



CBMS330

Biomolecular Sciences Capstone

S2 Day 2015

Dept of Chemistry & Biomolecular Sciences

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	3
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	6
<u>Unit Schedule</u>	7
<u>Policies and Procedures</u>	9
<u>Graduate Capabilities</u>	10
<u>Changes from Previous Offering</u>	15

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General Information

Unit convenor and teaching staff

Unit Convenor

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Tuesday to Friday (9am to 4pm) by appointment

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Credit points

3

Prerequisites

Corequisites

9cp from (CBMS306 or CBMS331 or CBMS332 or CBMS333 or CBMS335 or CBMS336 or CBMS337 or CBMS340 or CBMS341 or CBMS342)

Co-badged status

Unit description

Having mastered some fundamental and practical aspects from the biomolecular science-based subjects, you have started to understand how to integrate your knowledge from these subjects into broader biomolecular areas such as systems biology, proteomics, genomics, computational biology, biotechnology and structural biology. The aim of this unit is to help you further with 'putting it all together' as we aim to provide you with additional skills, tools and preparation for future employment. An important aspect of this unit is a laboratory-based component where you will use your strong foundation in the biomolecular sciences to conduct a research project in synthetic biology. You will also develop skills to aid you in the transition into the workforce or further study.

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:

Integrate the knowledge, abilities, and values that you have obtained from your undergraduate experience to define a problem, formulate a hypothesis, and design and plan an investigation in the area of synthetic biology.

Demonstrate the need for experiments, experimental design and conduction of experiments when investigating a research problem in synthetic biology.

Demonstrate generic proficiency in techniques used in research laboratories in the Biomolecular Sciences.

Through your participation in your research group project, engage in cutting edge research in synthetic biology by recording, analysing and critically interpreting experimental data.

Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.

Demonstrate an ability to work effectively, responsibly and safely; as a member of a research team.

Demonstrate a sound understanding of the major ethical issues posed by advances in synthetic biology.

Develop career networking skills and capabilities that will aid you with either moving into the workforce or further study.

Assessment Tasks

Name	Weighting	Due
<u>Case Study: iGEM report</u>	20%	Week 4
<u>Execution of Project</u>	10%	Weekly (weeks 1 to 8)
<u>Portfolio Task</u>	20%	Week 10
<u>Seminar presentation</u>	20%	Week 12
<u>Final research report</u>	30%	Week 13

Case Study: iGEM report

Due: **Week 4**

Weighting: **20%**

You will be given a list of 5 presentations from teams in the 2014 iGEM competition to view. You will pick one and submit a short written report (~1,000 words) critiquing one of your selected presentations.

On successful completion you will be able to:

- Demonstrate the need for experiments, experimental design and conduction of experiments when investigating a research problem in synthetic biology.

Execution of Project

Due: **Weekly (weeks 1 to 8)**

Weighting: **10%**

At the conclusion of each week, via an online blog, post a short summary of your contribution to the project for the week. Include details such as project plans, your contribution to the project, and any outcomes.

On successful completion you will be able to:

- Integrate the knowledge, abilities, and values that you have obtained from your undergraduate experience to define a problem, formulate a hypothesis, and design and plan an investigation in the area of synthetic biology.
- Demonstrate generic proficiency in techniques used in research laboratories in the Biomolecular Sciences.
- Through your participation in your research group project, engage in cutting edge research in synthetic biology by recording, analysing and critically interpreting experimental data.
- Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.
- Demonstrate an ability to work effectively, responsibly and safely; as a member of a research team.

Portfolio Task

Due: **Week 10**

Weighting: **20%**

Choose from a list of supplied job ads/job descriptions of work that you may be interested in

applying. Or supply a job ad of your choosing. Prepare a cover letter and a short (~2 to 3 page) cv tailored for the job application/work description. Guidance on portfolio development and preparing job applications will be given.

On successful completion you will be able to:

- Develop career networking skills and capabilities that will aid you with either moving into the workforce or further study.

Seminar presentation

Due: **Week 12**

Weighting: **20%**

In a small group (3-4 students), you will present a short research seminar for a topic associated with the research project (15 minute + 5 min question time). Topics will vary but may include the iGEM Jamboree presentation or current topics in synthetic biology.

On successful completion you will be able to:

- Through your participation in your research group project, engage in cutting edge research in synthetic biology by recording, analysing and critically interpreting experimental data.
- Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.
- Demonstrate an ability to work effectively, responsibly and safely; as a member of a research team.
- Demonstrate a sound understanding of the major ethical issues posed by advances in synthetic biology.

Final research report

Due: **Week 13**

Weighting: **30%**

A 3000 word report on your research project is to be completed at the end of the semester (week 13). The format is formal and in the style of a scientific paper. It will include the following sections: Abstract, Introduction, Materials and Methods, Results and Discussion, References. Report writing skills will be given during the tutorials and via ilearn.

On successful completion you will be able to:

- Demonstrate generic proficiency in techniques used in research laboratories in the Biomolecular Sciences.

- Through your participation in your research group project, engage in cutting edge research in synthetic biology by recording, analysing and critically interpreting experimental data.
- Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.
- Demonstrate a sound understanding of the major ethical issues posed by advances in synthetic biology.

Delivery and Resources

Classes

There are NO formal lectures to attend and NO final exam.

Tutorials/Seminars

Tutorials/Seminars will be during the Thursday class (between 9am to 5pm) and located in the 'write-up' room - E7B 354. However, the time and location for tutorial sessions may vary and updates will be posted on the CBMS330 ilearn.mq site. It is essential that you check the ilearn.mq website on a regular basis for updates of the laboratory and seminar schedule. This course is NOT taught from standard texts and attendance at tutorials is compulsory.

Laboratory Session (Wet-lab)

The 'Timetables @ MQ' for CBMS330 has the practical component scheduled on Thursdays from 9am-1pm AND 2pm to 6pm in the laboratories located in E7B 354. You should plan to put aside Thursday (9am to 5pm) as your 'capstone day'. Outside these compulsory scheduled hours, you may also contribute to the research project during the mid-semester break (to help meet iGEM deadlines) or to remove/incubate samples during other times in the week (e.g. check plates from thursday class on a friday). The laboratory sessions start in week 1. It is not unreasonable to expect that you would dedicate ~7 – 10 h/week to your research project during weeks 1 to 8. Further information regarding the laboratory session and the nature of the laboratory component will be given in week 1.

Other (Dry-lab)

Due to the nature of the research activities in this unit (participation in iGEM), there are other tasks/activities that you will need to schedule time for both during and beyond the thursday scheduled contact hours (e.g. analysing data, preparing posters, seminars, completing a wiki etc). The 'write-up' room (E7B 354) and notebook computers will be available for you to use during the Thursday lab session to help with these tasks. The laboratory will also be open during the mid-semester break to help you complete these tasks - times/days will be advised on ilearn.

Each student is expected to attend all tutorials and laboratory sessions which commence at 9am. Excessive absence from tutorials and laboratory sessions will be treated as grounds for incomplete work in CBMS330.

The university timetable can be found at <http://www.timetables.mq.edu.au/>

Required and Recommended Texts and/or Materials

This course is NOT taught from standard texts but will depend on the nature of the weekly activities and thus reading material may be advised by your CBMS academic supervisor. Lists of other suggested reading material will be issued separately. Additional printed notes and other material will be issued as required or made available via the CBMS330 website: learn.mq.edu.au.

Technology Used and Required

You will be using and receive training in modern, state of the art research equipment for conducting your research project. This will be located in the laboratories located in E7B 354 and other research laboratories of the Dept CBMS. You will use database search tools including PubMed to acquire relevant literature. You will present assessment tasks and deliver presentations including a poster and oral talk that will require access to software such as word processing software, graphics software and powerpoint. You will contribute to development of a wiki page for your participation in iGEM. General use computers will be provided during the laboratory session with internet access.

Unit Web Page

- The URL of the CBMS330 Blackboard site is: ilearn.mq.edu.au
- You will be asked for your username (student MQID) and password.
- For log-in or contact difficulties, contact the University Library Information Technology Help Desk. <http://www.lib.mq.edu.au/help/ithelp/>

Unit Schedule

The ilearn site will be continually updated with the details of weekly schedule which will depend on the weekly progress of your research project.

Weekly tutorials/seminars are compulsory and will be structured around the five following topics and themes as specified below. The tutorial schedule will be available on the CBMS330 ilearn.mq website.

- Review of the Scaffold of the Biomolecular Science Major: reflecting on the development of your graduate capabilities and how these have been achieved within the degree.
- The Student Portfolio / Graduate Capabilities: Seminars from the career service and other professional bodies will allow you to take on an active role to reflect and then document on your abilities to demonstrate your capabilities in the area of Biomolecular Sciences. You will be provided with advice to prepare a portfolio.
- Research Project Skills: a practical introduction to research methods, effective writing, effective oral communication and presentations, group work, planning and organization will be given. This will be closely linked to your research project and the assessment

tasks associated with your research project.

- Introduction to Academic and Industry Cultures: Professional preparation of knowledge, skills and values of the profession, occupational health and safety requirements, computer literacy, library competency, software package analysis, analysis of Internet tools/software.
- Ethical and Substantive Issues and Themes: that affect the world community and broad cross-sections of humanity.

Below are brief guidelines regarding the synthetic biology research-project you will do in this unit. Further details and updates of project results will be continuously made available on the CBMS330 ilearn.mq website during the semester.

“Which techniques/skills that I have encountered during my undergraduate experience do I wish to further develop in a given practical situation?”

Designing and Building Biological Systems: Your research-project for the capstone unit will be mentored by A/Prof R Willows, Prof N Packer, Prof I Paulsen, Dr L Brown and other academics in the department. As a researcher, you will be the drivers of this research project and you will work as part of a team. The research project will also be used to participate in the international competition ‘International Genetically Engineered Machine - iGEM’. iGEM (www.igem.org/) is a worldwide synthetic biology competition aimed at undergraduate university students.

- For your research project, you will have access to a kit of ‘biological parts’ (supplied from the iGEM Registry of Standard Biological Parts), and during the semester, you will work to use these parts and new parts of your own design to build novel biological systems and operate them in living cells. Such novel biologically engineered systems have the potential to improve our world and push the frontiers of synthetic biology.
- The CBMS330 research project (and the involvement in iGEM competition) is a **group effort**. You will be given or embrace specific tasks as part of the team effort and be required to report your findings to the group. However, you will be assessed individually as per assessment guidelines.
- Suggestions and training on how best to perform your research-project will be part of the tutorial content. Skills to help you prepare for your presentation and written report will be included. Additionally, tutorial sessions will be designed around your project requirements and experts sought to help in the design and delivery of your project e.g. training in developing web pages, special lectures on specialized instrumentation *etc.*
- You should plan to commit at least 80 hours of actual time to work on your project within the laboratory during weeks 1 to 10 (~6-10 hours/week). Thursdays during semester are the official timetabled laboratory days. The majority of your work will also need to be

completed early in the semester & over the semester break (to meet deadlines to be presented at the iGEM Jamboree event). In general, your laboratory component will be completed by week 8.

- The iGEM Jamboree event for 2015 will be held during the mid-semester break (24th to 28th Sept) in Boston. A team representing CBMS330 will be chosen to present the research project at this event. Involvement in iGEM is optional. All iGEM team members receive any awards given at the Jamboree event.

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

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

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

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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/

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.

Your written reports may be subjected to analysis by Turnitin. Due dates for assessment tasks are on the ilearn site and assignments must be submitted through the ilearn site, where appropriate.

No extensions will be granted, unless a case for Special Consideration has been made through the Faculty site and approved by the Unit convenor.

Late reports will be penalised by deduction of 10% of total available marks for each 24

hour period delay. It is your responsibility to ensure all documents submitted on line are correct and readable.

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) 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

IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Integrate the knowledge, abilities, and values that you have obtained from your undergraduate experience to define a problem, formulate a hypothesis, and design and

plan an investigation in the area of synthetic biology.

- Demonstrate the need for experiments, experimental design and conduction of experiments when investigating a research problem in synthetic biology.
- Through your participation in your research group project, engage in cutting edge research in synthetic biology by recording, analysing and critically interpreting experimental data.
- Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.

Assessment task

- Execution of Project

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Demonstrate the need for experiments, experimental design and conduction of experiments when investigating a research problem in synthetic biology.
- Demonstrate an ability to work effectively, responsibly and safely; as a member of a research team.
- Develop career networking skills and capabilities that will aid you with either moving into the workforce or further study.

Assessment tasks

- Execution of Project
- Final research report

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcome

- Develop career networking skills and capabilities that will aid you with either moving into the workforce or further study.

Assessment tasks

- Case Study: iGEM report
- Execution of Project
- Portfolio Task

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Integrate the knowledge, abilities, and values that you have obtained from your undergraduate experience to define a problem, formulate a hypothesis, and design and plan an investigation in the area of synthetic biology.
- Demonstrate the need for experiments, experimental design and conduction of experiments when investigating a research problem in synthetic biology.
- Demonstrate generic proficiency in techniques used in research laboratories in the Biomolecular Sciences.

Assessment tasks

- Seminar presentation
- Final research report

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Integrate the knowledge, abilities, and values that you have obtained from your undergraduate experience to define a problem, formulate a hypothesis, and design and plan an investigation in the area of synthetic biology.
- Demonstrate the need for experiments, experimental design and conduction of experiments when investigating a research problem in synthetic biology.
- Through your participation in your research group project, engage in cutting edge research in synthetic biology by recording, analysing and critically interpreting experimental data.

Assessment tasks

- Seminar presentation
- Final research report

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Integrate the knowledge, abilities, and values that you have obtained from your undergraduate experience to define a problem, formulate a hypothesis, and design and plan an investigation in the area of synthetic biology.
- Demonstrate the need for experiments, experimental design and conduction of experiments when investigating a research problem in synthetic biology.
- Through your participation in your research group project, engage in cutting edge research in synthetic biology by recording, analysing and critically interpreting experimental data.

Assessment task

- Final research report

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms

effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.
- Demonstrate an ability to work effectively, responsibly and safely; as a member of a research team.
- Develop career networking skills and capabilities that will aid you with either moving into the workforce or further study.

Assessment tasks

- Execution of Project
- Portfolio Task
- Seminar presentation
- Final research report

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.
- Demonstrate a sound understanding of the major ethical issues posed by advances in synthetic biology.

Assessment tasks

- Case Study: iGEM report

- Execution of Project
- Portfolio Task
- Seminar presentation
- Final research report

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Effectively communicate key biomolecular science concepts and scientific results in written and oral form to a variety of audiences. This includes presenting your research in the format of a scientific poster, seminar and wiki.
- Demonstrate an ability to work effectively, responsibly and safely; as a member of a research team.
- Demonstrate a sound understanding of the major ethical issues posed by advances in synthetic biology.

Assessment tasks

- Execution of Project
- Seminar presentation
- Final research report

Changes from Previous Offering

To best accommodate earlier deadlines associated with iGEM for 2015 only, the project proposal task (15%) has been removed. The weightings of other tasks have increased (Case Study 20%, Final Talks 20%, Portfolio task 20%) and the weighting of the final report has decreased (30%).