



MOLS8411

Molecular Genomics Analysis and Design

Session 1, In person-scheduled-weekday, North Ryde 2022

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Paul Jaschke

paul.jaschke@mq.edu.au

Credit points

10

Prerequisites

((BMOL6201 or CBMS621) or (admission to MBioBus or BMedScMBiotech)) and BMOL6432

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.

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: Utilise 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.

For any unapproved absences, students will receive a zero mark.

Participation in ALL workshop sessions is required in order to complete the workshop reports.

Online quizzes, in-class activities, or scheduled tests and 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.

All other assessments must be submitted by 5:00 pm on their due date. Should these assessments be missed due to illness or misadventure, students should apply for Special Consideration.

Late submissions are permitted and a consistent penalty will be applied for late submissions as follows:

A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 January. Student A submits the assessment at 1 pm, 3 January. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Workshop Participation</u>	0%	Yes	Week 2-13

Name	Weighting	Hurdle	Due
Natural and Synthetic Genomics Essay	25%	No	Week 7
Genome assembly and annotation	25%	No	Week 8
Synthetic Biology Design Project	25%	No	Week 13
Final Exam	25%	No	University Examination Period

Workshop Participation

Assessment Type ¹: Participatory task

Indicative Time on Task ²: 0 hours

Due: **Week 2-13**

Weighting: **0%**

This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)

Based on attending workshops, contributing to discussions, and completing activities.

On successful completion you will be able to:

- Utilise 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
- 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

Natural and Synthetic Genomics Essay

Assessment Type ¹: Essay

Indicative Time on Task ²: 22 hours

Due: **Week 7**

Weighting: **25%**

An essay on a contemporary topic in genomics and/or synthetic biology.

On successful completion you will be able to:

- Utilise and describe techniques applicable to acquiring large biomolecular datasets and the limitations of the use of these methods
- 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
- 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

Genome assembly and annotation

Assessment Type ¹: Poster

Indicative Time on Task ²: 22 hours

Due: **Week 8**

Weighting: **25%**

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

On successful completion you will be able to:

- Utilise 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: Presentation

Indicative Time on Task ²: 25 hours

Due: **Week 13**

Weighting: **25%**

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: 20 hours

Due: **University Examination Period**

Weighting: **25%**

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

On successful completion you will be able to:

- Utilise 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

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

Offshore Students

Off-shore students must email the convenor as soon as possible to discuss study options.

COVID Information and on-campus classes

On-campus teaching continues to be scheduled for Session 1, 2022. Masks are compulsory for all classes in indoor spaces and social distancing will be implemented wherever possible. Students will also be required to sanitise surfaces before and after use. Students are requested to minimise the risk of spreading COVID to themselves and others in accordance with the university and NSW Health guidelines: <https://www.mq.edu.au/about/coronavirus-faqs> and <https://www.nsw.gov.au/covid-19/stay-safe>. Any further requirements or changes to units in relation to COVID will be communicated to students via iLearn.

Lectures

Fridays: 12 pm - 1 pm Lectures will be presented formally, although quizzes and general questions may be asked in class, to strengthen and increase understanding of the concepts. Most lecture material will be available on the unit web site, while other material will be provided in the lecture class. Do not assume these notes or recordings/video capture are a suitable substitute to attending the lectures. As a rule of thumb, you should spend 1-2 hours studying the lecture material for every hour spent attending lecture.

Workshops

Starting Week 2 of semester.

14 Eastern Road (14EAR also known as E8A) - 130/150 Science Lab

Fridays: 9 am - 1 pm The demonstrators are actively involved in research activities to bring knowledge from real-world experiences in their respective fields. You must attend these workshops to gain practical experience with data analysis and designing of the switch. As some of the assessment is based on your practical use of specific software it is essential that you attend these workshops. It is recommended that each student will bring to workshop a laptop computer to install data analysis software, or prior arrangements must be made with the convenor.

Required Reading for Book Review Assessment: To purchase the book **Biocode** (ISBN: 9780199687763), it is available from Booktopia: <https://www.booktopia.com.au/biocode-dawn-field/book/9780199687763.html>

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 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/.

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.