr i amrywiaeth ac ymddygiad anifeiliaid. Mi fydd y 10 darlith gyntaf yn ystyried tacsonomeg a ffisioleg organebau o fewn teyrnas yr anifeiliaid, a gan ddarparu dealltwriaeth eang i fyfyrwyr o holl fywyd anifeiliaid, o brotsoa un-gellog drwodd i fegafauna fel y morfil glas, cyn gorffen gydag esblygiad dynol. Yn y 10 darlith canlyno, ystyriwyd y pwysau esblygiadol sy'n gyrru ymddygiad anifeiliaid cyn arwain at addasiadau a welwyd ar draws teyrnas yr anifeiliaid, gan gynnwys dysgu a throsglwyddo diwylliannol, ymddygiadau gwrth-ysgylafaethol, a mudo. Gorffennir yr adran gyda darlith ar ymddygiad dynol, gan esbonio sut ydym ni dan ddylanwad yr un set o reoliadau naturiol sy'n llywodraethu ein cymheiriaid gwyllt. Yn ystod y modiwl hwn, bydd myfyrwyr yn datblygu eu dealltwriaeth o ddosbarthiad anifeiliaid, cydberthynas ac esblygiad, ac yn ennill profiad ymarferol gwerthfawr o fioleg anifeiliaid. Mae'r modiwl hwn yw chwaer-fodiwl i BIO114, ac mae'n darparu'r un cynnwys ond yn cael ei gyflwyno trwy gyfrwng Cymraeg.

This 20 credit module is divided into two sections and broadly introduces students to the diversity of animal groups, and the study of animal behaviour. The first 10 lectures will consider the taxonomy and physiology of organisms within the animal kingdom, and will provide students with a broad understanding of all animal life, from single celled protozoa through to megafauna such as the blue whale and concluding with human evolution. The following 10 lectures will consider the evolutionary pressures that drive animal behaviour and give rise to the behavioural adaptations witnessed across the animal kingdom today, from learning and cultural transmission, to anti-predatory mechanisms and migration. The section is concluded with a lecture on human behaviour, determining how we are influenced by the same set of natural regulations that govern our wild counterparts. During this module, students will develop their understanding of animal classification, interrelationships and evolution, and will gain valuable practical experience of animal biology. This module is the sister module of BIO114, and provides the same content but delivered via the medium of Welsh.



**Module Content:** Mae'r dosbarthiad canlynol o ddeunydd darlithoedd ond yn esiampl; oherwydd y dull rhyngweithiol o addysgu mae'n amodol ar addasu.

Cyflwyniad i'r deyrnas anifeiliaid, damcaniaethau esblygiadol, esblygiad moleciwlaidd a thacsonomeg  
Yr invertebratau: ffurf a swyddogaeth mewn sbyngau ac anifeiliaid pelydrol  
Ffurf a swyddogaeth mewn anelidau, molysgiaid ac echinodermâu  
Dosbarthiad, ffurf, swyddogaeth ac amrywiaeth arthropod  
Nodweddion cordadau a datblygiad  
Amrywiaeth, ffurf a swyddogaeth pysgod  
Amffibiaid ac ymlusgiaid: esblygiad fertebratau daearol  
Amrywiaeth a ffisioleg mamaliaid  
Esblygiad ac ymddygiad dynol

Cyflwyniad i etholeg ac esblygiad ymddygiad  
Mecanweithiau agos: synhwyrâu, hormonau a'r System Nerfol Ganolog  
Dysgu  
Trosglwyddo diwylliannol  
Atgynhyrchu  
Perthynas, cydweithrediad, signalau, a chyfathrebu  
Symudiadau a mudo  
Bwyta, ac osgoi cael eu bwyta  
Ymosodol a chwarae  
Ymddygiad Dynol

3 sesiwn ymarferol:  
Ymweliad ag amgueddfa  
Dyraniad pysgod  
Arsylwadau ymddygiadol yn ystod sesiwn ymarferol

The following distribution of lecture material is indicative; due to the interactive mode of teaching it is subject to modification.

Introduction to the animal kingdom, evolutionary theories, molecular evolution and taxonomy  
The invertebrates: form and function in sponges and radiate animals  
Form and function in annelids, molluscs and echinoderms  
Arthropod classification, form, function and diversity  
Chordate characteristics and development  
Fish diversity, form and function  
Amphibians and reptiles: the evolution of terrestrial vertebrates  
Mammalian diversity and physiology  
Human evolution and behaviour

An introduction to ethology and the evolution of behaviour  
Proximate mechanisms: senses, hormones and the Central Nervous System  
Learning  
Cultural transmission  
Kinship, cooperation, signalling, and communication  
Movements and migrations  
Eating, and avoiding being eaten  
Aggression and play

3 Practical sessions:  
Museum practical  
Fish dissection  
Behavioural observations practical

<p><b>Intended Learning Outcomes:</b> CD1) Meddu ar wybodaeth am amrywiaeth anifeiliaid, gan gynnwys dosbarthiad, addasiadau ffisiolegol allweddol, ac eu swyddogaeth, cyfyngiadau ffisiolegol, esblygiad ac addasiadau i'r amgylchedd</p> <p>CD2) Yn gallu disgrifio ymddygiad anifeiliaid, gan roi sylw arbennig i'w hecoleg, esblygiad, a'u cadwraeth</p> <p>CD3) Disgrifo bioleg parasitiaid, ysglyfaethwyr ac ysglyfaeth a'u dylanwad ar ymddygiad a phoblogaethau organebau letyol</p> <p>CD4) Gweithio fel tîm a gallu defnyddio technegau samplu ac arolygu priodol fel y gellir ei ddefnyddio mewn ymchwil a monitro ecolegol ac ymddygiadol yn yr amgylchedd morol a daearol</p> <p>CD5) Llunio cysylltiadau a nodi themâu rhwng yr ystod o bynciau gwyddonol yr ymchwilir iddo, gan lunio ystyr o wybodaeth ar lafar, yn ysgrifenedig ac yn rhifiadol trwy ddehongli a chrynhoi cydrannau allweddol</p> <p>CD6) Dadansoddi a dehongli data sy'n deillio o arsylwadau arbrofol, eu harwyddocâd ac o fewn y cyddestun sefydledig gan ddefnyddio technegau ystadegol priodol.</p> <p>CD7) Defnyddio llenyddiaeth ac adnoddau rhaglenni perthnasol i ddylunio, gweithredu a dadansoddi ymchwiliadau ymarferol.</p> <p>CD8) Perfformio dyraniadau ar anifeiliaid fertebrataidd (pysgod) ac infertebrataidd (cranc)</p>	
<p>LO1) Have knowledge of animal diversity, including classification, key physiological adaptations, their function, physiological constraints, evolution and adaptations in the environment</p> <p>LO2) Be able to describe the behaviour of animals, with special regard to their ecology, evolution, and conservation</p> <p>LO3) Describe the biology of parasites, predators and prey and their influence on host behaviour and population dynamics</p> <p>LO4) Work as a team and be able to utilise appropriate sampling and surveying techniques so that they can be employed in ecological and behavioural research and monitoring in the marine and terrestrial environment</p> <p>LO5) Draw links and identify themes between the range of scientific subject investigated within, constructing meaning from oral, written, and numerical information through interpretation and summarising key components</p> <p>LO6) Analyse and interpret data derived from experimental observations in terms of their significance and in the context of established knowledge utilising appropriate statistical techniques.</p> <p>LO7) Use relevant literature, information and programme resources to support the design, execution and analysis of practical investigations.</p> <p>LO8) Perform dissections on a vertebrate (fish) and an invertebrate (crab)</p>	
<b>Assessment:</b>	<p>Examination (50%)</p> <p>Coursework 1 (15%)</p> <p>Coursework 2 (15%)</p> <p>Coursework 3 (20%)</p>
<p><b>Assessment Description:</b> Arholiad: 50% Mehefin</p> <p>Gwaith cwrs 1: 15% Mehefin (amgueddfa)</p> <p>Gwaith cwrs 2: 15% Mehefin (dyraniad pysgod)</p> <p>Gwaith cwrs 3: 20% Mehefin (ethogram aseiniad ymddygiad)</p> <p>Examination: 50% June</p> <p>Coursework 1: 15% June (museum assignment)</p> <p>Coursework 2: 15% June (fish dissection worksheet)</p> <p>Coursework 3: 20% June (ethogram behavior assignment)</p>	
<p><b>Moderation approach to main assessment:</b> Not applicable</p>	
<p><b>Assessment Feedback:</b> Adborth ffurfiol gan y darlithydd, dychwelyd gwaith cwrs gyda sylwadau. Marc asesu o'r arholiad</p> <p>Formal feedback from lecturer, returned coursework with comments.</p> <p>Summative assessment mark from exam</p>	

**Failure Redemption:** Ail-eistedd arholiad  
Ailgyflwyno gwaith cwrs

Re-sit exam

Re-submission of coursework

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

Cymraeg yw iaith y modiwl hwn. Fel arfer, mae ar gael i fyfyrwyr dewisol, ymweld neu gyfnewid. Sylwch fod unrhyw ail-eistedd neu elfennau a fethwyd yn cael eu ail-eistedd yn ystod mis Awst, felly mae'n rhaid i chi sicrhau eich bod ar gael yn ystod yr adeg yna. Gall darlithoedd a deunydd ymarferol newid mewn ymateb i argaeledd staff ac amodau tywydd.

The language of instruction in this module is Welsh. Normally available to elective, visiting or exchange students. Please note that any failures are redeemed during the August resit period, so you must ensure your availability. Lecture and practical material may be subject to change depending on staff availability and weather conditions.