



CBMS737

Biochemistry and Cell Biology

S2 Day 2015

Dept of Chemistry & Biomolecular Sciences

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General Information

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CBMS Level 1, F7B 119

TBA

Credit points

4

Prerequisites

Admission to MRes

Corequisites

Co-badged status

CBMS337/737/837

Unit description

This unit outlines molecular principles underlying today's developments in cell biology and advanced biochemistry which are central to our understanding of medicine and biotechnology. Advances in these fields are dependent on a detailed understanding of the molecular basis of many diverse cellular processes. This unit links important biochemical processes to functions and properties of eukaryotic cells. It explores advanced concepts including enzyme function, properties of membranes, signal transduction, protein trafficking, transport, and protein turnover. These are linked to whole-cell behaviours such as cell division, differentiation, programmed cell death, cell signalling and communication, and general responses to external stimuli. Practical work complements lecture material and provides experience with a broad range of current techniques used in research and industry. Laboratory techniques used include analysis of signalling cascades, spectrophotometry, and fluorescence and light microscopy. The unit assumes a good understanding of the concepts of protein and membrane structure and function. These basic concepts will be used and built upon during the unit. Practical segments of the unit involve hands-on cell biology skills and introduce opportunities for critical data analysis and interpretation.

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:

Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.

Possess an understanding of the application of various cell based experimental and routine methodologies fundamental to an understanding and measuring of normal cell biological processes and how disturbances in these can be involved in disease;

Define the major biological systems and control points involved in a range of fundamental cell processes;

Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;

Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;

Contribute to the generation of new data and where appropriate entries in scientific databases.

Be able to critically analyze data and creatively solve problems in cell biology.

Assessment Tasks

Name	Weighting	Due
<u>Practical Reports</u>	15%	iLearn schedule/consult staff
<u>Post Lecture Online Problems</u>	5%	Every Week
<u>Introduction and Methods</u>	5%	Week 6
<u>Mid-Semester Exam</u>	10%	Week 7
<u>Human Cell Atlas Assignment</u>	5%	Week 9
<u>Hot Topics Seminar</u>	10%	Practicals (Week 12-13)
<u>Final Report</u>	10%	Week 13
<u>Final Examination</u>	40%	University Examination Period

Practical Reports

Due: **iLearn schedule/consult staff**

Weighting: **15%**

Practical reports will be due only for P2 and P3 (Hard copies to be submitted to the SCIENCE CENTRE) - All other practicals will be evaluated by a series of reflections post practical on iLEARN due one week from the practical date.

On successful completion you will be able to:

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;

Post Lecture Online Problems

Due: **Every Week**

Weighting: **5%**

Every lecture will have a thought problem for graduate students to attempt which will cover important aspects of the course. This will be worth 5% of the course mark and will be available on iLEARN post every lecture.

On successful completion you will be able to:

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Possess an understanding of the application of various cell based experimental and routine methodologies fundamental to an understanding and measuring of normal cell biological processes and how disturbances in these can be involved in disease;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;
- Be able to critically analyze data and creatively solve problems in cell biology.

Introduction and Methods

Due: **Week 6**

Weighting: **5%**

An introduction and methods section is the first part of the final report to be submitted at the end of the semester. Feedback will be given which will improve the final report so it is essential that students submit this for marking.

On successful completion you will be able to:

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Possess an understanding of the application of various cell based experimental and routine methodologies fundamental to an understanding and measuring of normal cell biological processes and how disturbances in these can be involved in disease;
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Mid-Semester Exam

Due: **Week 7**

Weighting: **10%**

There will be a 60 min. exam (10% total assessment) held in the practical class of Week 7 (i.e., FRIDAY 11th September from 1.05 pm sharp). This will cover all materials and textbook reading

associated with lectures 1-14. This is designed to give you specific feedback on your understanding of the topics up to this stage to assist you in your further study of the unit.

On successful completion you will be able to:

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;

Human Cell Atlas Assignment

Due: **Week 9**

Weighting: **5%**

Students will be required to prepare an illustrated one-two (1-2) page summary of the biochemistry and cell biology of TWO (2) of the ~230 known human cell types for entry into the CBMS Macquarie Human Cell Atlas database. Additional submissions will get bonus marks up to 5% (2.5% for each additional submission up to a Maximum of 5%)

On successful completion you will be able to:

- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Hot Topics Seminar

Due: **Practicals (Week 12-13)**

Weighting: **10%**

Prepare an individual presentation/seminar on one hot topic (currently trending) in molecular cell biology/biochemistry (A list of suggested topics will be provided on iLEARN but students can suggest their own for approval). 3% of the mark for this seminar will be allocated by your peers (averaged) and 7% by the staff.

On successful completion you will be able to:

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Define the major biological systems and control points involved in a range of

fundamental cell processes;

- Contribute to the generation of new data and where appropriate entries in scientific databases.

Final Report

Due: **Week 13**

Weighting: **10%**

This report will be a cumulative scientific report (of P4-6) written in form of a peer reviewed journal article. The format of the submission will be for the international scientific journal PLoS ONE as per guidelines <http://journals.plos.org/plosone/s/submission-guidelines>. The style, formatting, layout, etc. MUST conform to this journal. Marking Criteria will be available on iLEARN.

On successful completion you will be able to:

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Possess an understanding of the application of various cell based experimental and routine methodologies fundamental to an understanding and measuring of normal cell biological processes and how disturbances in these can be involved in disease;
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Final Examination

Due: **University Examination Period**

Weighting: **40%**

The final exam (40% total assessment) will be 3hr in length with 10min reading time. It is designed to address specific understanding of topics presented in all of the lectures, practicals and peer-assisted learning exercises and to show that the knowledge you have obtained can be applied to new problems.

On successful completion you will be able to:

- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;
- Be able to critically analyze data and creatively solve problems in cell biology.

Delivery and Resources

Objective of the unit

To integrate cell biology and biochemistry components of the course seamlessly to offer a basic understanding of cellular functions, interactions, signalling and properties. This culminates in a demonstration of cell function in cancer.

Classes

Timetable: Please check <https://timetables.mq.edu.au/2012/default.aspx> for the official timetable of the unit.

Required and Recommended Texts and/or Materials

Prescribed Texts:

B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter (2015) "Molecular Biology of the Cell" (6th Edition), ISBN 978-0-8153-4432-3. Available at the Co-op and a few copies for reference in the library.

Your lectures will cover the generic parts of each chapter and you are strongly advised to read and understand the remainder of each Alberts *et al.*, chapter as referred to in the lecture outline. This book is an absolute essential item for your future in any aspect of molecular and cellular biology.

CBMS737/837 lecture notes can be obtained from the CBMS737/837 unit web site.

Further reading material is also available in the library:

R. Garrett & C. Grisham (2008) "Biochemistry" (4th or earlier editions), Or any good Biochemistry textbook.

Technology Used and Required

You are expected to access the unit iLearn web site on a frequent basis and to download all necessary pdf files. To access the unit web site, if you have off-campus Internet access, simply start your web browser and proceed as above for logging in. On-campus wireless access is also available. If you do not have your own computer you may wish to access the CBMS737/837 web resources on campus using the computers in the Library.

To view the lecture notes and other pdf files on the website, you will require Adobe Acrobat Reader Version 9 or later to be installed on your computer. Acrobat Reader can be downloaded

from the Adobe website <http://get.adobe.com/uk/reader/>. If you are using the computers in the library, then Acrobat has already been installed.

We will also be using Lecture Tools (from iLEARN) and therefore you will be **required** to bring your laptop, tablet, smartphone to the lectures.

Please note information may also be sent by email to your student email account so please look at your student email account on a frequent basis.

Unit Web Page

The web page for this unit is at Macquarie's new learning management system website: <http://ilearn.mq.edu.au>

Login and follow prompts to CBMS737/837 Biochemistry and Cell Biology.

You are expected to access the unit web site frequently (i.e., almost daily). This site contains important information including lecture notes (that you will be expected to access (via lecture tools) in class), mid-semester exams and/or assignment.

Logging In: Type in the URL <http://ilearn.mq.edu.au> and find **CBMS337/837/737**. Your username is your Macquarie Student ID Number (MQID), which is an 8 digit number found on your student card. The password is your myMQ Student Portal password. This will be the original MQID password (2 random characters followed by your date of birth in ddmmyy format) that was sent to you on enrolment, unless you have already changed your password in the myMQ Student Portal. If you experience difficulties in getting your reprint or your password, please contact the StudentIT Desk (ph: 9850 6500).

Teaching and Learning Strategy

CBMS737/837 is a 3-credit point half-year unit and will require an average of 9 hours of work per week (contact hours plus self-study time). For students with “weaker” biochemistry backgrounds, more time than the 9 hours per week will probably be necessary to perform satisfactorily in this unit.

CBMS737/837 consists of 2 hours of lectures and a 3 hour laboratory class every week. The unit is designed to allow you to develop an understanding of biochemistry and cell biology and the practical skills to undertake experiments in this field in an efficient and safe manner. The lecture material and laboratories complement each other and have been developed to increase your understanding of the topics so you can achieve the learning outcomes.

The purpose of practicals will be to develop higher level critical thinking skills in students and teach contemporary methods in cell studies and biochemistry.

- The Experiments are designed with REAL samples (HCT116 CRC cell line) resulting in an eventual publication of the results in a peer reviewed journal.
- Will focus on collaborative work, critical thinking and methods development.

The unit coordinator's expectation is that you will:

- Attend **all interactive** lectures. If you cannot attend a lecture, you are expected to listen to the

iLecture as soon as possible after it is made available.

- Demonstrate reasonable competence in all laboratory preparation exercises and attend each laboratory class/tutorial.
- Perform satisfactorily in the final exam and all other assessments.
- Spend an average of no less than 3 hours per week of private study in addition to direct contact.

If you prepare and attend all components of the unit and work consistently/continuously throughout the semester, you should be able to develop a strong understanding of biochemistry and cell biology and how it operates in the context of molecular cell biology.

Students who “memorise” just before final exams typically do poorly in this unit.

You are expected to use the lecture materials in the lectures (or bring them) so you can spend most of the time listening rather than transcribing. The lectures are interactive and you will be expected to have input in polls and discussions. Do not assume notes or iLectures are in any way a suitable substitute for attending lectures – lecturers put an effort into making the lectures up to date and relevant, whilst textbooks cannot cover all examples or the latest research. Students historically fall behind and perform poorly if they do not attend lectures.

Learning is an active process, and as such you must engage with the material. This means downloading and reading lecture notes and relevant sections of the textbook (and beyond) before and after lectures are strongly recommended.

- The mid-semester exam will be run in a practical class.
- Laboratory prac classes are designed to develop basic laboratory skills, general safety practices and critical and analytical thought. In-lab and post-lab work are designed to allow you to appropriately record experimental observations and calculations in a detailed and accurate manner and assess your understanding of the theory behind experiments.

Unit Schedule

CBMS337 Biochemistry & Cell Biology 2015 Lecture Plan , subject to minor changes

Unit Coordinator: Dr. Abidali Mohamedali (AM) Lecturers: A/Prof Rob Willows (RW), A/Prof Mark Molloy (MM) and Professor Nicki Packer (NP)

Monday: E3A 133 Collaborative Forum (1pm-2pm) and Tuesday E3A130 (10am-11am)

Day	Lecture	Week	Monday	Lecturer	Lecture Title	Objectives
Mon	1	1	27-Jul	AM	Introduction	Universal Features of cells, diversity/similarity of genomes
Tue	2		28-Jul	RW	Cell Chemistry/ Bioenergetics 1	Enzyme Kinetics
Mon	3	2	3-Aug	RW	Cell Chemistry/ Bioenergetics 2	Enzyme Kinetics

Tue	4		4-Aug	RW	Cell Chemistry/ Bioenergetics 3	Enzyme kinetics and regulation
Mon	5	3	10-Aug	RW	Biochemisty core	Evolution of Biochemical Pathways
Tue	6		11-Aug	RW	Protein function methods	Overview of methods of detecting interactions/function /Mutation analysis(Y2H, Biacore, MS etc)
Mon	7	4	17-Aug	AM	Mathematical analysis of Cell functions	Modelling cellular reactions, modelling interactions, differential equations predict steady state, Combinatorial control etc.
Tue	8		18-Aug	MM	Studying cells in culture	Overview of Common methods of cell culture, hybridoma , transfection, Protein expression
Mon	9	5	24-Aug	AM	Protein Function	Antibody binding, complex formation, phosphorylation, Ubiquitination, network of interactions
Tue	10		25-Aug	AM	Membrane transport	Principles of Membrane transport, Transporters (ATP Driven pumps, ATPase pumps, Na/K pumps etc.)
Mon	11	6	31-Aug	AM	Electrical Properties of Membranes	Electrical transport, Action potentials, mechano receptors, Ca ion transport, neuronal functions
Tue	12		1-Sep	NP	Intracellular compartments /protein sorting 1	Principles of compartmentalisation, Nuclear transport, transport to mitochondria and chloroplasts
Mon	13	7	7-Sep	NP	Intracellular compartments /protein sorting 2	Endoplasmic reticulum, protein folding, glycosylation , GPI anchors, membrane proteins
Tue	14		8-Sep	AM	Endo/exocytosis 1	Molecular mechanisms of membrane transport ER>Golgi transport,
MID SEMESTER BREAK						
Mon	15	9	28-Sep	AM	Endo/Exocytosis 2	Trans Golgi Network transport to lysosome, Endocytosis and Exocytosis
Tue	16		29-Sep	AM	Cell Signalling 1	Principles of Cell Signalling
Mon		10	5-Oct	Labour Day		
Tue	17		6-Oct	AM	Cell Signalling 2	G=Protein coupled receptor signalling
Mon	18	11	12-Oct	AM	Cell Signalling 3	Enzyme Coupled Receptor Signalling and alternative signalling routes
Tue	19		13-Oct	AM	Cytoskeleton 1	Actins and Myosin
Mon	20	12	19-Oct	AM	Cytoskeleton 2	Microtubules and IFilaments
Tue	21		20-Oct	AM	Cell Junctions	Cell-cell junctions, Cell-Matrix junctions
Mon	22	13	26-Oct	AM	Extracellular Matrix	ECM, nature and function
Tue	23		27-Oct	MM	Cancer 1	
Mon	24	14	2-Nov	MM	Cancer 2	
Tue	25		3-Nov	AM	Revision Lecture	

CBMS337/837/737 Biochemistry & Cell Biology 2015 Practical Session Plan**Practical Demonstrator: A/Prof Rob Willows + Abidali Mohamedali + Other demonstrators****Fridays 10am-1pm E3A130 and 2pm-5pm E3A130 (only if required)**

Week	Practical	Day	Practical Schedule	Practical Report Schedule Due Dates
1	P1	31st July	Methods Development	
2	P2	7th Aug	Enzyme kinetics - Muscle pyruvate kinase Day 1	
3	P3	14th Aug	Enzyme kinetics - Muscle pyruvate kinase Day 2	
4	P4	21st Aug	Enzyme inhibition - Yeast hexokinase	Prac combined (P2+P3) Report
5	P5	28th Aug	Western blotting	P4 Report Due
6	P6	4th Sept	Western Blotting/ HPLC Demo	Prac 5 Reflections
7	P7	11th Sept	Mid Sem Exam	Prac 6 Reflections
9	P8	2nd Oct.	Immuno Fluorescence/Biacore Demo	
10	P9	9th Oct.	Immuno Fluorescence/Microscopy	Prac 8 Questions
11	P10	16th Oct.	FACS	Prac 9- Questions
12	P11	23rd Oct.	Hot Topics seminar	Prac 10- Questions
13	P12	30th Oct.	Hot Topics seminar	

Lecture & Practical timetable subject to change

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.

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

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

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Possess an understanding of the application of various cell based experimental and routine methodologies fundamental to an understanding and measuring of normal cell biological processes and how disturbances in these can be involved in disease;
- Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;

Assessment tasks

- Practical Reports
- Post Lecture Online Problems
- Introduction and Methods
- Mid-Semester Exam
- Hot Topics Seminar
- Final Report
- 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

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Possess an understanding of the application of various cell based experimental and

routine methodologies fundamental to an understanding and measuring of normal cell biological processes and how disturbances in these can be involved in disease;

- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;

Assessment tasks

- Practical Reports
- Post Lecture Online Problems
- Introduction and Methods
- Mid-Semester Exam
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Report
- 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

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
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- Contribute to the generation of new data and where appropriate entries in scientific databases.
- Be able to critically analyze data and creatively solve problems in cell biology.

Assessment tasks

- Practical Reports
- Post Lecture Online Problems
- Introduction and Methods
- Mid-Semester Exam
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Report
- 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

- Students will have an understanding of how Biochemistry is used to determine cellular functions and how the cell uses chemistry to achieve biological functions.
- Possess an understanding of the application of various cell based experimental and routine methodologies fundamental to an understanding and measuring of normal cell biological processes and how disturbances in these can be involved in disease;
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- Be able to critically analyze data and creatively solve problems in cell biology.

Assessment tasks

- Practical Reports
- Post Lecture Online Problems

- Introduction and Methods
- Mid-Semester Exam
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Report
- 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

- Be able to successfully communicate and critically analyse advanced molecular cell biological and biochemical concepts, Be able to communicate the research supporting these concepts in both verbal and written form;
- Be able to critically analyze data and creatively solve problems in cell biology.

Assessment tasks

- Post Lecture Online Problems
- Mid-Semester Exam
- Final Report
- 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

- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Contribute to the generation of new data and where appropriate entries in scientific databases.

- Be able to critically analyze data and creatively solve problems in cell biology.

Assessment tasks

- Practical Reports
- Post Lecture Online Problems
- Introduction and Methods
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Report
- Final Examination

Changes from Previous Offering

This unit has been upgraded substantially since the last offering. The most salient features of the updates are the integration of state of the art technologies and methodologies in cell biology techniques, and a focus on critical thinking aspects. Besides this, students are expected to participate in contributing knowledge to the scientific community in form of an eventual peer reviewed journal article.