MOLS8411

Molecular Genomics Analysis and Design

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

School of Natural Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
Paul Jaschke
paul.jaschke@mq.edu.au
Contact via email
14ER 357

Credit points
10

Prerequisites
Admission to GradDipResFSE or GradCertResFSE or (BMOL6201 and BMOL6432 and Admission to GradDipBiotech or MBiotech)

Corequisites

Co-badged status

Unit description
This unit provides an introduction to synthetic biology and hands-on practise in the analysis of large datasets gathered when working in the broad field of 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 specialised 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. The lectures on synthetic biology start with a brief overview of the field before delving into more challenging yet exciting concepts. You will learn about current techniques and approaches used in synthetic biology and design a molecular switch using these principles. The lectures also discuss applications, limitations and future potential of synthetic biology to produce new solutions to global challenges.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Zero Hunger; Good Health and Well Being; Life on Land

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: Ultilise and describe techniques applicable to acquiring large biomolecular datasets and the limitations of the use of these methods

ULO2: Design and conduct experiments to collect large biomolecular datasets using appropriate methods to assess and analyse the quality of these datasets.

ULO3: Report, communicate and draw new conclusions about a biomolecular system from large analytical datasets

ULO4: Summarise and discuss synthetic biology engineering principles using appropriate contemporary synthetic biological vocabulary

ULO5: Summarise current and future application spaces for synthetic biology by reviewing the latest published literature in the field

ULO6: Define the culture, safety practices, and organisational community of the synthetic biology field to evaluate how emerging and future synthetic biology technologies may benefit and/or potentially endanger humanity and the natural environment

General Assessment Information

All assignments must be submitted as soft copy before the date & time specified on iLearn. Specific instructions for how to successfully complete assessments will be provided on iLearn. Criteria and standards required for the assessment tasks will be available on iLearn.

The final exam must be undertaken at the time indicated in the unit guide. Should these activities be missed due to illness or misadventure, students may apply for Special Consideration.

Late Assessment Submission Penalty

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.

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.

Assessments where Late Submissions will be accepted

In this unit, late submissions will accepted as follows:

Genome Assembly and Annotation – YES, Standard Late Penalty applies

Synthetic Biology Design Project – YES, Standard Late Penalty applies

All Other Assessments (Final Exam) - NO, unless Special Consideration is Granted

Requirements to Pass this Unit

To pass this unit you must achieve a total mark equal to or greater than 50%

Attendance and participation

We strongly encourage all students to actively participate in all learning activities. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to deepen your understanding of the material, collaborate with peers, and receive valuable feedback from instructors, to assist in completing the unit assessments. Your active participation not only enhances your own learning experience but also contributes to a vibrant and dynamic learning environment for everyone.

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
Genome assembly and annotation	30%	No	06/05/2025
Synthetic Biology Design Project	30%	No	06/06/2025
Final Exam	40%	No	Exam Period

Genome assembly and annotation

Assessment Type [1]: Poster
Indicative Time on Task [2]: 22 hours
Due: **06/05/2025**
Weighting: **30%**

Presentation of a poster representing a genome assembly and annotation project.

On successful completion you will be able to:

- Ultilise and describe techniques applicable to acquiring large biomolecular datasets and the limitations of the use of these methods
- Design and conduct experiments to collect large biomolecular datasets using appropriate methods to assess and analyse the quality of these datasets.
- Report, communicate and draw new conclusions about a biomolecular system from large analytical datasets

Synthetic Biology Design Project

Assessment Type [1]: Media presentation
Indicative Time on Task [2]: 22 hours
Due: **06/06/2025**
Weighting: **30%**

A presentation on a synthetic biology design task.

On successful completion you will be able to:

- Summarise and discuss synthetic biology engineering principles using appropriate contemporary synthetic biological vocabulary
- Summarise current and future application spaces for synthetic biology by reviewing the latest published literature in the field
- Define the culture, safety practices, and organisational community of the synthetic biology field to evaluate how emerging and future synthetic biology technologies may benefit and/or potentially endanger humanity and the natural environment

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 28 hours
Due: **Exam Period**
Weighting: **40%**

An exam consisting of a series of short answer, problem solving, data interpretation and essay questions.

On successful completion you will be able to:

- Ultilise and describe techniques applicable to acquiring large biomolecular datasets and the limitations of the use of these methods
- Design and conduct experiments to collect large biomolecular datasets using appropriate methods to assess and analyse the quality of these datasets.
- Report, communicate and draw new conclusions about a biomolecular system from large analytical datasets
- Summarise and discuss synthetic biology engineering principles using appropriate contemporary synthetic biological vocabulary

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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

Attendance at scheduled activities

Should any activity be missed due to illness or misadventure please notify the convenor as soon as possible (ideally prior to the scheduled activity).

Week 1 Classes

Lectures (attend in-person 14SCO 163 Active Learning Space, or via Echo360:

Friday: 12 pm - 1 pm

NO practical in Week 1; practicals start in **WEEK 2**

Subsequent weeks

Lectures (attend in-person 14SCO 163 Active Learning Space, or via Echo360:

Friday: 12 pm - 1 pm

Practicals (attend in-person 14ER 130 only)

Fridays: 2 pm - 6 pm

• Close-toed shoes must be worn in every practical unless instructed otherwise.

• Lab coats are NOT needed.

• We highly encourage students to bring their own computer.

Methods of Communication

We will communicate with you via your university email and through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to the unit convenor via the contact email on iLearn.

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 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 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

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Changes in the 2025 offering:

Natural and Synthetic Genomics Essay: the assessment was discontinued due to a change to university assessment policy.

Synthetic Biology Design Project: based on student feedback, this assessment was changed from the last offering to include an additional workshop to assist student groups.

Unit information based on version 2025.05 of the Handbook