STAT8830

Statistical Methods in Bioinformatics

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Mathematical and Physical Sciences

Contents

General Information

Unit convenor and teaching staff
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TBA

Credit points
10

Prerequisites
Admission to MBiotech or GradDipBioTech or MBiotechMCom or MConsBiol or GradDipConsBiol or GradDipResFSE or GradCertResFSE

Corequisites

Co-badged status

Unit description
This unit introduces the statistical and probabilistic concepts that are the basis for the study of bioinformatics. Topics include an introduction to probability and conditional probability, probability distributions, sampling distributions and an introduction to Markov processes. Particular attention is paid to how they relate to specific applications in the field of bioinformatics. A basic understanding of calculus will be an advantage.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Good Health and Well Being; Industry, Innovation and Infrastructure

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: Communicate the knowledge of fundamentals of Probability and Statistics using specific terminology.

ULO2: Use relevant terminology and describe the distribution functions and characteristics of some discrete and continuous random variables.

ULO3: Evaluate probabilities of events, expected values andvariances of random

variables.

ULO4: Apply statistical and probabilistic modelling approach to genetic data.

ULO5: Apply fundamental principles of statistical data analysis.

General Assessment Information

Requirements to pass the unit

Achieve a total mark equal to or greater than 50% across all assessments.

Attendance and participation

We strongly encourage students to actively participate in all learning activities. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to

- enhance your understanding of the material

- collaborate with peers

- and receive valuable feedback from instructors

to assist in completing the unit assessments.

Your active participation is essential for the successful completion of the unit.

Late Assessment Submission and Penalties

- **Late Assessment Submission Penalty**

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 7th day (including weekends).***

After the 7th 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.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration.

- **Assessments where Late Submissions will be accepted**

Assignments - YES, Standard Late Penalty applies

Test - NO, unless Special Consideration is Granted

Practical Test - NO, unless Special Consideration is Granted

Special Considerations

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 https://connect.mq.edu.au.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment	25%	No	Week 4
Test	25%	No	Week 9
Practical test	50%	No	Week 12

Assignment

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 18 hours
Due: **Week 4**
Weighting: **25%**

Reinforce and apply skills learned in computer labs through data analysis.

On successful completion you will be able to:

- Apply fundamental principles of statistical data analysis.

Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 18 hours
Due: **Week 9**
Weighting: **25%**

This is a paper based mid-semester test. Further information will be provided in the iLearn site of the unit.

On successful completion you will be able to:

- Use relevant terminology and describe the distribution functions and characteristics of some discrete and continuous random variables.
- Evaluate probabilities of events, expected values andvariances of random variables.
- Apply statistical and probabilistic modelling approach to genetic data.

Practical test

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 24 hours
Due: **Week 12**
Weighting: **50%**

The task is designed to examine data analysis and R output interpretation skills taught in the unit.

On successful completion you will be able to:

- Communicate the knowledge of fundamentals of Probability and Statistics using specific terminology.
- Apply fundamental principles of statistical data analysis.

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[1] 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.

[2] 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

Week 1 classes

- **two-hour lecture**

Week 2-12 classes

- **two-hour lecture each week**
- **one-hour SGTA each week**

iLearn

All unit-related materials including lecture notes, SGTA's, and instructions for assessment tasks and administrative updates, will be published on iLearn.

Software:

The statistical software R will be used. This is a free software environment for statistical computing and graphics and can be downloaded from the website

http://www.r-project.org/

Texts and materials:

There is no required textbook for this unit.

Recommended reference sources:

1. W. P. Krijnen Applied Statistics for Bioinformatics using R, 2009: http://cran.r-project.org/doc/contrib/Krijnen-IntroBioInfStatistics.pdf
2. S. Draghici Statistics and Data Analysis for Microarrays Using R and Bioconductor. Chapman & Hall/CRC Mathematical and Computational Biology, 2nd Edition, 2012

Methods of Communication

We will communicate with you via your university email and through announcements on iLearn

Enquiries to the unit convenor can be sent via the contact email on iLearn or through your university email account.

Students can access the *iLearn* page by logging on at https://ilearn.mq.edu.au. Students must log in regularly to read the Announcements and access the teaching material.

Unit Schedule

Study Weeks	Lecture Topics
W1	Introduction
W2	Discrete random variables and their characteristics

W3 - W5	Hardy-Weinberg Equilibrium (HWE); Departures from HWE; Statistical testing of HWE.
W6 - W7	HWE for X-linked loci. Introduction to continuous random variables: Uniform Distribution.
Recess	
W8	Continuous random variables
W9 - W10	Hypothesis testing and its applications
W11	Markov Chains and their applications
W12	Practical Test

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (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). 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) 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 connect.mq.edu.au or if you are a Global MBA student contact 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://students.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 the Service Connect Portal, 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/.

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.

Changes from Previous Offering

To enable students more time to focus on learning, understanding, and reflecting on the content of the unit we have revised the assessment structure as follows.

There are now only three assessments: one assignment, a mid-session test, and a practical test.

The activities in the unit are designed to enhance your understanding of the content and support the completion of assessments.

Unit information based on version 2025.04 of the Handbook