



MOLS7012

Research Topic: Synthetic Biology

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Natural Sciences

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General Information

Unit convenor and teaching staff

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Credit points

10

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

This unit will build on fundamental concepts in molecular biology and bioengineering to explore themes in the emerging field of synthetic biology. This unit will provide students with the conceptual framework of systematic molecular design in order to build new componentry and biological systems. The unit will be taught extensively through the primary literature and will provide students with hands on experience in cutting edge tools required to design and synthesize biological parts. Exemplars of current applications including generation of biofuels, microbial synthesis of pharmaceuticals, and design of biosensors to detect infection and environmental waste will be examined. This unit will also focus on the ethical, legal and societal issues surrounding synthetic biology.

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: Summarise and discuss engineering principles and the relationship to synthetic biology. Gain familiarity with a common vocabulary useful for synthetic biology (e.g. standard part, chassis, switches, oscillators, etc.)

ULO2: Summarise current and future application spaces for synthetic biology and have a sound knowledge of the latest published literature in the field

ULO3: 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

ULO4: Productively work in a group on a scientific project

ULO5: Synthesize diverse primary synthetic biology literature sources and present in an accessible way suitable for a general audience

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must: - Achieve at least a 50% overall mark

Late Submissions

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

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. 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](#).

Special Consideration

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 ask.mq.edu.au

Assessment Tasks

Name	Weighting	Hurdle	Due
SynBio Company Assessment	18%	No	Week 2
Paper presentation/discussion	18%	No	Weeks 3-6
SynBio Ethics Essay	18%	No	Week 9
Gene refactoring	18%	No	Week 13
Digital Media Presentation	28%	No	Week 13

SynBio Company Assessment

Assessment Type ¹: Presentation

Indicative Time on Task ²: 17 hours

Due: **Week 2**

Weighting: **18%**

Presentation describing one company in the synthetic biology space

On successful completion you will be able to:

- Summarise and discuss engineering principles and the relationship to synthetic biology. Gain familiarity with a common vocabulary useful for synthetic biology (e.g. standard part, chassis, switches, oscillators, etc.)
- 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
- Synthesize diverse primary synthetic biology literature sources and present in an accessible way suitable for a general audience

Paper presentation/discussion

Assessment Type ¹: Presentation

Indicative Time on Task ²: 17 hours

Due: **Weeks 3-6**

Weighting: **18%**

Lead presentation of primary synthetic biology literature and participate in discussion of other student presentations

On successful completion you will be able to:

- Summarise and discuss engineering principles and the relationship to synthetic biology. Gain familiarity with a common vocabulary useful for synthetic biology (e.g. standard part, chassis, switches, oscillators, etc.)
- Productively work in a group on a scientific project
- Synthesize diverse primary synthetic biology literature sources and present in an accessible way suitable for a general audience

SynBio Ethics Essay

Assessment Type ¹: Essay

Indicative Time on Task ²: 17 hours

Due: **Week 9**

Weighting: **18%**

An essay on the ethics of synthetic biology

On successful completion you will be able to:

- Summarise current and future application spaces for synthetic biology and have a sound knowledge of 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
- Synthesize diverse primary synthetic biology literature sources and present in an accessible way suitable for a general audience

Gene refactoring

Assessment Type ¹: Design Task

Indicative Time on Task ²: 17 hours

Due: **Week 13**

Weighting: **18%**

Redesign (refactoring) of a set of genes for expression in an alternate host.

On successful completion you will be able to:

- Productively work in a group on a scientific project

Digital Media Presentation

Assessment Type ¹: Media presentation

Indicative Time on Task ²: 24 hours

Due: **Week 13**

Weighting: **28%**

Digital media presentation of a tool, method, and/or approach in synthetic biology aimed at general audience.

On successful completion you will be able to:

- Summarise and discuss engineering principles and the relationship to synthetic biology. Gain familiarity with a common vocabulary useful for synthetic biology (e.g. standard part, chassis, switches, oscillators, etc.)
- Summarise current and future application spaces for synthetic biology and have a sound knowledge of the latest published literature in the field
- Synthesize diverse primary synthetic biology literature sources and present in an accessible way suitable for a general audience

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

Instructors

This unit is presented by several experts in Synthetic Biology, including the unit convenor Dr. Paul Jaschke who has deep experience engineering organisms and viruses and runs lectures on understanding what synthetic biology is and what it is used for. Other lectures are run by Synthetic Biologists from the ARC Centre of Excellence and cover topics from the first creation of synthetic cells and reengineering a yeast to contain a plastid.

Class Times

This Session 1 unit comprises a 3-hour block each week. Please consult the iLearn site for updated timetable. This unit will be taught as tutorials that encompass both lectures and hands-on experiences/workshop activities (e.g. discussion of relevant papers from literature; software workshops etc). Tutorials will NOT be recorded and attendance is compulsory.

Unit Text

The following texts are recommended to help with your learning in this unit:

“Synthetic Biology: Tools and Applications” (2013) Huimin Zhao.

The ebook can be viewed using this link: <https://ebookcentral-proquest->

com.simsrad.net.ocs.mq.edu.au/lib/mqu/detail.action?docID=1160900

There is also a hardcopy of the book in the Macquarie Library. It is NOT recommended that you purchase this text.

Synthetic Aesthetics : Investigating Synthetic Biology's Designs on Nature (2014)

The ebook can be viewed using this link: <https://ebookcentral-proquest-com.simsrad.net.ocs.mq.edu.au/lib/mqu/detail.action?docID=3339753>

Other required learning material (e.g. journal articles, book chapters) will be made available on iLearn as this unit progresses.

Methods of Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to mols7012@mq.edu.au from your **university email address**

COVID Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus-faqs>. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via 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 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 Advocacy](#) provides independent advice on MQ policies, procedures, and processes

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.