



# CBMS794

## Research Topic: Synthetic Biology

S1 Day 2017

*Dept of Chemistry & Biomolecular Sciences*

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## General Information

Unit convenor and teaching staff

Unit Convenor

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Credit points

4

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:

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.

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.

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

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">SynBio Company Assessment</a>	15%	No	Week 3
<a href="#">Paper presentation/discussion</a>	15%	No	Week 4-6
<a href="#">SynBio Ethics Essay</a>	20%	No	Week 7
<a href="#">Gene refactoring</a>	15%	No	Week 9

Name	Weighting	Hurdle	Due
<a href="#">Research Report</a>	15%	No	Week 12
<a href="#">Digital Media Presentation</a>	20%	No	Week 13

## SynBio Company Assessment

Due: **Week 3**

Weighting: **15%**

Presentation describing one company in the synthetic biology space.

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

## Paper presentation/discussion

Due: **Week 4-6**

Weighting: **15%**

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

Due: **Week 7**

Weighting: **20%**

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

Due: **Week 9**

Weighting: **15%**

A report of the results of computationally refactoring genes.

On successful completion you will be able to:

- Productively work in a group on a scientific project

## Research Report

Due: **Week 12**

Weighting: **15%**

A research report on a topic in synthetic biology.

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

## Digital Media Presentation

Due: **Week 13**

Weighting: **20%**

Digital media presentation of new tool/approach in synthetic biology.

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.

## Delivery and Resources

### 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.

## Unit Schedule

**Tentative schedule subject to change with appropriate notice**

### Week 1-3: P Jaschke

Introduction – What is Synthetic Biology?

### Week 4-6: I Paulsen

Minimal Cells and Synthetic Life

### Week 7: R Willows

Parts, Devices and Systems - a more detailed look

**\* Easter Break \***

### Week 8-9: R Willows

Parts, Devices and Systems - a more detailed look

### Week 10: J Hallinan

Modelling Synthetic Biology Systems

**Week 11: P Jaschke**

Gene Circuits

**Week 12: B Mabbutt**

Nano Construction with Proteins

**Week 13: P Jaschke**

Unit wrap up and digital media presentations

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.html)

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public [http://www.mq.edu.au/policy/docs/complaint\\_management/procedure.html](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy (in effect until Dec 4th, 2017): [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html)

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Results

Results shown in *iLearn*, 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](http://ask.mq.edu.au).

**\*\* IMPORTANT\*\* Late submission of assessment tasks:**

No extensions will be granted. Late tasks will be accepted up to 72 hours after the submission deadline. There will be a deduction of 20% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 40% penalty). This penalty does not apply for cases in which an application for special consideration is made and approved.

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## 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.

## Graduate Capabilities

### PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:



## Learning outcomes

- 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.
- 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

## Assessment tasks

- SynBio Ethics Essay
- Gene refactoring
- Research Report

## PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

## Learning outcomes

- 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.
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## Assessment tasks

- SynBio Company Assessment
- Paper presentation/discussion
- SynBio Ethics Essay
- Gene refactoring

- Research Report
- Digital Media Presentation

## PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

### Learning outcomes

- 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

### Assessment tasks

- SynBio Company Assessment
- Paper presentation/discussion
- SynBio Ethics Essay
- Gene refactoring
- Research Report
- Digital Media Presentation

## PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

### Learning outcome

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

## Assessment tasks

- SynBio Company Assessment
- Gene refactoring
- Research Report
- Digital Media Presentation

## PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

## Learning outcomes

- 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.
- 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.
- Productively work in a group on a scientific project
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## Assessment tasks

- SynBio Company Assessment
- Paper presentation/discussion
- SynBio Ethics Essay
- Research Report
- Digital Media Presentation

## PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to

national and global issues

This graduate capability is supported by:

## **Learning outcomes**

- 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.
- 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

## **Assessment tasks**

- Paper presentation/discussion
- SynBio Ethics Essay

## **Changes from Previous Offering**

There will be the following changes made from the 2016 offering:

- No final exam
- Creation of one additional assessment task, the research report, and a rebalancing of other assessment task weights.
- Additional lecture from Dr. Jennifer Hallinan (Biological Sciences)