



MEDI2201

Clinical Bioinformatics

Session 2, Weekday attendance, North Ryde 2021

Medicine, Health and Human Sciences Faculty level units

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Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

Session 2 Learning and Teaching Update

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of [units with mandatory on-campus classes/teaching activities](#).

Visit the [MQ COVID-19 information page](#) for more detail.

General Information

Unit convenor and teaching staff

Unit Convenor

Edwin Lim

edwin.lim@mq.edu.au

Contact via 02 9850 2737

Level 1, 75 Talavera Road

Weekday

Credit points

10

Prerequisites

STAT170 or STAT1170

Corequisites

Co-badged status

Unit description

This unit builds on the basic computing and programming knowledge acquired in the first year to extend understanding of coding and its application to biostatistics and bioinformatics. This unit focuses on the basic concepts of statistical methodologies and common statistical techniques used to analyse genomic, proteomic and metabolomic data in order to understand the molecular mechanisms of human diseases and treatment response. In this unit, you will explore coding languages behind statistical techniques applied in the analyses of "omics" data and gain an understanding of how to interpret and present data generated from basic and clinical research. Learning activities will include lectures, online assessments, interactive tutorials and computer-based practicals. Through this unit you will gain biostatistics and bioinformatics skills that will be critical for a profession in medicine, public health, research or data 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: Apply fundamental knowledge of coding functions and statistical terminology and

their relevance in biostatistics and bioinformatics.

ULO2: Appraise statistical approaches underpinning study design for research in genomics, proteomic and metabolomics.

ULO3: Organise and manage datasets generated from next generation sequencing technologies.

ULO4: Implement common statistical approaches to analyse genomic, proteomic and metabolomics data.

ULO5: Interpret statistical and graphical outputs to communicate biological processes that underlie human diseases and treatment response.

General Assessment Information

Grade descriptors and other information concerning grading are contained in Schedule 1 of the Macquarie University Assessment Policy, which is available at: <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/assessment>.

Further details for each assessment task will be available on iLearn.

All final grades are determined by a grading committee and are not the sole responsibility of the Unit Convenor.

To pass this unit, students must demonstrate sufficient evidence of achievement of the learning outcomes, meet any ungraded requirements including professionalism and achieve an SNG of 50 or better.

Student Professionalism

In the Faculty of Medicine, Health and Human Sciences, professionalism is a key capability embedded in all our courses. As part of developing professionalism, students are expected to attend all small group interactive sessions including tutorials, as well as clinical- and laboratory-based practical sessions.

Students are required to attend a minimum of 80% of the 12 weeks. To be marked present all weekly listed activities must be completed to the best of student's abilities. Students that do not meet this requirement may be deemed unable to meet expectations regarding professionalism and may be referred for disciplinary action (which may include exclusion from assessments and unit failure).

Similarly, as part of developing professionalism, students are expected to submit all work by the due date. Applications for assessment task extensions must be supported by appropriate evidence and submitted via www.ask.mq.edu.au. For further details please refer to the Special Consideration Policy available at <https://students.mq.edu.au/study/my-study-program/special-consideration>.

Late Submission

Late submissions will receive a 5% per day penalty including weekends and public holidays. If

you submit the assessment task 10 days or more beyond the due date, without an approved extension, you will be awarded a maximum of 50% of the overall assessment marks. For example:

Due date	Received	Days late	Deduction	Raw mark	Final mark
Friday 14th	Monday 17th	3	15%	75%	60%

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Case study analysis and presentation</u>	25%	No	Week 11
<u>Online quiz</u>	0%	No	Week 4, 9, 11, and 13
<u>Final exam</u>	50%	No	Week 15
<u>Mid semester exam</u>	25%	No	Week 7

Case study analysis and presentation

Assessment Type ¹: Case study/analysis

Indicative Time on Task ²: 25 hours

Due: **Week 11**

Weighting: **25%**

Group research and presentation on an assigned case study

On successful completion you will be able to:

- Apply fundamental knowledge of coding functions and statistical terminology and their relevance in biostatistics and bioinformatics.
- Organise and manage datasets generated from next generation sequencing technologies.
- Implement common statistical approaches to analyse genomic, proteomic and metabolomics data.
- Interpret statistical and graphical outputs to communicate biological processes that underlie human diseases and treatment response.

Online quiz

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 8 hours

Due: **Week 4, 9, 11, and 13**

Weighting: **0%**

Online quiz (total of four throughout the unit) using a combination of multiple choice and short answer questions assessing lecture, tutorial and practical content

On successful completion you will be able to:

- Apply fundamental knowledge of coding functions and statistical terminology and their relevance in biostatistics and bioinformatics.
- Appraise statistical approaches underpinning study design for research in genomics, proteomic and metabolomics.
- Interpret statistical and graphical outputs to communicate biological processes that underlie human diseases and treatment response.

Final exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 25 hours

Due: **Week 15**

Weighting: **50%**

Formal written exam assessing content delivered across the session using a combination of short answer and multiple choice questions. This task is completed under examination conditions during the university examination period

On successful completion you will be able to:

- Apply fundamental knowledge of coding functions and statistical terminology and their relevance in biostatistics and bioinformatics.
- Appraise statistical approaches underpinning study design for research in genomics, proteomic and metabolomics.
- Organise and manage datasets generated from next generation sequencing technologies.
- Implement common statistical approaches to analyse genomic, proteomic and metabolomics data.
- Interpret statistical and graphical outputs to communicate biological processes that underlie human diseases and treatment response.

Mid semester exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 20 hours

Due: **Week 7**

Weighting: **25%**

Formal written exam assessing content delivered across the session using a combination of short answer and multiple choice questions

On successful completion you will be able to:

- Apply fundamental knowledge of coding functions and statistical terminology and their relevance in biostatistics and bioinformatics.
- Appraise statistical approaches underpinning study design for research in genomics, proteomic and metabolomics.
- Implement common statistical approaches to analyse genomic, proteomic and metabolomics data.

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

Unit structure

This unit adopts a distance learning approach, which requires students to engage in independent learning from the unit materials and the tasks provided on iLearn. The unit consists of five core topics and is divided into lecture content and coding activities. You will have 2 hours of lecture content and 3 hours of coding activities per week. The opportunity for additional interactions is allocated for each core topic every 2–3 weeks, facilitated by a lecture, a tutorial, and a practical session of 2 hours each per topic. You must attend the tutorials and practical session because this is where you will develop your skills and ensure you stay on top of the teaching materials.

Technology used and required for this unit

- Access to a computer (*Note*: tablets are not ideal for coding).
- Learning management system using iLearn.
- MATLAB (version R2019b or later) – instructions for installation will be provided during the course.
- R and RStudio – instructions for installation will be provided during the course.

Unit Schedule

Study Week	Topic	Topic Convenor
1	Topic 1: Common Statistical Methods & Techniques Part 1 of 3 – Identifying the types of data used in biostatistics & bioinformatics	Edwin Lim
2	Topic 1: Common Statistical Methods & Techniques Part 2 of 3 – Common statistical methods for hypothesis testing in clinical research	Edwin Lim
3	Topic 1: Common Statistical Methods & Techniques Part 3 of 3 – Handling time-series data, multiple independent variables, missing values and outliers	Edwin Lim
4	Topic 2: Application of biostatistics and bioinformatics in Public Health Part 1 of 2 – Study design, risk and odds ratio, sensitivity and specificity, concept of type-1 and -2 error	Edwin Lim
5	Topic 2: Application of biostatistics and bioinformatics in Public Health Part 2 of 2 – Introduction to sample size calculation, confounders and effect modification, sampling and measurement bias	Edwin Lim
6	Revision 1	Edwin Lim
7	Topic 3: Application of biostatistics and bioinformatics in Genomic Part 1 of 2 – Demographic and genotype data for genetic association studies	Kelly Williams
8	Topic 3: Application of biostatistics and bioinformatics in Genomic Part 2 of 2 – Case-control and population genome-wide association studies and in silico interrogation of genetic variation	Kelly Williams
9	Topic 4: Application of biostatistics and bioinformatics in Proteomic Part 1 of 2 – Introduction to handling biases, data processing and QC in quantitative proteomics	Charlie Ahn
10	Topic 4: Application of biostatistics and bioinformatics in Proteomic Part 2 of 2 – Case study on biostatistics methods and bioinformatic tool in proteomic analysis	Charlie Ahn
11	Topic 5: Application of biostatistics and bioinformatics in Metabolomics Part 1 of 2 – Introduction to metabolomic research and Receiver-Operating Characteristic (ROC) analysis	Pratishtha Chatterjee
12	Topic 5: Application of biostatistics and bioinformatics in Metabolomics Part 2 of 2 – Case study on metabolomic research for biomarker discovery using ROC and logistic regression	Pratishtha Chatterjee
13	Revision 2	Edwin Lim

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](#)
- [Grade Appeal Policy](#)
- [Complaint Management 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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [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

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.