



# BIOL6610

## Biological Data Analysis

Session 1, Online-scheduled-weekday 2023

*School of Natural Sciences*

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#### **Disclaimer**

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## General Information

### Unit convenor and teaching staff

Convenor

Drew Allen

[drew.allen@mq.edu.au](mailto:drew.allen@mq.edu.au)

### Credit points

10

### Prerequisites

Admission to MConsBiol or GradDipConsBiol or GradCertConsBiol or MSc or MScInnovationBioConsMgmt or BBioConsMConsBiol

### Corequisites

### Co-badged status

### Unit description

Biological organisms are inherently variable, which means that practicing biologists need a solid grasp of how to design and implement experiments, perform statistical analyses on the resulting data, and correctly interpret the results of statistical tests. This unit provides a foundation in the principles of experimental design and data analysis for biology. The unit is taught by biology staff and draws on research carried out in the Department of Biological Sciences. Students also learn the overall process of asking and answering questions in biology. Students learn a range of common data analysis techniques, and how to interpret the outcomes of these analyses. There is a strong emphasis on critically evaluating biological studies and identifying sound conclusions and not-so-sound conclusions. This unit is strongly recommended for students planning a career in biology or environmental science.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** Develop testable hypotheses from general scientific questions

**ULO2:** Design an unconfounded experiment to test a given scientific hypothesis

**ULO3:** Choose an appropriate statistical test to analyse experimental data

**ULO4:** Carry out and correctly interpret a range of commonly used statistical tests using

the computer package R

**ULO5:** Clearly present outcomes of statistical analyses using figures, tables and text

**ULO6:** Critically evaluate other studies with respect to experimental design and the application and interpretation of statistics

## General Assessment Information

**Requirements to Pass this Unit** To pass this unit you must:

- Achieve a total mark equal to or greater than 50%,
- Participate in, and undertake all hurdle activities for, a minimum of 9 of the 13 weekly practicals, and
- Achieve a mark of at least 50% on the Exam of Basic Stats Knowledge, which is also a hurdle.

### Details on Hurdle Assessments

**Practice-based task (0%)** Development of knowledge and skills requires continual practice at authentic problems in a hands-on setting. This unit has weekly practical classes and you must demonstrate your progress in developing and communicating knowledge and skills in a minimum of 9 of the 13 classes. This is a hurdle assessment meaning that failure to meet this requirement will result in a failing grade for the unit. If you know you will miss a practical, or if you have already missed one, please email the convenor at [biol2610@mq.edu.au](mailto:biol2610@mq.edu.au). There may be alternative practical slots, including the internal sessions, available for you to catch up. **Students are permitted up to four absences: additional absences will require a Special Consideration to be applied for (see below).**

**Exam of Basic Stats Knowledge (5%)** You will therefore be tested on your knowledge of basic statistical concepts and skills taught in the statistics prerequisite for this unit. The test will be delivered as an online quiz through iLearn. Students that fail to achieve a mark of at least 50% on their first attempt will be given a second attempt to pass the quiz in week 4. **Students must pass the Exam of Basic Stats Knowledge to pass the unit.**

### Late Submissions

Late submissions will be permitted for all assessment tasks in this unit. A consistent penalty will be applied for late submissions as follows:

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7<sup>th</sup> day (including weekends). After the 7<sup>th</sup> day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all

uploaded assessments is 11:55 pm. A 1-hour grace period will be provided to students who experience a technical concern.

### Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through [ask.mq.edu.au](http://ask.mq.edu.au).

### COVID Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus-faqs>. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Exam of Basic Stats Knowledge</a>	5%	Yes	Week 3
<a href="#">Weekly Quiz</a>	15%	No	Weekly
<a href="#">Practice-based task</a>	0%	Yes	Weekly
<a href="#">Mid-semester Exam</a>	15%	No	Week 8
<a href="#">Experiment Report</a>	20%	No	June 2, 11:55 pm
<a href="#">Final Exam</a>	45%	No	Final Exam Period

### Exam of Basic Stats Knowledge

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 1 hours

Due: **Week 3**

Weighting: **5%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

You will be tested on your knowledge of basic statistical concepts and skills taught in the

statistics prerequisite for this unit. The test will be delivered as an online quiz through iLearn.

On successful completion you will be able to:

- Choose an appropriate statistical test to analyse experimental data

## Weekly Quiz

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 26 hours

Due: **Weekly**

Weighting: **15%**

Every week there will be an online quiz with example problems to complete. These problems will be based on lectures and practicals. They will allow you to practice interpreting the results of statistical analyses, and applying the concepts and methods you have learned. It is strongly recommended that you make a serious effort to complete these quizzes.

On successful completion you will be able to:

- Choose an appropriate statistical test to analyse experimental data
- Carry out and correctly interpret a range of commonly used statistical tests using the computer package R
- Clearly present outcomes of statistical analyses using figures, tables and text

## Practice-based task

Assessment Type <sup>1</sup>: Practice-based task

Indicative Time on Task <sup>2</sup>: 0 hours

Due: **Weekly**

Weighting: **0%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Demonstrate knowledge of how to undertake and interpret statistical analyses by submitting practical tasks

On successful completion you will be able to:

- Carry out and correctly interpret a range of commonly used statistical tests using the

computer package R

## Mid-semester Exam

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 1 hours

Due: **Week 8**

Weighting: **15%**

You will be tested on your knowledge of lecture material for weeks 1 to 6 in Week 8 (following semester break). This test will be delivered as an online assignment accessible through iLearn. Skills you will be tested on include identifying the appropriate statistical test given a dataset and hypothesis, correctly interpreting statistical output produced by R, and critically evaluating the experimental designs and statistics of previous studies.

On successful completion you will be able to:

- Choose an appropriate statistical test to analyse experimental data
- Carry out and correctly interpret a range of commonly used statistical tests using the computer package R
- Critically evaluate other studies with respect to experimental design and the application and interpretation of statistics

## Experiment Report

Assessment Type <sup>1</sup>: Report

Indicative Time on Task <sup>2</sup>: 30 hours

Due: **June 2, 11:55 pm**

Weighting: **20%**

You will design, conduct and analyse data for an experiment of your own. You will be given a range of alternative experimental questions to choose from. You will need to pick a question, design and carry out an experiment addressing that question, then write up the results in the form of the methods and results sections of a scientific paper.

On successful completion you will be able to:

- Develop testable hypotheses from general scientific questions
- Design an unconfounded experiment to test a given scientific hypothesis
- Choose an appropriate statistical test to analyse experimental data

- Carry out and correctly interpret a range of commonly used statistical tests using the computer package R
- Clearly present outcomes of statistical analyses using figures, tables and text
- Critically evaluate other studies with respect to experimental design and the application and interpretation of statistics

## Final Exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 2 hours

Due: **Final Exam Period**

Weighting: **45%**

The final exam will be held during the Semester 2 Exam Period and will be 2 hr (plus 10 min reading time). Please consult the University Handbook to determine the commencement and finishing dates of the compulsory exam period. Skills you will be tested on include identifying the appropriate statistical test given a dataset and hypothesis, correctly interpreting statistical output produced by R, and critically evaluating the experimental designs and statistics of previous studies.

On successful completion you will be able to:

- Choose an appropriate statistical test to analyse experimental data
- Carry out and correctly interpret a range of commonly used statistical tests using the computer package R
- Critically evaluate other studies with respect to experimental design and the application and interpretation of statistics

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<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Lectures

There are two recorded one-hour lectures per week. You are expected to listen to all of the

recorded lectures. In addition, there will be live on-campus sessions where students can ask questions. You are encouraged to attend these live sessions, but recordings will also be made available on iLearn.

## **Practicals**

Practicals last 2 hours each and are conducted on campus and online. You are expected to attend and participate in practical sessions, as they are a hurdle requirement of the unit. Failure to attend and complete at least 8 of the practicals will result in a fail grade.

## **iLearn**

The primary means of communication for this unit is via iLearn, which can be accessed by most web browsers from inside or outside the University. You are expected to use iLearn for:

- Doing the Weekly Quizzes
- Regularly checking announcements
- Discussing the unit and its content with staff and other students
- Downloading Lecture and Practical materials
- Downloading reference materials

### *Logging in to iLearn*

- The iLearn login page is: <https://ilearn.mq.edu.au/>
- Username: your student number
- Problems? Please contact Student IT Help
- Need extra help due to a disability/health condition? Please visit the Student Services Website : <https://students.mq.edu.au/support/wellbeing>

## **Missed Practicals**

If you know you will miss a practical, or if you have already missed one, please email the convenor at [biol2610@mq.edu.au](mailto:biol2610@mq.edu.au). There may be alternative practical slots, including the internal sessions, available for you to catch up.

## **Overall Grades**

The University grading is: fail (F <50%), pass (P 50%-64%), credit (CR 65%-74%), distinction (D 75%-84%) and high distinction (HD 85%-100%).

## **Exam Special Consideration**



If you apply for Special Consideration for your final examination, you must make yourself available for the alternative examination period. If you are not available at that time, there is no guarantee an additional examination time will be offered. Specific examination dates and times will be determined at a later date.

### **Assignment submission, Turnitin and Plagiarism**

This is a paperless unit, so no paper submission will be required for your written report, which will be submitted through iLearn via a Turnitin link. Your written assignment will be checked for plagiarism using Turnitin. Plagiarism will not be tolerated. Do not under any circumstances lend your work to another student. If that student plagiarises your work, you too may be liable. The penalties imposed by the University for plagiarism are serious and may include expulsion from the University. A full outline of the Universities policy on plagiarism is found at [http://www.mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html).

### **Resources and Support**

How to find the answers

1. Please read the unit outline.
2. Consult iLearn - often your question has already been asked and answered by another student.
3. If the answer to a question will benefit others, please post it on iLearn.
4. Ask a question by emailing [biol2610@mq.edu.au](mailto:biol2610@mq.edu.au).
4. Unexpected adjustments made during the unit will announced via announcements, so make sure you check iLearn regularly.

### **Email Protocol**

1. Always submit questions to [biol2610@mq.edu.au](mailto:biol2610@mq.edu.au).
2. Please be courteous and patient - we will endeavour to reply to your email within 24 hours, excluding weekends. Responses will be delayed during weekends.

### **Textbook**

There are no required textbooks for the unit, but two recommended textbooks: "Statistics Explained : An Introductory Guide for Life Scientists" and "The Analysis of Biological Data".

### **Other Help**

The Numeracy Centre offers drop-in sessions to students with statistical questions. It is located

at 14 Sir Christopher Ondaatje Avenue, Room 188. For questions and scheduling, please visit the iLearn page.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://student.mq.edu.au>

[dents.mq.edu.au/support/](https://dents.mq.edu.au/support/)

## The Writing Centre

The [Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.