EXPERIMENTAL BIOLOGY - 2024/5

Module code: BMS2083

Module Overview

A degree in biosciences covers knowledge and skills, both being integral to employability beyond a university environment. As you develop as a scientist during your degree, you should learn the skills of self-management (organisation), cognitive (knowledge) and communication skills in addition to data analysis skills, all of which are essential for employability. This module aims to provide knowledge alongside practical applications, enabling students to see a clear link with how they can test their knowledge in different systems (Biochemistry, Ecology, Microbiology) and use bioinformatic programs to analyse, interpret, and present their data.

Students will develop their communication skills through interactions with their peers and module teaching team and receive feedback on their methods and ideas to help them develop resourcefulness and resilience as they test out their ideas and refine their experimental design in each topic, reflecting on their feedback to help shape their approach to the next task.

Module provider

School of Biosciences

Module Leader

WINNEBECK Eva (Biosciences)

Number of Credits: 15

ECTS Credits: 7.5

Framework: FHEQ Level 5

Module cap (Maximum number of students): N/A

Overall student workload

Workshop Hours: 9

Independent Learning Hours: 97

Lecture Hours: 10

Tutorial Hours: 4

Practical/Performance Hours: 10

Guided Learning: 10

Captured Content: 10

Module Availability

Semester 1

Prerequisites / Co-requisites

N/A

Module content

The following will be addressed in each of the topics below:

- Study design

- Associated techniques

- Data acquisition methods

- Data analysis (using common data analysis programs such as R, Python or GraphPad)

Topics:

- **Biochemistry:** receptors, membrane and cell signaling (includes applications of proteins as druggable targets)

- **Ecology**: Prey-Predator relationships (includes issues with sustainability and shifting ecology in response to global behavioral changes)

- **Microbiology/epidemiology:** (Includes further sustainability discussion based on global current topics such as antibiotic resistance)

Assessment pattern

Assessment type	Unit of assessment	Weighting
Coursework	Data analysis coursework	40
Examination	Exam - 90 minutes in 4-hour period	60

Alternative Assessment

In case students could not perform one or more practicals for justified absence, alternative materials and appropriate instructions are provided in order to complete the required exercises for the CW

Assessment Strategy

The assessment strategy is designed in a way to check application of knowledge to solve problems through the design of experiments and relating the data to theoretical knowledge to adapt and refine experimental approaches.

The coursework element will be case-based scenarios to determine the integration of knowledge with critical analysis of data to explain the results given and rationalize why the conclusion was reached. It includes the use of **digital technologies** to represent and statistically appraise the data, building feedback to develop resilience in a supporting and nurturing environment, engendering self-reflection to develop ideas for subsequent problems posed.

The exam will be used to check students' subject specific knowledge of the biochemistry content as well as data analysis skills and appropriate choices for experimental design and data analysis of the scenarios presented.

Thus, the summative assessment for this module consists of:

- Coursework (Addresses learning outcomes 1,3-6)

This will be a research data analysis. Marks will be awarded for demonstrating subject specific knowledge, how this applies to the experimental methods used, the quality of data visualisation (relates to study design), the choice of statistical analysis, and interpretation of the findings in addition to the presentation of the study.

- Online Exam (Addresses learning outcomes 1-6)

Part 1 will consist of Biochemistry multiple choice questions and/or short answers to ascertain subject specific knowledge.

Part 2 will consist of case-based scenarios to determine the integration of knowledge with critical analysis of data to explain the experimental design, results or appropriate analysis choice and rationalize why the conclusion was reached.

Formative assessment and feedback:

Formative feedback will be provided on students' (submitted for oral or written feedback) as well as specific tutorials to discuss students' application of content to the question and to provide oral feedback on student engagement with assessment literacy activities.

This might involve a reflection on the first piece of group work in a workshop/tutorial. The focus of this would be to evaluate the appropriateness of the experimental plan and how this might be improved next time. This develops student resourcefulness (providing a specific technique to investigate) and develops resilience as students are likely to have to overcome some experimental method issues, meaning they would likely fail, however the support of staff would nurture ways to cope and reflect on this experience and modify their plans for future experiments.

Weekly activities in the workshop/tutorial sessions will encompass possibilities for oral formative feedback.

Students are encouraged to use the discussion board which will be monitored regularly, providing formative feedback to help students develop resourcefulness.

Feedback

Team based activities during the workshops/practicals lead up to final coursework, generating similar data sets with statistics relevant to the task. One-to-one feedback is available during these workshops/practical sessions, enabling real time refinement of ideas and opportunities for learning from "failed" aspects of the practical work. Opportunities for formative group feedback with each topic lead as they explore the data/case study provided.

Module aims

- Explain the concept of intracellular signalling pathways and their importance in cell function, applying these principles to explain their importance in regulating metabolic pathways in health and disease.
- Explore a range of experimental methods appropriate to each of the topics Biochemistry, Ecology and Microbiology, critically appraising which are most relevant for the case study/scenario posed.
- Introduce students to programs such as R or Python and provide them with basic coding skills to enable the appropriate analysis and presentation of results.
- Students will develop analytical skills needed to determine which statistical tests are appropriate for data collected and experimental design
- Refine student understanding of experimental design, enabling them to reflect on past experiences and refine their suggestions to improve the reliability of their data output.

Learning outcomes

		Attributes Developed
001	Describe the major plasma membrane components and explain their role in cellular signalling and function. Describe the intracellular signalling pathways activated by major plasma membrane and nuclear receptors and explain their role in controlling gene transcription in health and disease.	KC
006	Develop communication skills to aid team working & disseminate results using appropriate scientific terminology by both written and oral methods.	KCP
003	Critically appraise study design and data collection methods to choose the most appropriate analysis techniques (e.g. statistical tests) for the data set.	KCPT
004	Link theoretical knowledge with scenario to demonstrate a rationale for experimental design, then reflect on data obtained and how this may be refined if repeated.	KCPT
005	Utilise digital technologies to visualise data and disseminate findings.	KCPT
002	Formulate the principles underpinning epidemiology and population ecology and inherent experimental designs and analysis strategies	CPT

Attributes Developed

C - Cognitive/analytical

K - Subject knowledge

T - Transferable skills

P - Professional/Practical skills

Methods of Teaching / Learning

The learning and teaching strategy is designed to include lectures, workshops, practicals and tutorials in order to develop subject specific knowledge, alongside practical skills and experimental study design then to communicate results with peers, which are essential for employability beyond the course.

Summative, formative and peer feedback is used to enhance self-efficacy and experimental design literacy.

Learning and teaching methods include:

- Lectures: These will include active learning activities and small group discussions and may link to additional questions posted for preparation from independent study prior to your attendance

- Workshops/Tutorials: include in class discussions, problem solving tasks and use of polling software for formative feedback. Students are encouraged and expected to use their prepared information to discuss with others, developing their communication and team working skills which are key to success beyond university in all career types. Development of communication skills is directly linked to employability and is a key indicator of student success.

- Practical/Laboratory sessions: Students will work in groups to design, test and collect data that relates to a selection of biologically relevant topics. They will reflect on their findings and suggest ways to adapt or refine their experimental plan to optimise that data obtained. Feedback on this and integration of the reflection will provide room and support for the development of resourcefulness and resilience providing an opportunity for failure and growth in recognising that this is needed to generate a better experimental plan. Selection of appropriate statistical tests will be key to ensure that the experimental plan has validity and therefore problem solving and an innovative idea of how the data will be used and its relevance to the topic is necessary. The Laboratory session prepares students with laboratory skills relevant to a selection of biological topics, thus improving practical employability skills in addition to those associated with assessment design.

- Independent study: Between lectures you will need to refine your knowledge through reading of textbooks and review papers relevant to module topics, extending your knowledge beyond the course content. Completion of pre-reading and/or formative assessment tasks/tests will help the identification of areas of topics to revise or ask for help with (on discussion boards or in person) to improve summative assessment performance. Scaffolding will be given to help students develop confidence and ensure the development of resilience and resourcefulness and confidence in their own ability to carry out further research.

Indicated Lecture Hours (which may also include seminars, tutorials, workshops and other contact time) are approximate and may include in-class tests where one or more of these are an assessment on the module. In-class tests are scheduled/organised separately to taught content and will be published on to student personal timetables, where they apply to taken modules, as soon as they are finalised by central administration. This will usually be after the initial publication of the teaching timetable for the relevant semester.

Reading list

https://readinglists.surrey.ac.uk
Upon accessing the reading list, please search for the module using the module code: BMS2083

Other information

Resourcefulness & resilience: The assessments for this module rely on the ability to interpret and understand primary research literature, and to produce data in practical. The coursework will allow students to develop teamwork skills, problem-solving, decision-making, self-efficacity, self-regulation and confidence.

Global & cultural capabilities: Students will work in small groups during the practical sessions/workshops which will encourage and engage students in working with other students from diverse cultures and abilities to achieve an end goal.

Sustainability: The module will consider the principles of ecology and sustainability.

Digital capabilities: For each component of the course work students will produce material using Microsoft Suits software as PowerPoint. Students will also utilize the virtual learning environment SurreyLearn and other digital resources. The skills learned will be applied in the assignments they undertake to equip the students for a variety of modern professions. Students will learn the principles of coding using required specific software.

Employability: Transferable skills such as the ability to work in a team, report findings in a scientific manner and ability to identify clades will equip students for a variety of modern professions. Coding and data analysis are relevant skills requested by employers.

Programmes this module appears in

Programme	Semester	Classification	Qualifying conditions
Biological Sciences (Animal Biology and Ecology) BSc (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Biological Sciences (Cellular and Molecular Sciences) BSc (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Biological Sciences (Infection and Immunity) BSc (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Biological Sciences BSc (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Veterinary Biosciences BSc (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module

Please note that the information detailed within this record is accurate at the time of publishing and may be subject to change. This record contains information for the most up to date version of the programme / module for the 2024/5 academic year.