



MOLS7011

Research Topic: Advanced Biomolecular Analysis

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

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Robert Willows

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Credit points

10

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

This unit addresses some advanced methods of analysis utilised in the biomolecular sciences. Biomolecular sciences spans the study of individual molecular structures and biochemical reactions to also encompass the 'omics' sciences of genomics, proteomics, metabolomics and glycomics. These sciences all generate large and complex datasets that require specialized software and methods to assemble and analyse. The analyses are challenging, as they not only require a good knowledge of biochemistry, molecular biology, and cell and developmental biology, but also an understanding of limitations of both the software and the data quality. This unit will provided a background to the data acquisition methods, quality control of the datasets, and analysis methods within a number of these areas. Most importantly it will provide hands-on experience in the analysis of real large-scale datasets and the correct use of appropriate analysis tools.

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: Demonstrate knowledge of appropriate techniques used in acquiring large biomolecular datasets and the limitations of the use of these methods

ULO2: Demonstrate understanding of experiment design and ability to critically assess the quality of large biomolecular datasets prior to in-depth analysis

ULO3: Analyze large datasets and compare it with established information about the

system under investigation

ULO4: Process datasets using specific software, providing a broad overview of data in terms of size, quality and utility for further analysis

ULO5: Demonstrate ability to effectively report, communicate and draw new conclusions about a biomolecular system from large analytical datasets.

General Assessment Information

The focus for this unit is the practical evaluation of large scale data obtained from some modern biomolecular analysis techniques. You will gain an understanding of the different types of data that can be produced from genomics, proteomics and glycomics and learn how to use software to process datasets to give molecular information. You will learn approaches for interpreting data to carry out integrative biomolecular analysis.

The unit will be co-taught by academics and post-doctoral fellows who are highly familiar with biomolecular data analysis in these disciplines.

The subject area is complex and constantly changing so the goal of the subject matter of this unit is not to enable you to understand completely how to do 'omics analysis, but to train you to know what to look for, what questions to ask, and how to proceed to answer those questions.

Late Assessment Submission

Late assessments are not accepted in this unit unless a [Special Consideration](#) has been submitted and approved.

Assessment Tasks

Name	Weighting	Hurdle	Due
Analysis Report 2	40%	No	Week 5
Analysis Report 1	20%	No	Week 10
Analysis Report 3	40%	No	Week 13

Analysis Report 2

Assessment Type ¹: Report

Indicative Time on Task ²: 45 hours

Due: **Week 5**

Weighting: **40%**

Students will be given a biomolecular data set during the workshops and will be required to analyse this dataset using methods presented during the workshops. The analysis results

relevant for the particular data set provided will be presented as a report. Some parts of the analysis will need to be conducted in the students own time between workshops. The type of dataset and analysis methods will be different from those used for report 1.

On successful completion you will be able to:

- Demonstrate understanding of experiment design and ability to critically assess the quality of large biomolecular datasets prior to in-depth analysis
- Analyze large datasets and compare it with established information about the system under investigation
- Process datasets using specific software, providing a broad overview of data in terms of size, quality and utility for further analysis
- Demonstrate ability to effectively report, communicate and draw new conclusions about a biomolecular system from large analytical datasets.

Analysis Report 1

Assessment Type ¹: Report

Indicative Time on Task ²: 24 hours

Due: **Week 10**

Weighting: **20%**

Students will be given a biomolecular data set during the workshops and will be required to analyse this dataset using methods presented during the workshops. The analysis results relevant for the particular data set provided will be presented as a report. Some parts of the analysis will need to be conducted in the students own time between workshops.

On successful completion you will be able to:

- Demonstrate understanding of experiment design and ability to critically assess the quality of large biomolecular datasets prior to in-depth analysis
- Analyze large datasets and compare it with established information about the system under investigation
- Process datasets using specific software, providing a broad overview of data in terms of size, quality and utility for further analysis

Analysis Report 3

Assessment Type ¹: Report

Indicative Time on Task ²: 45 hours

Due: **Week 13**

Weighting: **40%**

Students will be given a biomolecular data set during the workshops and will be required to analyse this dataset using methods presented during the workshops. The analysis results relevant for the particular data set provided will be presented as a report. Some parts of the analysis will need to be conducted in the students own time between workshops. The type of dataset and analysis methods will be different from those used for report 1 and 2.

On successful completion you will be able to:

- Demonstrate knowledge of appropriate techniques used in acquiring large biomolecular datasets and the limitations of the use of these methods
- Demonstrate understanding of experiment design and ability to critically assess the quality of large biomolecular datasets prior to in-depth analysis
- Analyze large datasets and compare it with established information about the system under investigation
- Process datasets using specific software, providing a broad overview of data in terms of size, quality and utility for further analysis

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

What you need to bring to class:

Laptop computer (Mac, PC or Linux).

We will supply masks if social distancing cannot be maintained.

We will help you set up your computer to load appropriate software for performing analysis of biomolecular "-omics" datasets and also help you access cloud compute resources for performing analyses that cannot run on a laptop computer.

Unit Schedule

Workshop topics: Genomics, Proteomics and Glycomics/Proteomics not necessarily in this order.

Each Topic will run for 4 weeks. The schedule for each topic will be provided in iLearn

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 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 an](#)

[d 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/.

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 since First Published

Date	Description
04/07/2022	Added late assessment information.