Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

Year 3 (FHEQ LEVEL 6)

MARINE BIOLOGY

DEGREE PROGRAMMES

SUBJECT SPECIFIC
PART TWO OF TWO
MODULE AND COURSE STRUCTURE
2022-23

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 22-23 academic year begins on 19 September 2022

Full term dates can be found here

DATES OF 22-23 TERMS

19 September 2022 – 16 December 2022

9 January 2023 – 31 March 2023

24 April 2023 – 09 June 2023

SEMESTER 1

19 September 2022 – 27 January 2023

SEMESTER 2

30 January 2023 – 09 June 2023

SUMMER

12 June 2023 – 22 September 2023

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. You should also refer to the Faculty of Science and Engineering proof-reading policy and this can be found on the Community HUB on Canvas, under Course Documents.

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.

This has been a challenging period for everyone. The COVID-19 pandemic has prompted a huge change in society as well as how we deliver our programmes at Swansea University and the way in which you study, research, learn and collaborate. We have been working hard to make sure you will have or continue to having an excellent experience with us.

We have further developed some exciting new approaches that I know you will enjoy, both on campus and online, and we cannot wait to share these with you.

At Swansea University and in the Faculty of Science & 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 staff, administrators, and your fellow students - I'm sure you will find many friendly helping hands ready to assist you.

We all know this period of change will continue and we will need to adapt and innovate to continue to be supportive and successful. At Swansea we are committed to making sure our students are fully involved in and informed about our response to challenges.

In the meantime, learn, create, collaborate, and most of all – enjoy yourself!

Professor Johann (Hans) Sienz
Interim Pro-Vice Chancellor/Interim Executive Dean
Faculty of Science and Engineering

Faculty of Science and Engineering	
Interim Pro-Vice Chancellor/Interim Executive Dean	Professor Johann Sienz
Head of Operations	Mrs Ruth Bunting
Associate Dean – Student Learning and Experience (SLE)	Professor Paul Holland
School of Biosciences, Geography and Physics **Head of School: Siwan Davies**	
School Education Lead	Dr Laura Roberts
Head of Biosciences	Professor Geoff Profitt
Biosciences Programme Director	Dr Wendy Harris
Year Coordinators	Year 1 – Dr Chris Lowe Year 2 – Dr Kevin Arbuckle Year 3 – Dr Ed Pope MSc – Dr Aisling Devine

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 9am-5pm.

The **Student Support Team** provides dedicated and professional support to all studentsin 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 (Monday–Friday, 9am–5pm)

Call: +44 (0) 1792 295514 and 01792 6062522 (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 otherresources:

https://myuni.swansea.ac.uk/fse/coe-student-info/

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 22-23 handbooks to ensure that you have access to the most up-to-date versions. Access to print material in the library may be limited due to CV-19; your reading lists will link to on-line material whenever possible. 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/

FIELDCOURSES AND PRACTICALS

Year 2 Local Residential Field courses

After successful completion of Year 1, you will take a compulsory Year 2 local residential field course in your subject area usually in early September, before induction week. Information regarding finals dates is sent early in the second semester.

Practical Attendance

Modules have up to 3 weeks of practical work and, when a module is running, students taking that module will work in a laboratory for approximately 3 hour slots on **one** day (time of practical may vary between modules). The practicals for BIO – prefixed modules will take place in **Laboratory 115 or 118** in the Wallace Building or **Laboratory M100** in the Margam Building. There are also some computer-based practical classes, please refer to your timetable for the date and location of these. You lecturer will inform you of the correct session to attend. **You can only attend the session that you have been allocated.**

It is particularly important that students should attend at the start of each practical class as it is then that the work for the session is explained and late arrival may well jeopardise your chance of understanding the content of that class.

The lecturers delivering the practicals will inform students how practical work should be submitted for assessment. Sometimes you will be told that practical work for marking will be collected from you at the end of the laboratory class. For other practicals you will submit onto Turnitin through Canvas.

Attendance at practical classes is compulsory, and absence must be covered by Extenuating Circumstances or will result in a Zero for associated assessment.

For practical classes each student will require the following:-

(a) A **laboratory overall**; students are expected to wear an overall during practical classes and will **not** be admitted to a class unless they do so.

(b) **Safety glasses/goggles**; these must be brought to all practical classes and must be worn unless the lecturer in charge allows dispensation.

(c) **Your own paper** and **pencils** etc.

(d) **Dissection kit**: standard dissection kit containing forceps, seekers, scalpels, scissors and a hand lens.

If you do not already have them, laboratory coats, safety glasses and dissection kits should be purchased before the start of your practical.

USE OF ANIMALS IN TEACHING - POLICY STATEMENT

We ensure a responsible and ethical policy in the use of living or dead animals in teaching. We ensure a minimum number of animals will be used in any class that requires them and always seek alternatives to the use of animals where possible. The use of live animals for teaching is reconsidered at regular intervals and subject to strict ethical reviews. In addition to conformity to Home Office regulations, we endorse an approach which emphasises the importance of avoiding trivial exercises, minimising stress, choosing the right species, ensuring correct sample size and minimising durations of experiments.

There are clear moral and technical distinctions between vivisection (surgery on live animals) and dissection and these should be appreciated. In Swansea, **no** student practicals involve vivisection as the term is generally understood, however a small of practicals may involve the use of dead animals. Students and staff are expected to handle animal material respectfully and sparingly.

The use of animal material **is not** a necessary component in the training of Bioscientisits and we **do** use alternatives (videos, models and museum material) wherever possible. **Alternative assessments will be made available if you choose not to participate.**

Year 3 (FHEQ Level 6) 2022/23
Marine Biology
BSc Marine Biology[C160,C160]
BSc Marine Biology with a Year Abroad[C107]
BSc Marine Biology with a Year in Industry[C424]

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
BIO346 **Professional Skills in Marine Biology** **20 Credits** **Dr N Esteban/Miss CM Bertelli/Dr CE Davies/Dr N Franconi/...**	
BIO350 **Biosciences Research Project** **30 Credits** **Dr EC Pope**	
Total 120 Credits	

Optional Modules

Choose a minimum of 30 credits

BIO313	Diseases of aquatic animals	Prof AF Rowley/Dr CE Davies	TB2	10
BIO318	Ecology of Marine Megafauna	Prof RP Wilson	TB2	10
BIO329	Climate Change Biology	Prof KW Tang	TB1	10
BIO330	Tropical marine ecology and conservation	Dr CE Davies/Dr N Esteban	TB1	10
BIO335	Fisheries and aquaculture	Prof C Garcia De Leaniz/Dr SI Da Silva Pires Marques Barrento	TB2	10
BIO338	Polar Biology	Prof KW Tang	TB2	10

And

Choose a maximum of 40 credits

No more than 70 credits can be selected from any one semester.

BIO334	Advanced Data Analysis	Dr JC Bull	TB1	10
BIO337	Biodiversity	Dr JN Griffin	TB1	10
BIO342	Sensory Ecology	Dr WL Allen	TB2	10
BIO344	Hormones and Behaviour	Dr I Fuertbauer	TB2	10
BIO345	Macroevolution and Phylogenies	Dr K Arbuckle	TB1	10
BIO355	Animal behaviour - from individuals to groups	Dr AJ King/Dr I Fuertbauer	TB2	10

Or

Choose exactly 20 credits

May Select ONLY 1

BIO327	Tropical marine ecology field course	Dr RKF Unsworth/Miss CM Bertelli/Dr N Esteban/..	TB2	20
BIO340	Professional Laboratory Skills	Dr EC Sonnenschein/Dr MPS Gwilliam/Dr TM Uren Webster/..	TB2	20
GEB300	Gwaith Maes Gwlad yr Ia	Dr RH Meara/Dr OH Elias/Dr GR Thomas/..	TB2	20

BIO313 Diseases of aquatic animals

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof AF Rowley, Dr CE Davies

Format: 15 lectures and demonstration session (2h)

Delivery Method: Lectures

Module Aims: This is a research-led module that explores recent advances in knowledge of diseases of aquatic organisms with particular reference to invertebrates (mainly crustaceans and molluscs) and fish of commercial significance

Module Content: Syllabus

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

This module will consist of 15 lectures/seminars on the following topics:

• Introduction to the concept of disease and its ecological relevance to aquatic environments
• Diseases of animals of relevance to aquaculture, includign biosecurity and the conept of global food security
• Coral bleaching & potential anthropogenic effects
• Emerging diseases and their threat to fisheries and aquaculture

Intended Learning Outcomes: At the end of the module, students should be able to:

LO1) Evaluate the importance and summarise the diversity of diseases in aquatic ecosystems
LO2) Review critically recent developments that predict changes in aquatic diseases with respect to climate change
LO3) Report on the nature of recent key advances in relevant knowledge and data acquisition at the level of primary research
LO4) Consider the complexity of aquatic diseases by referencing to the coral holobiont theory

Assessment: Examination (60%)
Coursework 1 (40%)

Assessment Description: Alternative exam:

Analytical question (33.3%)
1000 word essay question (33.3%)
1000 word directed Reading question (33.3%)

Moderation approach to main assessment: Not applicable

Assessment Feedback: Comments on examination scripts.

Failure Redemption: Resit failed components

Additional Notes: All modules are subject to staff availability and may be restricted by student number or prerequisites
Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules.

BIO318 Ecology of Marine Megafauna

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof RP Wilson

Format: This is a lecture-based module, with additional content being discussed in seminars
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

This is a lecture-based module, with additional content being discussed in seminars

Module Aims: This is a research-led module that explores the free-living behaviour of a range of marine animals through recent advances in biotelemetry such as satellite tracking and use of miniaturized dive computers and activity sensors attached to animals ranging from fish to air-breathing vertebrates.

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

This module will consist of 12 lectures/seminars in the following topics:

- Adaptations for diving in air-breathing vertebrates
- Diving behaviour in air-breathing vertebrates
- Patterns of movement across scales in marine vertebrates
- Patterns of energy expenditure as relates to behavioural optimization
- Technologies for tracking and diving studies.

Because of the nature of this module, reporting recent advances in the subject area, the precise syllabus is subject to change.

Intended Learning Outcomes: At the end of the module, students should be able to:

LO1) Critically evaluate data from state-of-the-art tracking and logging devices.
LO2) Draw critical connections between factors affecting spatial and temporal patchiness of foraging success.
LO3) Critically describe and explain feeding mechanisms of marine vertebrates.
LO4) Design detailed experiments and research protocols for studying free-living marine animals.

Assessment: Examination 1 (40%)
Coursework 1 (30%)
Coursework 2 (30%)

Assessment Description: Assessments consist of:
Coursework 1: Essay (30%)
Coursework 2: Essay (30%)
Examination 1: Analytical question (40%)

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Feedback on exam scripts as well as direct formative feedback from the lecturer where necessary

Failure Redemption: As a level 3 module all marks are recorded in final year examination, there are no re-sits

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

All modules are subject to staff availability and may be restricted by student number or prerequisites
Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules

BIO327 Tropical marine ecology field course

Credits: 20 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr RKF Unsworth, Miss CM Bertelli, Dr N Esteban, Dr M Lurgi Rivera, Dr PJ Neyland

Format:

Delivery Method: Blended learning (e-learning, direct teaching and practicals)

Module Aims: This field based module will provide students with an introduction to the ecology of tropical marine systems and teach students the key practical skills required by tropical marine biologists. Students will obtain training in how to design, implement and report scientifically robust marine research. The module will complement the level three marine field course and help develop key skills in field based marine biology. Students will learn skills in marine ecology and taxonomy, in-water marine sampling and surveys, and impact assessment.

This module will be mostly practical based but will also include theory lectures, workshops and feedback sessions. It would be structured around seven days of directed practical activities and a three day small group based mini-project. The field course will utilise snorkeling and intertidal walking as the major means of sampling throughout directed practical's.

Module Content: This field based module will provide students with an introduction to the ecology of tropical marine systems and teach students the key practical skills required by tropical marine biologists.

Students will obtain training in how to design, implement and report scientifically robust marine research.

The module will complement the temperate marine field course and help develop key skills in field based marine biology, providing preparation for students' final year dissertation projects.

Students will learn skills in marine ecology and taxonomy, in-water marine sampling and surveys, and impact assessment.

This module will be mostly practical based but will also include theory lectures, workshops and feedback sessions. It would be structured around seven days of directed practical activities and a three day small group based mini-project.

The field course will utilise snorkeling and intertidal walking as the major means of sampling throughout directed practicals.

Intended Learning Outcomes: Students will be able to:
LO1) Demonstrate knowledge of the ecology of tropical marine organisms and systems
LO2) Have a detailed knowledge of how to assess the resources and status of tropical marine species and systems
LO3) Effectively undertake different marine sampling techniques
LO4) Recognize the major threats to tropical marine species and systems
LO5) Develop key information about the taxonomy of the flora and fauna present in these biodiverse systems
LO6) Describe the anatomy and diet of tropical fish
LO7) Use a field note book to effectively record observations
LO8) Effectively communicate scientific information through oral presentations and reports

Assessment:
Coursework 1 (10%)
Coursework 2 (10%)
Coursework 3 (5%)
Coursework 4 (10%)
Coursework 5 (40%)
Coursework 6 (25%)

Assessment Description: Three assignments will form the major component of the assessment. In addition students will be assessed for their identification skills and their general performance throughout the field course.
The module will consist of the following assessments:

Species identification spot test prior to departure (formative assessment)
Field note book (directed content) - not assessed
CW1 Mini lit review (10%)
CW2 Taught activities - general performance during in water training - assessment of data submission (10%)
CW3 On-site group oral presentation of project plan (5%)
CW4 On-site group oral presentation of project results and implications (10%)
CW5 Research paper write up of mini-project (in style of a journal paper) (40%)
CW6 Formal poster presentation (on return to the UK) (25%)

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Communications with tutor
Personal contact during practicals and written feedback on assignments
Oral group feedback on presentations

Failure Redemption: Resubmission of practical work. Alternative desk based assignment in lieu of unrepeatable practical assessments (General performance and field note book).

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

This is a level 6 Biosciences module available to all biology, zoology and geography students, however marine biology students take priority on available places. Due to the high additional cost of the module it is not compulsory to any degree scheme and the University offers alternative modules.

BIO329 Climate Change Biology

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof KW Tang

Format: Lectures = 13;
Paper discussions = 3;
Tutorial = 1;
Drop-in sessions = 2;
Review session = 1
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
Paper discussions
Tutorial
Drop-in meetings

Module Aims: The module examines the intricate connections between air, land and water in regulating the global climate system, and how that in turn affects planetary scale biology and ecology. Major past and present climate events and projected climate change, and their global ecological and environmental consequences will also be covered.

Module Content: Lectures:
1. Our planet's climate system - basic characteristics and driving forces; timescales, feedbacks and variations
2. Basic planetary physics in climate regulation - heat balance; ocean and atmospheric circulations; tropical cyclone formation
3. Basic planetary chemistry in climate regulation - sea-air gas exchange; oceanic control of carbon; rock cycle; transfer of particles and aerosols
4. Basic planetary biogeochemistry in climate regulation - climatically active bioproducts; biogeochemical cycles and climate
5. Climate history: glacial-interglacial cycle and global change - methods in palaeoclimatology; geological evolution of climate; Quaternary glaciations
6. Climate history: the last 12,000 years and its impacts on human history - Medieval Warm Period; Little Ice Age; effects on human history
7. ENSO: from climate to fish and beyond - tropospheric pressure systems; Southern Oscillation; El Nino and La Nina; teleconnections
8. Gulf Stream and NAO: linchpin of Europe's climate - discovery and significance of the Gulf Stream; NAO effects on North Atlantic climate and ecology
9. PDO: from fish to climate and beyond - discovery and significance of PDO; effects on Pacific climate and ecology; synergistic effects with ENSO; other climate indices
10. Our planet's future - CO_2 and global warming; natural variability vs. anthropogenic forcing; projected trends
11. Our planet's future - socioeconomic impacts; climate change in coastal zones
12. Our planet's future - ocean acidification
13. Our planet's future - mitigation and response; prospect of geoengineering

Paper discussions:
1. Kasting et al. (1988) How climate evolved on the terrestrial planets. Scientific America 256:90-97
2. Rahmstorf (2002) Ocean circulation and climate during the past 120,000 years. Nature 419:207-214
3. Zhang et al. (2007) Global climate change, war, and population decline in recent human history. PNAS 104:19214-19219

Tutorial:
Radiative budget model and simple box model for climate change predictions

Topics described are indicative and may be subject to change due to staff availability

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

LO1) Compare and contrast the evolution of different planetary climate systems (plate tectonics, carbonate cycle, atmospheric chemistry).
LO2) Explain how planetary physics (heat balance, mass transport, atmospheric and ocean circulations) affects the global climate.
LO3) Explain how planetary chemistry (trace gases, carbonate system, nutrient cycles) affects the global climate.
LO4) Describe and discuss the formation of major climate and weather phenomena and their effects on global ecology.
LO5) Interpret historical climate data and relate them to impacts on life on Earth.
LO6) Demonstrate knowledge of the ecological and socioeconomic impacts of recent rapid climate change.

Assessment: Coursework 1 (10%)
Coursework 2 (20%)
Coursework 3 (10%)
Coursework 4 (60%)

Assessment Description: coursework 1 = 10% (short questions based on paper discussion; 300 words max.)
coursework 2 = 20% (short questions and quantitative skill questions based on paper discussion; 500 words max.)
coursework 3 = 10% (short questions based on paper discussion; 300 words max.)
coursework 4 = 60% (directed reading essay based on independent literature research; 1500 words max.)

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Written feedback on writing assignments and exam scripts. Individual formative verbal feedback during drop-in sessions.

Failure Redemption: Year 3 modules can be failed down to zero. August deferrals can be provided under extenuating circumstances.

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

All modules are subject to staff availability and may be restricted by student number. No pre-requisite required. Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules.

BIO330 Tropical marine ecology and conservation

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr CE Davies, Dr N Esteban

Format: Lecture based contact hours (100%)
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

Lecture based

Module Aims: This module will provide a holistic overview of the ecology and conservation of important marine ecosystems, and will place this information within the context of ecosystem services, and their value to humanity.

This module will consist of up to 12 lectures/seminars on the following topics:

• Diversity and biology of coral reef communities
• Structure and function of seagrass meadows (temperate and tropical)
• Mangrove forest ecology
• Connectivity across the tropical marine seascape
• The ecosystem services of tropical marine systems
• Response of coral reef systems to climate change and ocean acidification
• Degradation of tropical marine systems
• Resilience thinking and the management of tropical marine systems

The module also contains a workshop session and additional direct contact with the module lead lecturer.

Module Content: - Diversity and biology of coral reef communities
- Structure and function of seagrass meadows (temperate and tropical)
- Mangrove forest ecology
- Connectivity across the tropical marine seascape
- The ecosystem services of tropical marine systems
- Response of coral reef systems to climate change and ocean acidification
- Degradation of tropical marine systems
- Resilience thinking and the management of tropical marine systems

Intended Learning Outcomes: LO1) Develop an up-to-date knowledge of the ecology and biology of tropical marine systems,

LO2) Be able to describe the major factors driving the diversity and productivity of tropical marine systems,

LO3) Demonstrate a synthesis of the ecosystem service value of tropical marine systems,

LO4) Articulate how local, regional and global scale anthropogenic processes are degrading tropical marine systems,

LO5) Have a knowledge base of how these complex ecosystems can be managed in a sustainable manner.

Assessment: Coursework 1 (50%)
Coursework 2 (50%)

Assessment Description: Short Essay – Mangroves =50%
Infographic – Seagrass = 50%

Moderation approach to main assessment: Not applicable

Assessment Feedback: Annotated examination scripts

Failure Redemption: Year 3 modules can be failed down to zero. August deferrals can be provided under extenuating circumstances.

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

All modules are subject to staff availability and may be restricted by student number or prerequisites.
This module also provides compulsory preparation for students undertaking the Tropical marine field module (BIO327)
Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules.

BIO334 Advanced Data Analysis

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr JC Bull

Format: 6 hour lectures, 12 hours practical IT workshops and revision sessions.

Delivery Method: 6 hours of lectures. 12 hours practical IT workshops and revision sessions.

Module Aims: This module extends core knowledge of statistical computing to cover a range of more specialized topics of particular importance to the analysis of real world biological datasets, such as those collected for final year undergraduate research dissertations. We use the R software environment; building on experience of this gained during the core Second Year module, BIO252 – Ecological Data Analysis. Students will be guided through 6 computer-based workshops / practicals, including brief introductory lectures to each topic. The workshops, and associated additional guidance, will cover 5 key themes: 1) Linear modelling refresher, 2) Experimental design and analysis, 3) Generalised Linear Modelling A - Count data, 4) Generalised Linear Modelling B - Proportion data, 5) Non-parametric analysis. The final week will be based around further practice and revision sessions. The module will be subject to continuous assessment, consisting of 3 in-class tests under exam conditions, throughout the course (equivalent to the 'Analytical' question in all final year Biosciences exams). In addition, students will complete a coursework assignment after the course, where they will gain additional experience of analysis and interpreting biological data.

Module Content: Computer-based workshops:
1). Linear modelling refresher,
2). Experimental design and analysis,
3). Generalised Linear Modelling A - Count data,
4). Generalised Linear Modelling B - Proportion data,
5). Non-parametric analysis revisited.

Intended Learning Outcomes: Successful completion of this module will equip students with an appropriate range of advanced statistical skills to handle real world biological datasets. This will give students specific skills of particular relevance to final year undergraduate research dissertations, as well as preparing them for a range of careers where biological / environmental data analysis is needed.
The course will cover:
LO1) visualization of data
LO2) generating appropriate hypotheses
LO3) formulating statistical models to test hypotheses,
LO4) statistical analysis,
LO5) programming skills using R
LO6) interpretation and presentation of biological data analysis.

These outcomes will crucially rely on independent learning by the students between each of the weekly workshops. As each workshop will build upon the material learned in the previous sessions, which will need to be assimilated and practiced independently, regular work by the students each week after each workshop will be essential. Also, without essential independent learning, following the instructions provided during each workshop, student will not be able to satisfactorily complete the continuous assessments or coursework.

Assessment: Assignment 1 (20%)
Assignment 2 (20%)
Coursework 1 (60%)

Assessment Description: In Class test 1: Experimental design and analysis.
In Class test 2: Generalised Linear Modelling of count data.
In Class test 3: Generalised Linear Modelling of proportion data.

In Class tests 1-3 are mapped to be equivalent to a typical 'Analytical' question in a Biosciences final year end of module exam.

Coursework 1: Writing a suitable quantitative methods section in the style of a scientific paper. Performing an appropriate statistical analysis, interpreting results, and presenting in the form of a results section in the style of a scientific paper.

The end of module assignment is mapped to be equivalent to the essay questions, making up the remainder of a Biosciences final year end of module exam.

Moderation approach to main assessment: Second marking as sampling or moderation
Assessment Feedback: One-to-one feedback during the workshops by both lecturers and teaching assistants to students. Additional Stats Help sessions to provide feedback and repetitions during the course.
Failure Redemption: Re submission of continuous assessment and coursework
Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus. All modules are subject to staff availability and may be restricted by student number or prerequisites Syllabus as stated is subject to modification due to staff availability Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules

BIO335 Fisheries and aquaculture

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof C Garcia De Leaniz, Dr SI Da Silva Pires Marques Barrento

Format: 15 lectures, plus drop in sessions

Delivery Method: On Campus

Module Aims: This module provides an introduction to the operation and management of commercial fisheries with particular relevance to the current over-exploitation and decline of most commercial fish stocks, and the potential for changing this situation by using aquaculture

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

This module will typically consist of 15 lectures/seminars on the following topics:

- Introduction to world fisheries, marine fish stocks and their identification
- Aims of fisheries management, ageing techniques, models of fish growth and mortality and their calculation
- Recruitment and year class strength and causes of its variation
- Variation in the distribution and abundance of fish and their behavior under exploitation
- Background to, and shortcomings of surplus production, analytic and cohort analysis models
- Operation of commercial fishing gears, their target species, environmental impacts & design improvements
- Importance of life history strategy of target species to survival under exploitation
- Deep sea and industrial fisheries
- Options for future management
- Principles of Sustainable Aquaculture
- Aquaculture and food security

Intended Learning Outcomes: After completion of the module the student will -
LO1) have a fundamental appreciation of issues in fisheries management and aquaculture
LO2) be able to describe the nature and distribution of fish stocks and aquaculture methods
LO3) have acquired a fundamental understanding of the von Bertalanffy model of fish growth and its relevance in fisheries management
LO4) be able to critically evaluate the different types of commercial fishing gear, their target species, environmental impact and recent improvements
LO5) be able to evaluate the shortcomings of past management techniques and the options available for the future

Assessment:
Coursework 1 (20%)
Coursework 2 (30%)
Coursework 3 (25%)
Coursework 4 (25%)

Assessment Description: C1 Fish consumer survey – 30%
C2 Aquaculture assignment – 25%
C3 5 x 4 min quizzes – 20%
C4 Fisheries assignment – 25%

Moderation approach to main assessment: Universal second marking as check or audit

Assessment Feedback: Feedback on Coursework

Failure Redemption: As a level 3 module all marks are recorded in assessments, there are no re-sits

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

All modules are subject to staff availability and may be restricted by student number or prerequisites
Please note that any failures are non-redeemable, there are no resits for Year 3 modules. This module is only available to marine biology students

BIO337 Biodiversity

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr JN Griffin

Format: 15 Lectures
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

Module Aims: Biodiversity (or biological diversity) is the 'variety of life' at all levels of organisation -- from genes to ecosystems. This module will explore the foundational and very latest research exploring spatial and temporal patterns of biodiversity, how biodiversity is related to the functioning of ecosystems, the growing extinction threat, and global strategies to conserve biodiversity.

Module Content: This module will be largely lecture-based, with a directed reading component. The module will provide a detailed consideration of the complexity of the issue of biodiversity, its consequences for a functioning ecosystem and the wider implications for society and global systems. The major themes covered will include:

The complex concept of Biodiversity will be carefully defined, and its various elements (from genes to ecosystems) discussed. Specific attention will be paid to the most commonly used measure of biodiversity -- the species unit.

Spatial patterns in Biodiversity, from local to the global scale. Focus will be on describing and explaining the macro-scale patterns in biodiversity, including variation with latitude, altitude (terrestrial) and depth (marine).

Changes in Biodiversity over deep geological time, from the origin of life to the present day. The causes and evolutionary consequences of the 'big five' past mass extinctions will be discussed.

Human caused extinctions, including pre-historic extinctions, recent extinctions and projected species extinctions. These events will be placed in the context of the 'big five' to ask whether we are facing the '6th mass extinction'.

Cutting-edge research addressing the possible consequences of extinctions for the structure and functioning of ecosystems. The links between various aspects of biodiversity (species, functional, phylogenetic) and various ecosystem functions (including stability) will be discussed. Furthermore, the possibility that primary species extinctions could cause cascades of secondary extinctions will be evaluated.

Consideration of whether biodiversity is linked to ecosystem services. Although the link between whole ecological communities and valuable ecosystem services is well-established, whether biodiversity per se influences services remains a research frontier.

Discussion on the various strategies being used to maintain (e.g. in situ and ex situ conservation) and store (e.g., seed banks) biodiversity and the controversial topic of de-extinction (bringing species back through synthetic biology).

Intended Learning Outcomes: By the end of the module students will be able to:
LO1) Define 'biodiversity' and explain its various dimensions.
LO2) Describe and explain the main spatial and temporal patterns in biodiversity.
LO3) Discuss the main drivers of modern biodiversity loss, and discuss why certain habitats and species are more vulnerable than others.
LO4) Describe and explain the role of biodiversity in the functioning of ecosystems and provisioning of ecosystem services to humans.
LO5) Discuss and critically evaluate strategies of conserving biodiversity, from genes to ecosystems.

Assessment: Coursework 2 (20%)
Coursework 3 (40%)
Coursework 1 (40%)

Assessment Description: Coursework 1. Understanding biodiversity and the drivers of its loss.
Three-part essay question, with each answer a maximum of 500 words (with references additional). The questions will cover: a) what is biodiversity and its various components and ways of measurement; and how is biodiversity distributed globally and across taxa; b) what are the main drivers of biodiversity loss, with examples; c) what are the patterns of biodiversity loss across taxonomic groups and according to species' traits?

Coursework 2. Analysis of a biodiversity experiment.
1000 word report, including statistical analysis and figures.
Skills: data handling, data analysis, data presentation, interpretation, critical analysis/thinking to place in broader context

Coursework 3. Understanding biodiversity and ecosystem functioning in the real world and its connections to people
Three-part essay question. Biodiversity – stability relationships; b) biodiversity – functioning across heterogeneous real world ecosystems; c) biodiversity, services, human wellbeing.
500 words for each part.

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Final year exams will not have formal feedback provided.

Failure Redemption: As a level 3 module all marks are recorded in final year examination, there are no re-sits. Year 3 modules can be failed down to zero. August deferrals can be provided under extenuating circumstances.

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

All modules are subject to staff availability and may be restricted by student number or prerequisites. Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules

BIO338 Polar Biology

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof KW Tang

Format: Lectures = 13 hours; Paper discussions = 4 hours; Drop-in sessions = 2 hours; Review session = 1 hour
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, paper discussions, drop-in meetings

Module Aims: This module considers the ecology of the polar region. Topics are organised into six themes: 1) History of polar exploration; 2) Characteristics of the environments; 3) Major wildlife; 4) Adaptation strategies; 5) Ecosystem dynamics; 6) Changes and threats. Lectures will be complemented by paper discussions.

Module Content: The module is organised around six main themes:

1. The history: Heroic age of polar exploration; Modern-day polar exploration and research
2. The environment: Geological formation of the polar oceans; Environmental conditions; Sea ice and deep water formation; Dry Valleys, subglacial lakes, fjords, tundra
3. The wildlife: Polar vertebrates and their evolutionary history; Krill and zooplankton migration; Vegetation; Biodiversity pattern
4. Adaptations: The challenges of living in the polar regions; Concept of Q10 and the basics of thermal biology; Different ways to deal with cold temperature; Adaptations by vegetation
5. The ecosystem: Phytoplankton and primary production; Iron limitation and ocean fertilisation; Biological pump; Sea ice dynamics and biological production; The importance of krill; Antarctic vs. Arctic marine food web
6. Changes and threats: Ozone depletion & UV exposure; Fishing and hunting pressure; Pollution; Climate change; Other disturbances

Lectures will be complemented by paper discussions. Extensive extra directed reading is expected.

Intended Learning Outcomes: At the end of this module the students will:

LO1) Demonstrate an appreciation of the extreme environmental conditions in the polar region
LO2) Be able to compare and contrast wildlife in polar regions and those in lower latitudes
LO3) Be able to describe strategies used by organisms to adapt to the polar environment
LO4) Demonstrate detailed understanding of food web structure and dynamics in the polar oceans
LO5) Be able to describe recent changes and threats to the polar ecosystems

Assessment:
Examination (40%)
Coursework 1 (5%)
Coursework 2 (10%)
Coursework 3 (5%)
Coursework 4 (40%)

Assessment Description: EXAM: Essay question (40%)

FINAL COURSWORK: Directed reading question (40%)

CONTINUOUS COURSEWORK (20%)
5% assignment 1
10% assignment 2
5% assignment 3

Moderation approach to main assessment: Universal non-blind double marking

Assessment Feedback: Individual formative verbal feedback during drop-in sessions; written feedback on writing assignments and exam scripts.

Failure Redemption: As a Level 3 module, there are no re-sits or alternative course works. Year 3 modules can be failed down to zero. August deferrals can be provided under extenuating circumstances.

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

All modules are subject to staff availability and may be restricted by student number or prerequisites

Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules

BIO340 Professional Laboratory Skills

Credits: 20 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr EC Sonnenschein, Dr MPS Gwilliam, Dr TM Uren Webster, Dr M Wood

Format: 4 (x 6 hours) practicals, 5 (x 1 hour) lectures, 1 (x 6 hours) workshop, 1 (x3 hours) drop-in session, 1 (x 2h feedback session)
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

On campus: lectures; use of computer- and wet-laboratories; workshop for data analysis and report writing.

Module Aims: Professional Laboratory Skills is a module that provides students with the opportunity to gain practical experience of fundamental and advanced laboratory techniques in the broad area of biomolecular sciences. BIO340 consists of four intense laboratory sessions: two conducted in the wet-lab and two conducted in the computer lab. This blend of in vitro and in silico experimentation reflects the skills needed by modern biology graduates. Each session will have a theme: (1) protein biochemistry, (2) in silico structural manipulations, (3) PCR-techniques and gel electrophoresis, (4) Bioinformatics.

Students will examine the structure-function relationship of a conserved, yet functionally diverse, family of proteins. Such proteins are found in plants, animals (including invertebrates) and microorganisms.

[It should be noted that this module runs out of term time (usually early September), in a similar manner to residential field courses]

Module Content: This module will entail:

Good laboratory practice (Health and Safety)

Laboratory Practicals:
(1) Protein biochemistry I: enzyme kinetics
(2) Protein biochemistry II: in silico structural manipulations
(3) Molecular Biology I: PCR techniques and gel electrophoresis
(4) Molecular Biology II: Bioinformatics
(5) Workshop: Data handling and presentation

Lectures
(1) Applied enzymology
(2) Solving protein structures
(3) Gel electrophoresis and PCR-based methodologies
(4) Bioinformatics and molecular phylogenetics
(5) Good lab practice (GLP) and Standard operating procedures (SOPs)

Intended Learning Outcomes: Upon completion of this module, students should be able to:

LO1) Evaluate experimental approaches in the biomolecular sciences
LO2) Calculate enzyme kinetic values (e.g. Vmax and Km) from raw data
LO3) Generate a sequence alignment and phylogenetic tree
LO4) Navigate protein visualisation tools (e.g. UCSF Chimera)
LO5) Analyse biological samples using gel electrophoresis
LO6) Prepare and deliver a group research pitch (oral presentation) on a specialist 'OMICS' platform
LO7) Produce a scientific report of a professional standard
LO8) Keep accurate records of raw data in a laboratory notebook

Assessment: Coursework 1 (25%)
Coursework 2 (25%)
Coursework 3 (50%)

Assessment Description: CW 1 Group presentation (25%) CW 2 Gene tree report (25%) CW 3 Laboratory portfolio (50%)
Moderation approach to main assessment: Universal double-blind marking
Assessment Feedback: Class feedback Individually annotated reports Feedback on oral presentation
Failure Redemption: As this is a Year 3 module there is no opportunity to redeem failure.
Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus. All modules are subject to staff availability and may be restricted by student number or prerequisites Not available to visiting or exchange students

BIO342 Sensory Ecology

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr WL Allen

Format: 11h Lectures and interactive sessions
8h practicals
2h drop-in sessions

Delivery Method: Lectures.
Interactive sessions.
Field based practical session.
PC lab practical session.

Module Aims: Sensory Ecology aims to understand how organisms acquire, process and respond to information. It is a relatively new field within the biological sciences that draws on knowledge and techniques from a wide range of disciplines, beginning with the physics that defines the structure of information in the environment, through to the anatomy, neurophysiology, perceptual psychology and psychophysics that aims to understand how this information is sensed, processed and perceived. The subject also includes the behavioural ecology and evolutionary biology that seeks proximate and ultimate explanations for sensory systems. The module emphasises the interdisciplinary nature of studying sensory systems and aims to make links between different kinds of explanation.

Module Content: The course is initially broken down by modality and covers the physics and physiology of sensation and perception. It then moves on to discuss the role of sensory information in ecology, behaviour and evolution.

Week 1.) Introduction to sensory ecology
Week 2.) Vision
Week 3.) Hearing, pressure and touch (mechanoreception), and equilibrioception.
Week 4.) Smell and taste (chemoreception)
Week 5.) Thermoreception, electroreception and magnetoreception
Week 6.) Signalling and communication
Week 7.) Foraging, predation and predator avoidance
Week 8.) Mating signals
Week 9.) Evolutionary divergence of signals, sensory systems and species.
Week 10.) Sensory ecology in the Anthropocene

Practical based on using digital photography and image processing to investigate camouflage mechanisms.

Interactive sessions will include:
• Guided individual problem solving
• Workshop on what it is like to be a sensory ecologist & careers in sensory ecology
• Product design workshop using sensory ecology
• Revision and writing workshop

Intended Learning Outcomes: At the end of this model learners should be able to:

LO1) Explain how the physical structure of the environment and an organism's interactions with it drive the evolution of sensory systems.
LO2) Develop tools and techniques for measuring/interpreting the sensory environment.
LO3) Describe how different sensory systems work to gather and process information.
LO4) Identify and examine how animals use sensory information to control behaviour.
LO5) Critically appraise the role of sensory information processing in the evolution of life on earth.
LO6) Investigate how sensory ecology interacts with anthropogenic environmental change and animal welfare.

Assessment: Examination 1 (40%)
Examination 2 (40%)
Coursework 1 (20%)

Resit Assessment: Examination 1 (40%)
Examination 2 (40%)
Coursework 1 (20%)

Assessment Description: Coursework (60%)
Lab report on quail egg camouflage practical (20%)
Directed reading essay - 800 words (40%)

Exam (40%)
Two essays (from choice of three) – 800 words, 40% each

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Verbal feedback in interactive activities
Assessment through online quizzes
Written feedback on coursework assignment and examination

Failure Redemption: Year 3 modules can be failed down to zero. August deferrals can be provided under extenuating circumstances.

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

All modules are subject to staff availability and may be restricted by student number or prerequisites
Normally available to elective, visiting or exchange students. Please note that any failures are non-redeemable, there are no resits for Year 3 modules.

BIO344 Hormones and Behaviour

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr I Fuertbauer

Format: 8 lectures; 4 practicals; 1 revision lecture; 1 feedback lecture; 6 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

Composite lectures and practicals

Module Aims: This course focusses on endocrine physiology and hormonal mechanisms of behaviour in vertebrates. We begin with an overview of the endocrine system and hormones. We then study reproductive physiology and investigate the concept of homeostasis and energy balance, and explore the physiology of stress. We also study biological rhythms and the hormonal underpinnings of parental care and learning and memory. Finally, we focus on non-invasive methods in endocrinology and their application in the field and laboratory. To strengthen understanding of reproductive endocrinology, we explore a real data set during a practical session.

Module Content: This course focusses on endocrine physiology and hormonal mechanisms of behaviour in vertebrates. We begin with an overview of the endocrine system and hormones. We then study reproductive physiology and investigate the concept of homeostasis and energy balance, and explore the physiology of stress. We also study biological rhythms and the hormonal underpinnings of parental care and learning and memory. Finally, we focus on non-invasive methods in endocrinology and their application in the field and laboratory. To strengthen understanding of stress endocrinology, we explore a real data set during a practical session.

Lectures will include:

- Introduction
- Hormones & the endocrine system
- Reproductive endocrinology
- Hormones and behaviour
- Homeostasis & Energy balance
- Stress & Coping styles
- Biological rhythms
- Learning & Memory
- Non-invasive methods in endocrinology

Practical Session:

Practical 1: Reproductive endocrinology
Students will analyse real data sets (macaques, baboons) and determine reproductive state (timing of ovulation/conception; pregnancy) from faecal hormone hormone profiles.

Syllabus as stated is subject to modification.

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

LO1) demonstrate a knowledge of the hormonal mechanisms that underlie reproductive, behavioural, and cognitive processes
LO2) explain the endocrinology of stress and biological rhythms
LO3) recognise the basic principles of vertebrate reproduction
LO4) assess and interpret female reproductive function from hormone profiles
LO5) synthesise information from vertebrate taxa regarding endocrine physiology and behaviour
LO6) describe how endocrinology can be applied in the field and laboratory
LO7) demonstrate awarness of environmental and physiological factors affecting hormone secretion

Assessment:	Examination (40%) Coursework 1 (30%) Coursework 2 (30%)
Assessment Description: Exam (1 essay out to a choice of 3) CW 1: Practical Report in Poster format, including analytical component CW 2: Written Report	
Moderation approach to main assessment: Second marking as sampling or moderation	
Assessment Feedback: Individual formative feedback on assignments Written feedback on exam and class feedback lecture	
Failure Redemption: Year 3 modules can be failed down to zero. August deferrals can be provided under extenuating circumstances.	
Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus. All modules are subject to staff availability and may be restricted by student number or prerequisites Available to visiting or exchange students	

BIO345 Macroevolution and Phylogenies

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules: BIO108

Co-requisite Modules:

Lecturer(s): Dr K Arbuckle

Format: 12 lectures; 1 practical; 1 revision session
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 and practicals.

Module Aims: This module covers the concepts and techniques available in the study of macroevolution and phylogenetic comparative biology. It will introduce the range of ways in which phylogenies are built, how we can evaluate our confidence in the trees, and why phylogenetic trees can be important both to biology and to the wider world. You will then progress to studying how we can use information from phylogenies to understand how the traits possessed by organisms have evolved, how coevolutionary interactions persist through time (and how we know this has happened), and how the geographic distribution of organisms has been shaped by their evolutionary history. Finally, you will also study macroevolutionary patterns and concepts such as convergent evolution, species concepts, speciation, extinction, and diversification rates.

Module Content: This course focusses on the interpretation and use of phylogenetic trees (phylogenies) for understanding the patterns and processes of macroevolution. In addition to learning about the range of concepts involved, the course will also provide students with an understanding of the methods available to comparative biology and therefore provide the necessary background to critically interpret research papers using these approaches. As part of this methods focus, the practical session will introduce students to the principles and techniques for simulating data and how these can be used. The concepts covered will include the origin and maintenance of biodiversity and historical associations such as coevolutionary interactions and historical biogeographic patterns, in addition to the estimation of the evolutionary history of organisms and their traits.

Lectures will include:

• Phylogenetic tree construction (including estimating the timescale of evolution)
• How do we know we have the right tree?
• Applications of phylogenies
• Estimating ancestral states
• 'The' comparative method (the problem of interspecific data and how phylogenetic information can help)
• Trait evolution (different models of evolution and what they can tell us)
• Convergent evolution
• Coevolution
• Historical biogeography
• Speciation (including species concepts and the issue of gene trees vs species trees)
• Extinction
• Diversification rates

Practical Session: Simulation techniques in phylogenetic comparative biology (or 'how to make up data legitimately') Students will be introduced to the concept of simulation of data and phylogenies and will learn about the situations when this is useful. Students will learn how to simulate data and trees to answer questions in evolutionary biology, and apply this to a question of their choice. A short report based on using simulation to answer the chosen question will be assessed.

Syllabus as stated is subject to modification.

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

LO1) understand how phylogenies are built, interpreted, and used
LO2) demonstrate a knowledge of the general principles of model-based inference in phylogenetic comparative biology
LO3) explain and critically evaluate evidence for concepts and patterns of trait and lineage evolution
LO4) describe and demonstrate how simulation approaches can be used in phylogenetic comparative biology
LO5) write in a clear, concise, and accurate scientific style

Assessment: Coursework 1 (40%)
Coursework 2 (60%)

Assessment Description: Coursework 1: Science Communication article (500 words max)
Coursework 2: Practical Report (based on simulation techniques covered in practical session). (500 words max)

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Individual formative feedback on assignment and coursework.
Written feedback on exam.

Failure Redemption: No resits are permitted following standard practice for final year modules. Year 3 modules can be failed down to zero. August deferrals can be provided under extenuating circumstances.

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

All modules are subject to staff availability and may be restricted by student number or prerequisites
Not available to visiting or exchange students.

BIO346 Professional Skills in Marine Biology

Credits: 20 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr N Esteban, Miss CM Bertelli, Dr CE Davies, Dr N Franconi, Dr FA Januchowski-Hartley, Dr CD Lowe, Miss AF Mendzil, Dr RKF Unsworth

Format: Blended learning approach depending on COVID restrictions via

A. Synchronous learning:
1. 12 lectures [or Zoom session with discussion groups & presentations] (1-2 hr x 12)
2. Field practicals: 4 x 7 hours
3. Data entry practical: 3 hours

B. Asynchronous learning:
1. 12 recorded lectures (series of 2-3 lectures) per week of TB1
2. EIA case study to read
3. 5 demonstrated survey videos

Delivery Method: Blended teaching and assessment including field excursions data entry, recorded lectures and zoom lectures (including workshops and feedback sessions).

Module Aims: This module will introduce students to the professional techniques utilised to monitor and study marine life in a variety of marine and coastal habitats and in relation to conservation management and biodiversity monitoring in the United Kingdom. The course places a strong emphasis on marine ecological census techniques. Students will learn key skills relevant to the marine ecology sector including protected and economically-important species (especially marine mammals, fish, shellfish, coastal birds) and Phase 1 habitat surveys. Students will also learn about the biotic and abiotic factors that define different UK habitats and relevant regulations that protect them.

The module provides an introduction to the Environmental Impact Assessment (EIA) process and a range of impacts on the marine environment including energy generation and coastal development. Participants in this module will work in groups to discuss case study surveys and EIAs, including a presentation reporting findings from rapid ecological surveys for a case study EIA. The class will be responsible for collecting key survey data for a Preliminary Environmental Appraisal Report (PEAR) for a proposed commercial development in Carmarthen Bay. During a field course, small groups will work as marine environmental consultancy companies responding to an Invitation to Tender with survey design, planning, cost estimation, data collection and analysis.

A focus of the module is on developing key transferable skills that enhance employability such as survey design and planning, problem solving, data analysis, report writing, evaluation, communication and teamwork. If Covid-19 restrictions are lifted this will be a residential field course, otherwise it will be a series of days trips.

Module Content: This module will entail teaching of 12 professional marine biology topics in TB1 and will include shore-based sampling in Carmarthen Bay and follow up data entry. Teaching follows a question-based approach to professional skills in marine and coastal biology centred around four themes:

1. How to assess marine taxa population and community assemblages?
• Assessment of a range of protected and economically important species (abundance/diversity/size classes of marine mammals, estuarine/seabirds, demersal/pelagic/migratory fish, shellfish stock)
• General approach to surveys (consideration of historical datasets to identify key species, site selection)
• Different methodological approaches (e.g., MaxN, mark and recapture/resight, population trends)

2. How to assess & map key components and environmental drivers of a range of habitats (supra, inter-, sub-tidal)?
• Review of relevant methodology, e.g., historical baseline, habitat mapping using range of platforms; image analysis
• Intertidal marine habitat mapping using JNCC protocols
• Approaches for coastal- and offshore surveys on range of platforms
• Relevance of anthropogenic activities

3. What are the relevant law, policy and regulations governing marine and coastal habitats and development?
• Consideration of EU/UK national and regional (Wales) law
• EIA policy & processes including Preliminary Environmental Appraisal Report
• Role of regulatory agencies and consultancies to navigate the complexities involved

Students will review available datasets and conduct surveys to collect data for a PEAR for a proposed coastal development in Carmarthen Bay.

Intended Learning Outcomes: By the end of this module, the student should be able to:

LO1) Apply knowledge of primary professional ecological census techniques to monitor marine vertebrate and invertebrate populations and marine/coastal habitats.
LO2) Evaluate the important features of local UK habitats and communities relevant to legislation of conservation importance.
L03) Identify marine species, particularly indicator species and species of conservation importance.
L04) Create and design appropriate monitoring protocols, design, plan, budget and undertake key surveys required for a Preliminary Environmental Appraisal for a proposed coastal development.
L05) Analyse habitat and ecological species data using techniques based on ecological census techniques and synthesise ecological data and literature into professional outputs.

Assessment:
Coursework 1 (10%)
Coursework 2 (20%)
Coursework 3 (50%)
Coursework 4 (20%)

Assessment Description: Coursework: 100%

Coursework 1 (10%): Field notebook
Coursework 2 (20%): Group presentation on EIA case study
Coursework 3 (50%): Preliminary Ecological Appraisal Report (PEAR)
Coursework 4 (20%): Poster on EIA case study

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Class feedback
Group feedback
Individually annotated reports
One-to-one feedback

Failure Redemption: As this is a Year 3 module, there is no opportunity to redeem failure, though if there are extenuating circumstances, students would be offered a written alternative assessment using archived data sets.

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

All modules are subject to staff availability and may be restricted by student number or prerequisites
Not available to visiting or exchange students with the exception of those within the department's existing exchange programmes.

BIO350 Biosciences Research Project

Credits: 30 Session: 2022/23 September-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr EC Pope

Format: Two introductory lectures and individual or small-group supervision. Regular contact with supervisor. Practice Talks, Symposium. Draft feedback and final mark feedback.
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

Independent research with regular meetings with a project supervisor.

Depending on the subject, projects may start either at the end of Year 2 (especially field-orientated projects) or at the start of Year 3. Students are expected to work on the practical aspects of the project for 10 weeks.

The project will be presented as a talk at a research symposium (10% final mark). The results do not have to be fully analysed when they are presented.

Module Aims: This module is designed to develop the research and/or survey skills of undergraduate students in Biology, Marine Biology and Zoology. It covers literature reviewing; research planning and experimental/survey design; safety assessment; data collection techniques; data analysis and presentation; critical evaluation; discussion of results in the light of published work; final report production and presentation of results at a research symposium.

Module Content: This module is designed to develop the research or survey skills of Biosciences undergraduate students.

It covers literature reviewing; research planning and experimental/survey design; safety assessment; data collection techniques; data analysis and presentation; critical evaluation; discussion of results in the light of published work; final report production and oral presentation.

Dissertations may take the form of either a research-paper or a survey report, depending on the subject area. Depending on the subject, projects may start either at the end of Year 2 (especially field-orientated projects) or at the start of Year 3. Students are expected to work on the practical aspects of the project for 10 weeks. At the end of the research period, students present a brief talk on their work at a research symposium.

Intended Learning Outcomes: At the end of the module the learner will have demonstrated the ability to:

LO1. Survey the scientific literature, making appropriate use of electronic database searches;
LO2. Design meaningful studies or surveys with adequate controls;
LO3. Interpret and use health and safety regulations in your own research;
LO4. Apply research ethics in your work;
LO5. Execute a careful and accurate study or survey without constant supervision;
LO6. Record data in an accurate manner, mindful of sources of errors and variance;
LO7. Critically interpret data and appraise the limitations of techniques or studies;
LO8. Analyse data using appropriate statistical tests and present data using appropriate graphical, pictorial and tabular methods;
LO9. Critically evaluate findings in the context of the scientific literature and techniques used;
LO10. Construct a coherent and detailed report in the style of a scientific paper or report, making appropriate use of a range of IT skills;
LO11. Present orally in a symposium, and be able to defend your hypotheses against questioning.

Assessment: Presentation (10%)
Project (90%)

Assessment Description: Motivation and enthusiasm (10%) - awarded by project supervisor.

Research report or thesis (6 000 words excluding references; 80%) - double marked (supervisor and second marker).

Presentation at research symposium (10%) - double marked.

Moderation approach to main assessment: Universal non-blind double marking

Assessment Feedback: Feedback will be provided via individually annotated reports and a detailed mark and comment cover sheets.

Failure Redemption: Final year project cannot be compensated - year 3 modules can be failed down to zero

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

All modules are subject to staff availability and may be restricted by student number or prerequisites
Not available to visiting or exchange students

Final year project cannot be compensated - year 3 modules can be failed down to zero

BIO355 Animal behaviour - from individuals to groups

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr AJ King, Dr I Fuertbauer

Format: x10 Lectures
x2 Practicals
x1 Drop in/Feedback session

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

Composite lectures including practical elements

Module Aims: The module will showcase the latest developments in the field of animal behaviour, first describing how and why individuals within the same species or populations often behave in consistently different ways (i.e. show personality). Second, we will explain how individual variation in behaviour can shape patterns of behaviour shown by groups of animals (i.e. collective behaviour). Throughout the module, we will use recent research as examples – on insects, fish, birds and mammals (including humans) – to enable students to understand key concepts and then directly apply this knowledge during research-led practical sessions. The module adopts an inclusive and integrated teaching style and will suit students who enjoy interactive teaching (e.g. discussion, group activities).

Module Content: The module will be delivered by Dr King & Dr Fürtbauer. During the first lecture both lecturers will provide an introduction to the course and topics to be covered. Then, Dr Fürtbauer will deliver Part A on 'individuals' and Dr King will deliver Part B on 'groups'.

Part A - Individuals (Dr Fürtbauer)

Topics
• Individual behaviour and individual differences and methods in animal personality research
• Personality & plasticity
• Personality & social context

Practical
• Animal behaviour/personality practical

Part B - Groups (Dr King)

Topics
• Collective animal behaviour
• Personal and social information
• Diversity within groups
• Group decision-making and leadership

Practical
• Animal collective behaviour practical

Dr King & Dr Fürtbauer will also provide a drop-in/feedback session for coursework and a lecture on exam preparations and questions as required.

Syllabus subject to change.

Intended Learning Outcomes: LO1) summarise and describe the concept of animal personalities and phenotypic plasticity
LO2) demonstrate knowledge of the proximate mechanisms underlying personality and plasticity
LO3) have knowledge of the evolutionary processes underlying animal personalities
LO4) understand personality experiments
LO5) use statistical techniques to assess animal personalities
LO6) describe patterns of collective behaviour with examples
LO7) understand collective behaviour experiments
LO8) analyse behavioural data, and, where appropriate, propose new hypotheses/predictions
LO9) evaluate and discuss the potential for research in collective animal behaviour to be applied to real-world problems

Assessment: Coursework 1 (40%)
Coursework 2 (20%)
Examination (40%)

Assessment Description: CW1 Directed reading (40%)
CW2 Crab Personality (20%)
Exam Essay Question (40%)

Moderation approach to main assessment: Second marking as sampling or moderation

Assessment Feedback: Feedback on assignment (written)
Discussion with lecturer (verbal)

Failure Redemption: Failures cannot be redeemed as a final year module, but alternative coursework assessments exam re-sits are available for students with extenuating circumstances.

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

Syllabus as stated is subject to modification due to staff availability.

Module may be restricted by student number or prerequisites.

Available to visiting or exchange students.