



# MOLS7012

## Research Topic: Synthetic Biology

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

*School of Natural Sciences*

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## General Information

Unit convenor and teaching staff

Unit Convenor

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14EAR 357

Following workshop

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Lecturer

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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

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
<a href="#">SynBio Company Assessment</a>	18%	No	Week 2

Name	Weighting	Hurdle	Due
<a href="#">Paper presentation/discussion</a>	18%	No	Week 3-6
<a href="#">SynBio Ethics Essay</a>	18%	No	Week 9
<a href="#">Gene refactoring</a>	18%	No	Week 13
<a href="#">Digital Media Presentation</a>	28%	No	Week 13

## SynBio Company Assessment

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

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Presentation

Indicative Time on Task <sup>2</sup>: 17 hours

Due: **Week 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 <sup>1</sup>: Essay

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Design Task

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Media presentation

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

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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

### 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.

### 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 4-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 text is recommended to help with your learning in this unit. “Synthetic Biology: Tools and Applications” (2013) Huimin Zhao. The ebook can be downloaded from the library using this link: <http://mqu.ebib.com.au/patron/FullRecord.aspx?p=1160900> There is a hardcopy of the book in the Macquarie Library. It is NOT recommended that you purchase this text. Other required learning material (e.g. journal articles, book chapters) will be made available on iLearn as this unit progresses.

## 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.