LF103-12 Quantitative Skills for Biology

23/24

Department
Life Sciences
Level
Undergraduate Level 1
Module leader
Daniel Franklin
Credit value
12
Module duration
14 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

Modern biological sciences generate increasing quantities of quantitative data - from measurements of gene expression for many thousands of genes simultaneously to data on the predicted impacts of climate change.

This module provides an introduction to the quantitative skills that all biological scientists need to understand to be able to make the most of any quantitative data that they generate - in particular introducing statistical methods for the summary and analysis of experimental data (such as might be generated in lab classes throughout your degree) and the basic principles for modelling biological populations and infectious disease.

The module is taught entirely through computer-based practical workshops, using Microsoft Excel for calculations, some data handling and exploring biological rates and systems, and SPSS Statistics, to apply a range of statistical techniques to analyse data.

[Module web page](#)

Module aims

The purpose of this module is to introduce students to a range of data analysis skills that they will need to apply throughout their undergraduate studies. By studying the module, students will gain an appreciation of the benefits of the application of statistical approaches to support the understanding and interpretation of biological data, an awareness of how simple mathematical models can be used to explore biological systems, and the computational skills to enable them to test and interpret biological data.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Summarising biological data - types of data, graphical summaries, summary statistics.
Probabilities and common statistical distributions for biological data - simple ideas of probability; normal, Poisson and binomial distributions.
Estimates and Confidence Intervals - summarising real data using sample statistics and distributional assumptions.
Testing for differences - principles of hypothesis testing, t-tests and non-parametric alternatives for comparing population means.
Tests for count data - chi-squared tests for association and goodness of fit with applications to distributions, genetics, medical studies.
Familiarisation with statistical software.
Normality in biological data and testing for normality. Non-parametric alternatives for testing for differences between two samples.
Analysing Designed Experiments - analysis of variance and interpretation of results, with applications in plant, animal and medical science
Simple Linear Relationships - simple ideas of linear regression models, plots, fitted lines and summary statistics
Biological Data Analysis - applications of statistical summary approaches, hypothesis testing and regression modelling in a range of biological sciences, including epidemiology, medical science, ecology, and environmental science.
Descriptive and predictive modelling

Learning outcomes

By the end of the module, students should be able to:

- By the end of this module students will have a clear appreciation of the value of statistical approaches to the analysis and interpretation of biological data. They should also understand the basic principles of modelling biological populations, be aware of how to summarise and analyse the different types of data they will generate, have an understanding of how and when to apply a number of standard statistical tests, and understand how to use spreadsheets and dedicated statistical software to manipulate data and explore biological relationships.

Indicative reading list

DYTHAM, C. 2011. Choosing and using statistics: a biologist's guide, John Wiley & Sons.

Subject specific skills

Students will:
Understand and scrutinise statistical results in journal articles
Handle data
Learn to conduct basic statistical analyses
Understand how biological relationships can be described by equations

Transferable skills

1. Critical appraisal of source material
2. Self directed learning
3. Adult learning

Study

Study time

Type	Required
Practical classes	28 sessions of 1 hour (23%)
Private study	92 hours (77%)
Total	120 hours

Private study description

Independent learning, self directed learning and in-module assessments

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group A3

	Weighting	Study time
assignment 1	50%	

	Weighting	Study time
assignment 2	50%	

Assessment group R

	Weighting	Study time
Reassessment (100%)	100%	
Whole module reassessment		

Feedback on assessment

Cohort level feedback provided on summative assessment along with individual marks\r\n\r\n

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Availability

Courses

This module is Core for:

- Year 1 of UBSA-C700 Undergraduate Biochemistry
- ULFA-C1A2 Undergraduate Biochemistry (MBio)
  - Year 1 of C1A2 Biochemistry
  - Year 1 of C700 Biochemistry
- Year 1 of ULFA-C702 Undergraduate Biochemistry (with Placement Year)
- Year 1 of ULFA-C1A6 Undergraduate Biochemistry with Industrial Placement (MBio)
- UBSA-3 Undergraduate Biological Sciences
  - Year 1 of C100 Biological Sciences
  - Year 1 of C100 Biological Sciences
- Year 1 of ULFA-C1A1 Undergraduate Biological Sciences (MBio)
- Year 1 of ULFA-C113 Undergraduate Biological Sciences (with Placement Year)
- Year 1 of ULFA-C1A5 Undergraduate Biological Sciences with Industrial Placement (MBio)
- UBSA-C1B9 Undergraduate Biomedical Science
  - Year 1 of C1B9 Biomedical Science
  - Year 1 of C1B9 Biomedical Science
  - Year 1 of C1B9 Biomedical Science
- ULFA-C1A3 Undergraduate Biomedical Science (MBio)
  - Year 1 of C1A3 Biomedical Science
  - Year 1 of C1B9 Biomedical Science
- Year 1 of ULFA-C1A7 Undergraduate Biomedical Science with Industrial Placement (MBio)
- ULFA-CB18 Undergraduate Biomedical Science with Placement Year
  - Year 1 of CB18 Biomedical Science with Placement Year
  - Year 1 of CB18 Biomedical Science with Placement Year
  - Year 1 of CB18 Biomedical Science with Placement Year

- Year 1 of UIPA-C1L8 Undergraduate Life Sciences and Global Sustainable Development
- Year 1 of ULFA-B140 Undergraduate Neuroscience (BSc)
- Year 1 of ULFA-B142 Undergraduate Neuroscience (MBio)
- Year 1 of ULFA-B143 Undergraduate Neuroscience (with Industrial Placement) (MBio)
- Year 1 of ULFA-B141 Undergraduate Neuroscience (with Placement Year) (BSc)