



# MEDI2201

## Clinical Bioinformatics

Session 2, In person-scheduled-weekday, North Ryde 2022

*Macquarie Medical School*

### Contents

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|   |    |
|---|----|
| <a href="#"><u>General Information</u></a>            | 2  |
| <a href="#"><u>Learning Outcomes</u></a>              | 3  |
| <a href="#"><u>General Assessment Information</u></a> | 3  |
| <a href="#"><u>Assessment Tasks</u></a>               | 4  |
| <a href="#"><u>Delivery and Resources</u></a>         | 7  |
| <a href="#"><u>Unit Schedule</u></a>                  | 7  |
| <a href="#"><u>Policies and Procedures</u></a>        | 9  |
| <a href="#"><u>Inclusion and Diversity</u></a>        | 10 |
| <a href="#"><u>Professionalism</u></a>                | 11 |

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## General Information

Unit convenor and teaching staff

Unit convenor

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Consultation by appointment

Credit points

10

Prerequisites

STAT170 or STAT1170

Corequisites

Co-badged status

### Unit description

Did you know that a huge proportion of medical professionals do not have the adequate statistical training to effectively communicate and report data from their research studies? Using real-world problems that span the cutting-edge research fields of genomics, proteomics and metabolomics, we will show you how to apply computer programming and biostatistical skills to understand and investigate the underlying processes of human diseases and improve treatments.

Targeted at students who have a basic understanding of, and more importantly, a keen interest in computing, programming, and statistics, this unit will allow you to explore coding languages to handle large datasets used in the health and medical research setting, interpret and communicate data generated from clinical research, and gain practical knowledge and training to tackle common biostatistical problems faced by medical professionals. This unit is ideal for students who are interested in a profession as a Data Scientist, Biostatistician, Clinician, Medical Researcher, Epidemiologist and Clinical Research Associate.

## 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 the [Macquarie University Assessment Policy](#).

All final grades are determined by a grading committee, in accordance with the Macquarie University Assessment Policy, and are not the sole responsibility of the Unit Convenors.

Students will be awarded a final grade and a mark which must correspond to the grade descriptors specified in the [Assessment Procedure](#) (clause 128).

To pass this unit, students must demonstrate sufficient evidence of achievement of the learning outcomes, meet any ungraded requirements, and achieve a final mark of 50 or better.

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

### Late Submission

Unless a Special Consideration request has been submitted and approved, a 5% penalty (OF THE TOTAL POSSIBLE MARK) will be applied each day a written 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. Submission time for all written assessments is set at 11.55 pm. A one-hour grace period is provided to students who experience a technical concern.

For example:

| Number of days (hours) late | Total possible marks | Deduction | Raw mark | Final mark |
|-----------------------------|----------------------|-----------|----------|------------|
| 1 day (1-24 hours)          | 100                  | 5         | 75       | 70         |
| 2 days (24-48 hours)        | 100                  | 10        | 75       | 65         |
| 3 days (48-72 hours)        | 100                  | 15        | 75       | 60         |
| 7 days (144-168 hours)      | 100                  | 35        | 75       | 40         |
| >7 days (>168 hours)        | 100                  | -         | 75       | 0          |

For any late submissions of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

## Assessment Tasks

| Name   | Weighting | Hurdle | Due                                  |
|--|-----------|--------|--------------------------------------|
| <a href="#">Online quiz</a>                          | 0%        | No     | Week 4,9,11,13                       |
| <a href="#">Mid semester exam</a>                    | 25%       | No     | Week 7                               |
| <a href="#">Case study analysis and presentation</a> | 25%       | No     | Week 11                              |
| <a href="#">Final exam</a>                           | 50%       | No     | Part A: Week 13; Part B: Exam period |

## Online quiz

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

Indicative Time on Task <sup>2</sup>: 8 hours

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

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.

## Mid semester exam

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

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

## Case study analysis and presentation

Assessment Type <sup>1</sup>: Case study/analysis

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

## Final exam

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

Indicative Time on Task <sup>2</sup>: 25 hours

Due: **Part A: Week 13; Part B: Exam period**

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.

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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

As a student enrolled in this unit, you will engage in a range of online and face-to-face learning activities, including lecture (notes + online video), weekly face-to-face workshop (optional), online discussion, tutorials, and practicals. Details can be found on the MEDI2201 iLearn site for this unit.

### Technology Used

Active participation in the learning activities throughout the unit will require students to have access to a laptop or similar device (tablet not recommended). Students who do not own their own laptop computer may borrow one from the university library.

## Unit Schedule

|        | Topic/Theme                                      | Learning Activities                               | Assessment Task         |
|--------|--|---|-------------------------|
| Week 1 | Stat Topic 1: Basic statistic & beyond           | Lecture notes + Workshop                          | None                    |
|        | Coding Module 1: Introduction to MATLAB – Part 1 | Coding notes                                      |                         |
| Week 2 | Stat Topic 1: Basic statistic & beyond           | Lecture notes + Workshop                          | None                    |
|        | Coding Module 2: Introduction to MATLAB – Part 2 | Coding notes, Practical class (Introduction)      |                         |
| Week 3 | Stat Topic 1: Basic statistic & beyond           | Lecture notes + Workshop, Tutorial (Stat Topic 1) | None                    |
|        | Coding Module 3: Introduction to MATLAB – Part 3 | Coding notes                                      |                         |
| Week 4 | Topic 2: Application in public health – Part 1   | Lecture notes + Workshop                          | Online Quiz for Topic 1 |
|        | Coding Module 4: Data Cleaning                   | Coding notes, Practical class (Module 1-3)        |                         |
| Week 5 | Topic 2: Application in public health – Part 2   | Lecture notes + Workshop                          | None                    |
|        | Coding Module 5: Common Biostat methods          | Coding notes, Practical class (Module 4)          |                         |

|         |  |   |   |
|---------|--|---|---|
| Week 6  | Stat Revision I<br><br>Coding Module 6: Customised MATLAB functions                                    | Workshop, Tutorial (Stat Topic 2)<br><br>Coding notes                             | None  |
| Week 7  | Topic 3: Application in genomics – Part 1<br><br>Coding Module 7: From R to MATLAB – Part 1            | Lecture notes + Workshop<br><br>Coding notes, Practical class (Module 5)          | Mid-Session Exam (Stat Topic 1 & 2)                                 |
| Week 8  | Topic 3: Application in genomics – Part 2<br><br>Coding Module 8: From R to MATLAB – Part 2            | Lecture notes + Workshop, Tutorial (Stat Topic 3)<br><br>Coding notes             | Start of Group Assignment   |
| Week 9  | Topic 4: Application in proteomics – Part 1<br><br>Coding Module: Nil                                  | Lecture notes + Workshop<br><br>Practical class replaced by Group Assignment      | Online Quiz for Topic 3   |
| Week 10 | Topic 4: Application in proteomics – Part 2<br><br>Coding Module: Nil                                  | Lecture notes + Workshop, Tutorial (Stat Topic 4)<br><br>Group Assignment         |   |
| Week 11 | Topic 5: Application in metabolomics – Part 1<br><br>Coding Module 9: Data analysis workflow – Part 1  | Lecture notes + Workshop<br><br>Coding notes, Practical class: Group presentation | Online Quiz for Topic 4<br><br>Group Assignment report due          |
| Week 12 | Topic 5: Application in metabolomics – Part 2<br><br>Coding Module 10: Data analysis workflow – Part 2 | Lecture notes + Workshop, Tutorial (Stat Topic 5)<br><br>Coding notes             |   |
| Week 13 | Stat Revision II   | Workshop  | Online Quiz for Topic 5<br><br>Final Exam Part A - Coding Part only |

\*All notes (i.e. Lecture notes and Coding notes) are meant for self-learning. Students are expected to read these notes in preparation for the corresponding week's activities.

Workshops are conducted in a consultation (or Q&A) manner for students who need extra help to understand the unit content. These sessions do not replace the need for self-learning with lecture/coding notes. Answers to tutorial questions will not be discussed before the start of the tutorial class. Students are expected to come prepared with specific questions for their workshop



session.

## 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://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 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.

## Inclusion and Diversity

Social inclusion at Macquarie University is about giving everyone who has the potential to benefit from higher education the opportunity to study at university, participate in campus life and flourish in their chosen field. The University has made significant moves to promote an equitable, diverse and exciting campus community for the benefit of staff and students. It is your responsibility to contribute towards the development of an inclusive culture and practice in the

areas of learning and teaching, research, and service orientation and delivery. As a member of the Macquarie University community, you must not discriminate against or harass others based on their sex, gender, race, marital status, carers' responsibilities, disability, sexual orientation, age, political conviction or religious belief. All staff and students are expected to display appropriate behaviour that is conducive to a healthy learning environment for everyone.

## 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 clinical, practical, laboratory, work-integrated learning (e.g., PACE placements), and team-based learning activities. Some learning activities are recorded (e.g., face-to-face lectures), however you are encouraged to avoid relying upon such material as they do not recreate the whole learning experience and technical issues can and do occur. As an adult learner, we respect your decision to choose how you engage with your learning, but we would remind you that the learning opportunities we create for you have been done so to enable your success, and that by not engaging you may impact your ability to successfully complete this unit. We equally expect that you show respect for the academic staff who have worked hard to develop meaningful activities and prioritise your learning by communicating with them in advance if you are unable to attend a small group interactive session.

Another dimension of professionalism is having respect for your peers. It is the right of every student to learn in an environment that is free of disruption and distraction. Please arrive to all learning activities on time, and if you are unavoidably detained, please join activity as quietly as possible to minimise disruption. Phones and other electronic devices that produce noise and other distractions must be turned off prior to entering class. Where your own device (e.g., laptop) is being used for class-related activities, you are asked to close down all other applications to avoid distraction to you and others. Please treat your fellow students with the utmost respect. If you are uncomfortable participating in any specific activity, please let the relevant academic know.