CBMS880

Molecular and Medical Biotechnology

S2 Day 2019

Dept of Molecular Sciences

Contents

General Information

Unit convenor and teaching staff
Convener
Morten Andersen
morten.andersen@mq.edu.au
Contact via morten.andersen@mq.edu.au
4WW, Office 333
Upon appointment only

Associate convener
Liisa Kautto
liisa.kautto@mq.edu.au
Contact via liisa.kautto@mq.edu.au
6WW, Office 304
Upon appointment only

Credit points
4

Prerequisites
Admission to MBiotech or GradDipBiotech or MBiotechMCom or MRadiopharmSc or MBioBus or MSc

Corequisites

Co-badged status
CBMS731

Unit description
This unit is composed of lectures, a significant hands-on laboratory component, student debate, tutorials, assignments and reports. We will explore areas of contemporary molecular and medical biotechnology by building on students' existing knowledge and showing how science is translated to applications in health, industry and the environment. Lecture topics range from the production of recombinant biomolecules in various cell factories and their industrial and medical applications to nanobiotechnology, forensics and stem cells. Instrumentation and technology supporting biotechnology will be introduced and discussed. Visiting lecturers from various academic disciplines will lead discussion on their areas of expertise. The unit also has a significant hands-on laboratory component with tutorials and assignment tasks. A special task for the 800-level students is to compose an essay on ethical issues in modern biotechnology.

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:

Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
Ability to relate information published in the scientific literature to practical research questions in biotechnology.
Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
Become introduced to and engaged with curiosity-driven learning.
Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.
Critically evaluate work by others including fellow students and learn from it.

Assessment Tasks

Name	Weighting	Hurdle	Due
Report 1	15%	No	TBA
Report 2	8%	No	TBA
Report 3	12%	No	TBA
Primer crafting task	5%	No	TBA
The Great Debate	5%	No	TBA
Hot topic essay	10%	No	TBA

Name	Weighting	Hurdle	Due
Continuing assessment	5%	No	Each week, Monday 5 pm
Final Examination	40%	Yes	End of S2, 2019

Report 1

Due: **TBA**
Weighting: **15%**

The written report on Practical 1 involving five weeks of lab work will introduce students to report writing and provide early feedback on the skills and style in report writing and extracting relevant information from various paper and electronic sources. The first report provides an opportunity for the students to improve via feedback from the lecturer their ability to interpret, analyse and explain experimental results, skills they can use in Report 2 and 3 and later in their career. There are additional questions for the students to answer as part of the report.

The due date for the report will be provided in the beginning of the unit.

Report format and marks for Report 1 (and Report 2, see below):

Introduction – Provide background information needed for the reader to understand the context and purpose of the experiment. At the end of the introduction, state the aims clearly.

Materials and Methods – Describe what was done in the experiment. Include materials used and procedures followed. State the main points and procedures.

Results and Discussion – Present the findings of the experiment with tables and graphs where applicable. Interpret and explain the findings and place them in the context of background information. Discuss results with reflecting on the published literature.

References - choose one style and stick to it (MQ library guide: https://libguides.mq.edu.au/referencing)

Results should consist of tables, diagrams, figures and text in between to tie the story together. Presenting tables, graphs, etc. without any explanation is not acceptable. Every table, graph and figure should be numbered and have a caption, and you should refer to them in the text by their number.

Report length - Expected length for an average report is about 5-10 double spaced typewritten pages plus figures and tables.

Answers to questions - separate from other text

Please answer the questions after the actual report text under a heading ‘Answers to questions’ and number your answers.

Marks - Marks allocated to each component are given in the class.

On successful completion you will be able to:

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.

Report 2

Due: **TBA**
Weighting: **8%**

Written report on Practical 2 involving one week of lab work. The students have received feedback on their first report and thus should take the advice on board when writing report 2. This report involves presenting confocal microscopy image material produced in the practical and discussing the observations in detail. Also, the students are requested to answer additional questions on related topics and produce an executive summary linking together Practicals 1 and 2, as part of the report.

The due date for the report will be provided in the beginning of the unit.

Same report requirements (format and style) as Report 1

On successful completion you will be able to:

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical

concepts.

- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from 'what was done?' to explaining 'what does it mean?'.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.

Report 3

Due: **TBA**
Weighting: **12%**

Written report on Practical 3 involving two weeks of lab work. The report concerns detailed data analysis using glycomics data obtained in the class. There are additional questions for the students to answer as part of the report.

The due date for the report will be provided in the beginning of the unit.

Report format and marks for Report 3:

Report length and marks - Maximum **4 pages** (strictly including references and figures). Marks out of a maximum of 10 will be given. The report is to be written individually. The report should cite literature and used software for data handling at the relevant places and should contain the following section:

1) **Introduction**: Concise introduction and description of the aims (~½ page, 1 mark).

2) **Methods**: Draw a detailed flow chart summarising all the experimental steps performed in this practical including data acquisition and analysis (~½-1 page, 2 marks).

3) **Results**: Present the obtained glycomics data (use provided table format). Concisely compare the human and bovine glycosylation of lactoferrin (~1 page, 3 marks).

4) **Discussion**: Briefly discuss and reflect on the obtained results. Address the additional questions on related topics, which will be provided in-class (~1 page, 3 marks).

5) **Conclusion**: Briefly summarise the findings of this practical (~½ page, 1 mark).

6) **References**: - choose one style and stick to it (MQ library guide: https://libguides.mq.edu.au/referencing) (<½ page),

On successful completion you will be able to:

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary

nature and impact on modern society.

- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.

Primer crafting task

Due: **TBA**
Weighting: **5%**

In this exercise, you will learn how to turn a peptide sequence to a DNA sequence and design oligonucleotide primers for various purposes in the laboratory such as “catching” a gene and DNA sequencing. This is one of the most essential skills in molecular biology. You will also learn the ropes for peer-assisted marking as you will be marking your classmates work. During the tutorial, you will be given a brief, material to work with and specific questions to answer. Rubric and instructions for peer-assisted marking will also be presented and explained. This assignment will be completed at home and returned so that students can mark each others work.

The due date for the self-evaluation will be provided in the beginning of the unit.

On successful completion you will be able to:

- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.

- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from 'what was done?' to explaining 'what does it mean?'.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.
- Critically evaluate work by others including fellow students and learn from it.

The Great Debate

Due: **TBA**
Weighting: **5%**

The students will be divided into groups of 4-5 people (depending on the total student number) who will be given a topic in the area of biotechnology (drawn out of a hat) which they either have to defend or oppose. The topics will be chosen from those suggested by the students and teaching staff. The groups will know their topic in the previous week so that they can plan ahead their debating strategy. Each debate, chaired by the course convener, will last for 10-20 minutes followed by questions from the audience. The audience will participate in the assessment by voting for the winning team after each debate. This is a good opportunity to practice ethical voting, *i.e.* voting based on a successful argument and not *e.g.* because you are good friends with some individuals in one of the debating teams. There will be no individual marks but the collective mark goes to everyone in the group.

The date of the debate will be provided in the beginning of the unit.

On successful completion you will be able to:

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Become introduced to and engaged with curiosity-driven learning.
- Critically evaluate work by others including fellow students and learn from it.

Hot topic essay

Due: **TBA**
Weighting: **10%**

This essay will be written in the "Times magazine style", *i.e*. to a broader audience. The topic will be announced before the mid-semester break. Your task is to engage the reader and present your point of view. Expected length of the paper is about 5-10 double spaced typewritten pages. Use illustrations and references if applicable. The essay will be submitted to turnitin and assessed by the lecturer.

The due date for the report will be provided in the beginning of the unit.

On successful completion you will be able to:

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.

Continuing assessment

Due: **Each week, Monday 5 pm**
Weighting: **5%**

Continuing assessment involves providing a brief answer to a weekly question appearing on iLearn each Tuesday by 5 pm. The question concerns a topic discussed in the same week Mon lectures. You are expected to attend lectures/listen to the lecture recordings and submit a **single-sentence answer** to the question on iLearn. Your answers must be in by 5 pm on the following Monday. There will be 12 questions overall. The mark will be calculated according to the number of questions answered correctly and/or answer with appropriate justification/ argumentation. Answering all questions 'correctly' will give you the full 5%. This exercise is voluntary; however, it is great practice for the final exam.

On successful completion you will be able to:

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Become introduced to and engaged with curiosity-driven learning.

Final Examination

Due: **End of S2, 2019**
Weighting: **40%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This is a hurdle assessment task (see https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/assessment for more information on hurdle assessment tasks).

The final course examination will be 3 hours plus 10 min reading time. The examination will cover all sections of the unit including tutorials and practicals and consists of short answers, problem solving tasks and essay questions. In their answers the students are encouraged to practise critical thinking and expand on ideas rather than just listing facts and figures with no discussion. Dot point-style answering is not allowed. You do not need a calculator in the examination.

The final exam is a hurdle assessment and you will need to get >= 40% of the marks available to meet the hurdle. In the event that you make a serious first attempt at the final exam, you will be provided with an opportunity to sit a new final exam. The Faculty defines a serious attempt as a mark of 10% below the hurdle, which in this instance is a mark between 30-40%. **You will NOT be given a second attempt to pass the exam if you get below 30% in your first attempt.**

On successful completion you will be able to:

- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.

Delivery and Resources

Technology Used

Access to the Internet is necessary for efficient communication and research. General use computers are provided by the University, but it would be advantageous to have your own computer/laptop with internet access.

All calculations during practicals can be carried out using a smart phone. It is also recommended that you will take pictures from the cultivation plates etc to be included in the prac report. Do not use gloves when handling the phone. Laboratory reports can be produced using standard Microsoft Office software.

Classes

Timetable: Please check http://www.timetables.mq.edu.au/ for the official timetable of the unit.

Lectures: There are two one-hour back-to-back lectures per week, **Mon 10 am-12 pm, 9 WW, room 116** (in the event of any changes, please see timetables and/or iLearn for updates). The material presented in the lectures is examinable. Please note that there is no text book coverage for a fair amount of the presented material. Therefore, regular attendance to the lectures and careful listening of the recordings is highly recommended. Lecture topics and dates can be found on the unit web-page on iLearn (CBMS880 http://ilearn.mq.edu.au). Lectures will be delivered as scheduled with eCHO recording available through iLearn.

Lecture graphics will be uploaded on CBMS880 iLearn (http://ilearn.mq.edu.au) the day before each lecture or shortly thereafter. The site also provides you with lecture recordings, videos, images and general data generated in the practicals, and material required for the assignment(s). Announcements facility will be used to communicate information from the unit convener.

Laboratory sessions: Please note that **laboratory sessions commence in Week 2**. Practical topics and the timetable are available on iLearn. The 4-hour practical sessions will be offered on Tue afternoon from 2-6 pm or Wed morning 9 am-1 pm in 14 Sir Christopher Ondaatje Ave - 349/350 Science Labs. Each student should enroll in **one** of these sessions and stay within that group throughout the entire semester. Students are required to attend 80% of the laboratory/tutorial sessions although 100% attendance is recommended. It should be noted that missing any practical will make the reporting very difficult since some of the practicals continue over several weeks and plenty of data will be generated every week. Should a student miss a practical for a valid or unavoidable reason, he or she should consult their working pair and other class mates for results and other information generated and shared during the missed session in order to be able to produce a report. The student can also join the other weekly prac class as a temporary guest (in consultation with the convener) and then return to his or her allocated class.

In the laboratory: This course will involve laboratory work with microorganisms, DNA samples, proteins and sugars. The experimental techniques feature molecular biology, microbial cultivation, fluorescent microscopy, biochemical analyses and mass spectrometry. Note that there are safety requirements concerning the use of these techniques. All students are required to adhere to the guidelines for safe laboratory conduct provided on iLearn.

You will not be allowed to enter the laboratory unless you are wearing **enclosed footwear**. **When in the lab, wear a laboratory coat and safety glasses at all times, and gloves when required** - preferably bringing your own lab coat and glasses. It is recommended that you carry a

marking pen (permanent), spatula, scissors and tweezers (and a phone for taking photos).

Instructions for the laboratory experiments and tutorial tasks can be downloaded from iLearn. It is essential that you bring the notes with you to each class. Additional material may be provided in the class.

You will be required to keep **a laboratory book** in which the details, results and conclusions of experiments will be recorded. The best format is an A4 ruled notebook that opens flat. This book is to be used in the practicals and the notes taken should be good enough to allow you to repeat the experiment. Tablets and laptops may be used for note-taking but using them may be tricky as you should not wear gloves when typing notes. You are required to write three formal reports on the practical work, a task that will be a lot less painful experience with good notes in hand.

The lectures and practicals link together to support the overall learning. Questions related to the practicals are formulated so that you will have the opportunity to use the information acquired in the class and provided in the lectures. You are expected to consult scientific literature for additional information and inspiration. The students will have plenty of time for hands-on laboratory work and opportunities to discuss their findings and potential problems with the demonstrator and class mates. **It is important to keep in mind that experiments with living organisms can produce surprising results or sometimes no results at all!** If that should happen, your task would be to find reasons for the unexpected outcome(s). There are no pre-set 'correct' results to the laboratory work and it is important to learn how to continue with the experiment in the face of the unexpected. Similarly, there may be modifications or additions to the instructions printed in the practical notes provided, depending on the course the experiments may take.

The Great Debate: The debates will be carried out at the time slot allocated for the laboratory work (*i.e*. 2-6 pm on Tue or 9 am-1 pm on Wed). The venue will be announced later.

Tutorials: Tutorials (codon optimisation and namesake peptide) are run as part of the practical sessions. Please consult iLearn for location. Tutorial material, which forms part of the material submitted for assessment and/or examination, will be made available on iLearn.

Required Materials and/or Recommended Readings

Biotechnology draws from different disciplines and technologies. The recommended textbooks will give you a good general introduction to (Thieman and Palladino) or deeper knowledge of these areas (Clark and Pazdernik) and provide further reading as well as useful websites for more in depth studies. The books also provide good questions at the end of each chapter to test your learning.

Textbooks:

William J. Thieman and Michael A. Palladino (2012): Introduction to Biotechnology, 3rd edition. Pearson Benjamin-Cummings Publishing Company, San Francisco CA.

David P. Clark and Nanette J. Pazdernik (2016): Biotechnology, 2nd edition. Elsevier, China. This book also provides an online study guide available with the textbook.

The books is available at the University Bookshop. Please note that while the books provide an anchor for the studies, plenty of **additional and examinable information** will be provided in the

lectures.

Almost every issue of the mainstream biotechnology journals will contain scientific papers related to the lecture material. Journals such as 'Biotechnology' and 'Trends in Biotechnology' are subscribed by the MQ Library and a good amount of the relevant journals are accessible through electronic databases such as PubMed (http://www.ncbi.nlm.nih.gov/pubmed/). Please take some time to browse through the journals for papers that you may find interesting. Getting familiar with the format in which scientific papers are presented will be of great help in your own report writing.

Website

The official CBMS880 website is: **ilearn.mq.edu.au**

You will be asked for a username and password. Your username is your student number. If you have trouble logging in, please follow the help instructions given on the web page before contacting your lecturer academic staff. You may also contact the

Help Desk:

Phone: 9850-HELP (4357)

Freecall: 1800 063 191

Email: http://help.mq.edu.au/

Unit Schedule

Molecular and Medicinal Biotechnology CBMS731/CBMS880 - S2 2019

Overview of lecture series

Location: 9WW, Rm 116

Week	Lecture - Topic	Date/time/location	Lecturer
1	1 - Course introduction	29 Jul, 10-11 am	Morten Andersen
	2 - The toolbox for genetic engineering	29 Jul, 11-12 noon	Liisa Kautto
2	3 - More tools for genome editing	5 Aug, 10-11 am	Liisa Kautto
	4 - Biotech pipeline	5 Aug, 11-12 noon	Liisa Kautto
3	5 -Protein secretion and quality control	12 Aug, 10-11 am	Morten Andersen
	6 - Protein engineering	12 Aug, 11-12 noon	Anwar Sunna
4	7 - Transgenic plants in biotechnology	19 Aug, 10-11 am	Liisa Kautto

	8 - Mammalian cell cultures and transgenic animals	19 Aug, 11-12 noon	Marco Morsch
5	9 - Synthetic biology, a key discipline in biotechnology	26 Aug, 10-11 am	Tom Williams
	10 - Synthetic yeast chromosomes	26 Aug, 11-12 noon	Hugh Goold
6	11 - Microscopy – the basics	2 Sep, 10-11 am	Lindsay Parker
	12 - Advanced microscopy and applications in biotechnology	2 Sep, 11-12 noon	Lindsay Parker
7	13 - Flow cytometry and Microfluidics	9 Sep, 10-11 am	Martin Ostrowski
	14 - Microbial cell factories and scaling up production	9 Sep, 11-12 noon	Heinrich Kroukamp
8	Semester break		
9	Semester break		
10	15 - Cancer nanomedicine	30 Sep, 10-11 am	Andrew Care
	16 - Glycobiology, the basics	30 Sep 11-12 noon	Morten Andersen
11	17 - Glycosylation, important yet overlooked PTMs in biotechnology	7 Oct, 10-11 am	Morten Andersen
	18 – Designing and Engineering Nanoparticles for Cancer Treatment	7 Oct, 11-12 noon	Andrew Care
12	19 - Entrepreneurship in biotechnology (academic><industry interface)	14 Oct, 10-11 am	Nicki Packer
	20 - Product-oriented biotechnology (industry/start-up)	14 Oct 11-12 noon	Ben Herbert
13	21 - Glycoengineering, a new tool in biotechnology	21 Oct, 10-11 am	Edward Moh
	22 - Antibody glycoengineering, case stories (IgM, IgG)	21 Oct, 11-12 noon	Edward Moh/Nick Debono
14	23 - Biopharmaceuticals	28 Oct, 10-11 am	Albert Lee
	24 - Medical biotechnology	28 Oct, 11-12 noon	Albert Lee
15	25 - Course summary + Q and A	4 Nov, 10-11 am	Morten/Liisa
	26 - Course summary + Q and A	4 Nov, 11-12 noon	Morten/Liisa

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-centr

al). 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
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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

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

If you are a Global MBA student contact globalmba.support@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/.

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

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Become introduced to and engaged with curiosity-driven learning.
- Critically evaluate work by others including fellow students and learn from it.

Assessment tasks

- Report 1

- Report 2
- Report 3
- Primer crafting task
- The Great Debate
- Hot topic essay
- Continuing assessment
- Final Examination

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

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.
- Critically evaluate work by others including fellow students and learn from it.

Assessment tasks

- Report 1
- Report 2
- Report 3

- Primer crafting task
- The Great Debate
- Hot topic essay
- Continuing assessment
- Final Examination

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

- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.
- Critically evaluate work by others including fellow students and learn from it.

Assessment tasks

- Report 1
- Report 2
- Report 3
- Primer crafting task
- Hot topic essay
- Final Examination

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 outcomes

- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to understand, critique and communicate a complex biotechnology topic in writing and orally and the ability to go beyond the obvious, i.e. move from ‘what was done?’ to explaining ‘what does it mean?’.
- Become introduced to and engaged with curiosity-driven learning.
- Critically evaluate work by others including fellow students and learn from it.

Assessment tasks

- Report 1
- Report 2
- Report 3
- Primer crafting task
- Final Examination

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

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Ability to explain and interpret results from the laboratory experiments carried out during

the practicals reflecting published literature and relevant technical and theoretical concepts.
- Ability to relate information published in the scientific literature to practical research questions in biotechnology.

Assessment tasks

- Report 1
- Report 2
- Report 3
- Primer crafting task
- The Great Debate
- Hot topic essay
- Continuing assessment
- Final Examination

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

- Ability to understand and explain key concepts of biotechnology, its interdisciplinary nature and impact on modern society.
- Learn and demonstrate good practical laboratory skills involving the use of contemporary experimental techniques in biotechnology including microbial culture, production of recombinant proteins and glycan analysis.
- Become introduced to and engaged with curiosity-driven learning.
- Acknowledge and discuss ethical aspects related to the application of gene editing and recombinant DNA technologies in our society.

Assessment tasks

- The Great Debate
- Hot topic essay
- Continuing assessment
- Final Examination

Changes from Previous Offering

The weighting of the three written reports has been slightly increased relative to past years (a total of a 5% increase) and the 'Primer crafting task' assessed via peer-assessment has been reduced accordingly (5% decrease). The unit has this year a slightly greater focus on the importance of the glycobiology and biomedical aspects of biotechnology compared to past year.

General assessment information

Practical Reports

These are major reports describing the laboratory experiments in detail with references to literature. The reports must be submitted to iLearn by the due date (see below) for checking in turnitin. In addition to the electronic copy, a hard copy is to be submitted to the Science and Engineering Student Centre MUSE, where a submission box will be set up. Campus maps are available at http://www.bgo.mq.edu.au/maps_campus.htm. The Centre is open from 8.30 am to 5.30 pm from Monday to Friday.

Submission

All reports and assignments must be submitted by 5.30 pm on the due date.

Late Submission

Written tasks 10% or less - Students who have not submitted the task by the deadline will be awarded a mark of 0 for the task, except for cases in which an application for Special consideration is made and approved (see below).

Written tasks above 10% -There will be a deduction of 10% of the total available marks made from the total awarded mark for each 24 hour period the submission is late. This penalty does not apply for cases in which an application for Special consideration is made and approved. **No submissions will be accepted after marked reports have been returned to the students**.

Non-attendance of assessment

Non-Attendance for Assessable Tasks: If you are unable to attend a practical class, tutorial class or exam due to short-term, serious and unavoidable circumstances, **you must submit a Special consideration request at ask.mq.edu.au** no later than five (5) working days after the assessment task date or due date. Please also immediately contact the Unit Convenor, Dr Morten Andersen (morten.andersen@mq.edu.au).

Information on Supplementary Exams: If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn (bit.ly/FSESupp) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

The unit expectation is that you will:

- Attend all lectures or when not possible listen to the recorded lectures
- Attend all practicals and set exercises during the practical hours
- Actively engage in the practical and coursework assessment tasks
- Hand in all practical reports and assessment tasks
- Attend and participate actively in the Great debate