CBMS333

Functional Proteomics

S2 Day 2014

Chemistry and Biomolecular Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
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Credit points
3

Prerequisites
39cp including CBMS224

Corequisites

Co-badged status
The 3 credit point unit CBMS333 shares the same lectures and tutorials as CBMS833. However, CBMS333 students are not required to submit the literature review essay, submit a laboratory practical report in a different format, are subject to different assessment marking schema, sit a different exam paper, and hence can expect distinct learning outcomes. For 2013, CBMS333 will also be co-taught with CBMS733 which is a postgraduate unit for students in the Masters of research degree program. The 3 credit point unit CBMS333 outlines chemical principles underlying the most recent developments in protein science and proteomics. The unit extends previous work undertaken in CBMS832, which included an understanding of the emerging new disciplines of proteomics, structural biology and bioinformatics. CBMS333 focuses on the proteomic methods used in the biotechnology and pharmaceutical industries to isolate, characterize, analyse and purify proteins using advanced proteomic technologies. The practical includes 1D and 2D protein gel separation, in-gel digestion of separated proteins, mass spectrometric analysis, database searching for protein identification, and shotgun proteomic quantitation. The learning outcomes for CBMS333 are focused on gaining discipline specific knowledge, understanding of the processes and technologies involved and how to apply them to answer biological questions, and hands-on practical experience in proteomics. CBMS333 is offered internally in second semester only. There are two hours of lecture time and two hours of tutorial time per week, plus a five full day practical component taught during semester break.

Unit description
Functional proteomics is the study of protein expression in living systems, considered in a functional context. This allows us to better understand how protein networks become dysfunctional, which in turn enables the manipulation of protein functions and cellular phenotypes through the use of drug treatment, or genetic or environmental intervention. This unit covers the principles and applications of functional proteomic techniques, and assumes basic knowledge of protein electrophoresis and mass spectrometry. Topics include: a detailed study of advanced techniques, instrumentation and protein identification software in mass spectrometry; two-dimensional differential gel electrophoresis; label-free and isotope-labelling quantitation in proteomics; application of different types of peptide- and protein-based shotgun proteomics approaches; characterisation of protein post-translational modifications including phosphorylation, glycosylation and others; and application of proteomics in the pharmaceutical industry.

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:

Understand technologies used in proteomics

Comprehend the chemical, biochemical and biophysical processes involved in proteomics, and how to apply them to answer biological questions

Exhibit a sound knowledge of proteomics technologies and their applications

Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of proteomics

Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment Tasks

Name	Weighting	Due
Oral Presentation	25%	Variable
Continuing assessment	5%	Variable
Mid-semester test	5%	Mid-semester
Practical Report	25%	October 18th
Final Exam	40%	To be advised

Oral Presentation

Due: **Variable**
Weighting: **25%**

Oral Tutorial Presentation **25%**

Ø Choose one publication from the Tutorial Papers List (on a first-come first-served basis)

Ø Present your critique of the topic as a short Powerpoint seminar (generally 10 min talking with 5 mins questions but we may adjust that depending on class numbers)

Ø Note: Participation in all other group's topics contributes to your final mark

- NEW for 2014: The research tutorial presentation will now be accepted as a video presentation uploaded in advance to youtube. It must include figures, graphics, text (and some footage of the presenter). You can either record straight to video camera, or use software such as iMovie or Windows Movie Maker.

On successful completion you will be able to:

- Understand technologies used in proteomics
- Comprehend the chemical, biochemical and biophysical processes involved in proteomics, and how to apply them to answer biological questions
- Exhibit a sound knowledge of proteomics technologies and their applications
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of proteomics

Continuing assessment

Due: **Variable**
Weighting: **5%**

Continuing assessment: Weekly Speaker Questions 5%

Ø You will be given five minutes at the end of each lecture, after question time, in which you are required to write down and submit a question for the speaker of the day. This must demonstrate understanding and critical analysis of the topic that has been presented.

On successful completion you will be able to:

- Understand technologies used in proteomics
- Comprehend the chemical, biochemical and biophysical processes involved in proteomics, and how to apply them to answer biological questions

Mid-semester test

Due: **Mid-semester**
Weighting: **5%**

Mid-semester test	**5%**

Ø This will typically be a short answer quiz aimed at helping students assess their area of strength and weakness prior to the final exam. It is usually held during a tutorial session.

On successful completion you will be able to:

- Understand technologies used in proteomics
- Exhibit a sound knowledge of proteomics technologies and their applications

Practical Report

Due: **October 18th**
Weighting: **25%**

Practical Report (Due October 17th)	**25%**

Ø Non-submission will mean a Fail grade is recorded in CBMS333.

On successful completion you will be able to:

- Understand technologies used in proteomics
- Comprehend the chemical, biochemical and biophysical processes involved in proteomics, and how to apply them to answer biological questions
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of proteomics

- Gain hands-on practical experience in a range of proteomics techniques and applications

Final Exam

Due: **To be advised**
Weighting: **40%**

Final Exam (2 hrs, date and time to be advised) 40%

Ø 2hr exam covering all practical and theoretical components of CBMS333

Ø Questions are a mix of long and short answer questions

Ø You are required to reach a satisfactory grade in the final exam to pass CBMS333

On successful completion you will be able to:

- Understand technologies used in proteomics
- Exhibit a sound knowledge of proteomics technologies and their applications

Delivery and Resources

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Other important items

ø We do not work from a textbook but we do have one book that is recommended reading and is available in the University bookstore: Proteomics for Biological Discovery, by Tim Veenstra and John R. Yates, published by Wiley Press.

ØAdditional reading material is also included at the end of most lectures. It is your job to look it up.

ØThe practical class is 5 days long and runs during semester break,

so make plans now to be available for a week long practical class during that time.

ØThis unit is designed to build upon CBMS332 Protein Discovery and Analysis. There is no prerequisite for entry into CBMS333 but passing CBMS332 is strongly recommended.

ØTechnologies used and required. Lecture notes will be made available on the unit website in Blackboard. Notes will be made available a few days in advance of the lecture whenever possible, and it is your responsibility to print them out.

ØTechnologies used and required. All of the important information during semester will be communicated to you via the unit website on Blackboard. It is your responsibility to check it regularly for announcements and other information.

ØTechnologies used and required. Students will need to have access to a computer and printer, and be able to use Word, Excel, Powerpoint, and a reference manager program such as EndNote.

ØWhat is changed? The unit is updated every year with revised lecture content and numerous new tutorial research papers.

ØWhat is changed? From 2013 onwards the unit will also be offered at 700 level to Masters of Research students.

ØWhat is changed? **NEW for 2014**: The research tutorial presentation will now be accepted as a video presentation uploaded in advance to youtube. It must include figures, graphics, text (and some footage of the presenter). You can either record straight to video camera, or use software such as iMovie or Windows Movie Maker.

Unit Schedule

LECTURE, TUTORIAL and PRACTICAL TIMETABLE

Lectures: Mondays 2:00 pm - 4:00 pm August 4th - November 10th, Room E7B100

Tutorials: Fridays 11:00 am - 1:00 pm, August 8th - November 14th, Room W5C 320

NOTE: the first scientific content lecture will be held in the first tutorial timeslot, Friday August 8th 11 – 1pm in W5C 320.

Practicals: Are held in a one-week block during semester break. You must be available for all of September 22nd- 26th. Practical classes run all day, approximately 9am – 5 pm. This is the equivalent of 3+ hours per week for the whole semester, we just do it all at once. Attendance is compulsory - if you are not able to attend the practical class all week, for any reason, do not enrol in this unit.

The practical course includes differential display 2D gel electrophoresis, in-gel protein digestion, peptide spectrometry (MALDI-TOF/TOF and nanoESI-Linear ion trap), protein identification using Mascot and XTandem, shotgun proteomic analysis using SDS-PAGE protein fractionation, and label-free protein quantitation using normalized spectral abundance factors.

Up to date timetable information is found at timetables.mq.edu.au

All unit information is distributed using the unit website on ilearn, accessed via ilearn.mq.edu.au

Lectures Mondays 2-4pm, starting August 4th, E7B100

Week	Date	Lecture Title
1	**MONDAY** August 4th E7B100	Subject Outline and Assessment Process, Scientific Writing, Intro
1	**FRIDAY** August 8th W5C320	Mass Spectrometry Fundamentals (***in tutorial timeslot***)
2	August 11th	Protein Identification from MS data
3	August 18th	2D gel Sample Preparation and troubleshooting
4	August 25th	2D-DIGE and experimental design
5	September 1st	Differential display and shotgun proteomics
6	Sept 8th	Quantitative proteomics (I) label-free
7	Sept 15th	Quantitative proteomics (II) isotope labels

Practical: 5 Days, 22nd-26th September (*during semester break*)		
	Monday October 6th is a public Holiday; no lecture.	
11	October 13th	Multiple reaction monitoring and proteomics validation
12	October 20th	Protein-Protein Interactions

(continued)

Practical report due 9am Friday October 17th		
13	October 27th	Post-translational modifications (I) Glycoproteomics
14	November 3rd	Post-translational modifications (II) Phosphoproteomics
15	November 10th	Revision

Assignments and practical reports are to be handed in at the Science Centre in E7B, and are due in by 9am on the due date.

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TUTORIAL TIMETABLE

Tutorials: Fridays 11-1pm from August 15th

Room W5C 320

Week Date Tutorial

2 August 15th (note: August 8th is used for the first lecture)

3 August 22nd

4	August 29th
5	September 5th
6	September 12th
7	September 19th
	Semester Break - September 22nd to October 5th
10	October 10th
11	October 17th
12	October 24th
13	October 31st
14	November 7th
15	November 14th *(Only if required)*

Learning and Teaching Activities

Lecture

Two hour lectures, presented in a logical sequence so that new material builds upon previously introduced concepts.

Tutorial

Two hours of tutorial time. Each student will present a 10-15 minute oral presentation on a research paper chosen from an extensive list which is grouped by subject matter. Each tutorial presentation comes 1-2 weeks after the corresponding lecture.

Practical Class

A five day long intensive practical block taught during semester break.

Weekly follow up

The first 15 minutes or so of each lecture is spent addressing the weekly speaker questions from the previous lecture.

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/

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Guidelines for preparation of written work

ALL WRITTEN WORK MUST BE ORIGINAL. Students are sometimes tempted to use material which is not their own without due acknowledgment. This constitutes cheating, the penalty for which is failure of the course. It is considered equivalent to cheating in an examination. Direct copying and/or submitting material from your own work done in previous years is also considered cheating.

WHAT CONSTITUTES CHEATING?

Collusion

Collusion is the secret and fraudulent production of identical or superficially altered work submitted for assessment by two or more students. It is easily detected by the examiner from the similarity in styles. This constitutes cheating and will be dealt with accordingly.

Plagiarism

Plagiarism is the verbatim use of someone else's work, as if it were your own. This also constitutes cheating and will be dealt with accordingly. The "someone else" concerned may be an author, critic, lecturer, or even a fellow student. Plagiarism includes copying of material from practical books obtained from other students in the same or previous years. It also includes the direct copying of material from texts, references and other sources. It is important to realize that it does *not* make it acceptable to reproduce a sentence or paragraph from a published source when you add the

name or number of the reference at the end.

If you need to quote another piece of work, do it correctly. You must provide quotation marks around the quotation and this must be referenced. In other words, the only proper way to indicate that the words are not yours is to show clearly that they are a quotation.

It is often desirable and may even be necessary to use other people's ideas but you must not pretend that they are your own. In such cases, your text should include a reference to the source of the idea. You may need to use a figure or table from another source. If so, the legend must indicate the source, with the appropriate reference. The list of referees should include acknowledgment of ideas, data and direct quotations from all sources.

More information regarding the University policy on academic honesty can also be found at http://www.mq.edu.au/policy/docs/academic_honesty/policy.html.

Collaboration

Students are often required to work cooperatively in groups when performing experiments. This may be necessitated by limitations on the amount of equipment or experimental material available, or simply by the fact that more than one pair of hands is required to do the experiments. Such collaboration is common and is an essential part of scientific endeavour. However, collaboration must always be acknowledged.

When you perform experimental work as part of a group, you must always acknowledge the collaboration by writing the names of the other members of the group at the start of your practical report.

Collaboration in performing an experiment does not extend to writing a report on the experiment where that report is assessed for marks. Students must prepare their own report individually.

Guidelines for preparation of written work

WHAT IS REQUIRED?

References

Essay and practical reports need scientific references to support facts and ideas that you are referring to. These should be primarily journal articles from recent scientific literature. You should only rarely need to cite textbooks; everything in a textbook was most likely published elsewhere in the literature long before the book was published. You should not refer to websites such as Expasy or NCBI for general information; gel images in Expasy for example, have also been published elsewhere in the scientific literature. You should NEVER refer to Wikipedia or to tutorial information posted on the web at another university. The reason for these rules is that textbooks, websites and Wikipedia are not primary sources, they are compilations of previously published material. More importantly, they are not peer-reviewed (including textbooks) so the authors can say whatever they like on a topic whether it is right, or not.

Learn to use Endnote or a similar program to manage and cite your references. This will make your written work look

more polished and will avoid simple mistakes which cost you marks. Endnote is available as a free download from the MQ library, along with simple online tutorials in how to use it. Format references in your work according to the guidelines of any of the following journals: Analytical Biochemistry, Journal of Biological Chemistry, Journal of Proteome Research, Molecular and Cellular Proteomics, or Proteomics. The most common error students make with references is that the references in a list are inconsistent in style – they all need to be *exactly* the same format.

What is an essay?

An essay is a written discourse on a topic. It has a defined introduction, middle and conclusion, and contains logical arguments that follow a clear sequence. An essay does not contain dot point lists, and does not need to contain subheadings. It can contain table and figures to illustrate a point. If these are copied from a reference it needs to state that explicitly in the Figure legend or table footnote. Tables and figures should be numbered sequentially in order of their appearance in the text, and can either be inserted into the text or collated at the end. Every figure needs an explanatory legend, most tables need a footnote or two to explain the meaning of column headings. An essay has relevant references formatted as described earlier and collected at the end of the text.

What is a practical report?

A practical report has a title, aim, introduction, materials and methods, results, discussion, and references. It is divided into sections under these headings. It usually contains figures, and may contain tables as well. If these are copied from a reference it needs to state that explicitly in the Figure legend or table footnote. Tables and figures should be numbered sequentially in order of their appearance in the text, and can either be inserted into the text or collated at the end. Every figure needs an explanatory legend, most tables need a footnote or two to explain the meaning of column headings.

The aim of the experiment should be clearly stated. The methods should not just be copied directly from the course manual or notes. The results should describe what you observed, irrespective of whether you think it “worked” or not. Discussion should compare your observed results with literature or other experiments in class, especially if you have positive controls to work with. A practical report has relevant references formatted as described earlier and collected at the end of the text.

HINTS ON HOW TO USE SCIENTIFIC JOURNALS

During CBMS333 we will use current research (as distinct from partially digested textbook examples) to illustrate principles. The most up-to-date information is published in scientific journals.

CBMS333 students need to read journal articles to supplement the information given in lectures and practical notes. Your own reports should be modeled on the style of scientific papers (so take careful note of their presentation). It is

important that you become efficient at using the large amount of information available. A huge number of journals and papers are available. The following paragraphs give you some guidance in doing this efficiently.

If everyone read scientific papers with care, effort and attention to detail, we would have to read a lot less. Develop an economical reading style and avoid too much rereading. In addition:-

1. Do not read through the paper from start to finish. A journal article is NOT a novel (though the results and ideas may be!). The various sections are there for good reasons.

2. Read and think about the Title. "Is the paper really about the subject matter I thought it was? Do I need to read it at all?"

3. Read the Abstract (or Summary) to confirm the suspicions formed in 2. This section should give you an idea of the main results and why they are important. Ask yourself: "Do I need to read further? Is this paper appropriate?" This is especially important if you have uncovered the reference in another paper or from Science Citation Index or Current Contents. Titles often suggest that the paper is more relevant than it really is.

4. If you continue, now read the Results. Examine the figures and tables. They should be self-explanatory. (This is something that you must bear in mind when you prepare your own report. Good captions and labels are vital). What do the results mean? How convincing are they? Now look at the Discussion. Do your interpretations of the data and conclusions agree with those of the author(s)?

5. How do these experiments fit in with the general research field and with current theories? In other words, why was the research conducted? This should be established in the Introduction.

Despite the efforts of editors and reviewers there are bad papers as well as good papers in the published literature. Some are badly presented, but contain basically good work. You have to plough through those to extract the gems of wisdom. Others look great on the surface but say nothing of importance. You should train yourself to recognize these quickly without wasting time on them. To help you here, look carefully at the following:-

(a) What are the hypotheses (or questions) posed in the paper? (Be careful that you are not simply forming your own idea of what the paper is testing.)

(b) What approach is used to collect the data (see Methods section).

(c) Do the data, and the manner of collection allow a DIRECT TEST of the hypothesis? If not, what sort of experiment would?

(d) Are there interpretations of the Results which you would make but which have been ignored by the author(s)?

You should try to bear these points in mind when you are reading any papers, but it will be especially important when reading the key papers for your reports, major essay and tutorial presentation. We expect that you will show evidence of having evaluated the strengths of published work.

TIMELY SUBMISSION

ALL CBMS333 assessment deadlines must be met

· Late submissions **will** be penalised with 10% loss of the maximum mark for each day past the deadline.

· If there is any medical reason why you cannot submit work on time or if you cannot give your tutorial topic for any reason, you should contact the course convenor as early as possible, *before* the due date.

· Copies of medical certificates **MUST** be forwarded to the course convenor as soon as possible. Failure to do so will incur a zero mark for non-submission.

EXAMINATION POLICY

• As with all subjects in the Department of Chemistry and Biomolecular Sciences, your final mark has a large component of continual assessment.

• Since your final mark is the sum of all components of this subject, you should approach this subject in a consistent and diligent manner throughout the session; leaving your best effort to the final examination period would be most unwise.

• Remember, marks are deducted from the continuous assessment component if you are absent without cause or if your submissions are late.

• Despite the presence of a significant continuous assessment component in CBMS333, you will be required to achieve a satisfactory grade in the final exam in order to pass CBMS333. In the event you fail this unit, you can NOT request a supplementary examination or re-examination simply because you failed.

• The final examination is typically 2 hours long, but may be longer if required.

CBMS333 LABORATORY SAFETY POLICY

1. Laboratory coats and sensible footwear (no thongs or open-toed sandals) must be worn in the research lab at all times. Lab coats should be removed prior to entering common areas (eg: hallways, tea rooms).

2. Smoking, eating and drinking are not permitted at any time in any lab.

3. You are responsible for the smooth and efficient operation of your work area. Keep your assigned work areas as tidy as possible (e.g., clean and store any used items when no longer required; return any communal reagents to their assigned place in the laboratory). Do not leave a mess for someone else (eg: co-workers or Departmental technical staff) to clean up.

4. You might be handling bio-hazardous or radioactive materials during your practicals. Mouth pipetting is NOT

allowed at any time. The Chemistry and Biomolecular Sciences Department has a complete Safety Manual which you may refer to at any time prior to undertaking a hazardous task. In order to provide a safe working environment, please take this request most seriously.

5. All instructions for the handling of:

(a) biohazardous and radioactive material;

(b) micro-organisms;

(c) recombinant materials; and

(d) research equipment

must be carefully adhered to.

6. Some practical exercises may involve the examination of human fluids, human cells or human cell lines. There should be no sharing of this material or any of the instruments used to collect them.

SPECIAL CONSIDERATION AND SUPPLEMENTARY EXAMINATIONS POLICY

The rules regarding special consideration and supplementary examinations are set out in full in the University Undergraduate Calendar. The following is a summary.

1. What is a request for special consideration?

A request for the Department to take into account, when assessing your performance in any assignment or examination, circumstances beyond your control: typically medical problems or other compassionate circumstances. Forms regarding the special consideration process are available at:

www.reg.mq.edu.au/Forms/APSCons.pdf

2. What are acceptable reasons for special consideration?

(i) ***valid*** medical, compassionate and serious unforeseen personal events that prevent a student from meeting scheduled deadlines,

(ii) ***validated*** conflicts between scheduled assessments and sporting, cultural or other activities ***at a national or international level***: these **must be** raised well in advance with the Department.

3. How do you apply?

(i) Lodge ***a written application***, together with supporting documentation, with the Student Enquiries Office in Admin.

(ii) Do this no later than 7 days following the serious illness or other situation. Admin. will pass it on to the

Department.

(iii) It is ***your*** responsibility to check the outcome with the Department, ***not later than two weeks*** after lodging the application.

4. What is "supporting documentation"?

(i) ***A medical certificate***, which states the date or dates of any relevant consultations or attendances, the nature of the problem and the treatment; and a specific statement that the student was unfit to complete the required assessment or examination on the date specified. Medical certificates which do not have all this information will not be accepted.

(ii) ***A letter from the University Counselling Service***, or a professional counsellor, which sets out the general nature of the problem affecting the student, and the opinion of the counsellor that the student was unfit to complete the required assessment

(iii) ***A statutory declaration***, setting out the facts upon which special consideration is requested, and attaching any supporting documents.

Note: A letter from an employer, friend, religious advisor etc. is not sufficient.

5. Supplementary exams?

(i) These are granted ***only under special conditions***: (a) if the student did not sit the standard examination for an acceptable reason; or (b) if the student, after reporting the illness to the Supervisor-in-Charge, left the examination room because of verified illness.

(ii) ***Early exam/assessment will not be permitted*** on the grounds of lengthening the period available for holidays or for departure overseas before the end of the exam period.

6. Timing of Supplementary Assessment

(i) Supplementary assessment is to be completed at a time convenient to the Department. It is the responsibility of the applicant to comply with the requirements of the Department.

(ii) It is ***your responsibility*** (a) to be available to sit for the exam at any time during the vacation period immediately following the application; AND (b) to leave a contact address and telephone number with the Department.

7. Form of Supplementary Assessment

Supplementary theory and practical exams may require different and additional assessment tasks to the normal examination. Supplementary examination may be in individual, oral format.

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

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

- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of proteomics
- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment task

- Practical Report

Learning and teaching activity

- A five day long intensive practical block taught during semester break.

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 outcomes

- Understand technologies used in proteomics
- Comprehend the chemical, biochemical and biophysical processes involved in proteomics, and how to apply them to answer biological questions
- Exhibit a sound knowledge of proteomics technologies and their applications
- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment task

- Continuing assessment

Learning and teaching activity

- Two hour lectures, presented in a logical sequence so that new material builds upon previously introduced concepts.
- A five day long intensive practical block taught during semester break.
- The first 15 minutes or so of each lecture is spent addressing the weekly speaker questions from the previous lecture.

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

- Understand technologies used in proteomics

- Comprehend the chemical, biochemical and biophysical processes involved in proteomics, and how to apply them to answer biological questions
- Exhibit a sound knowledge of proteomics technologies and their applications
- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment tasks

- Oral Presentation
- Mid-semester test
- Practical Report
- Final Exam

Learning and teaching activities

- Two hour lectures, presented in a logical sequence so that new material builds upon previously introduced concepts.
- Two hours of tutorial time. Each student will present a 10-15 minute oral presentation on a research paper chosen from an extensive list which is grouped by subject matter. Each tutorial presentation comes 1-2 weeks after the corresponding lecture.
- A five day long intensive practical block taught during semester break.
- The first 15 minutes or so of each lecture is spent addressing the weekly speaker questions from the previous lecture.

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

- Understand technologies used in proteomics
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- A five day long intensive practical block taught during semester break.

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

- Understand technologies used in proteomics
- Exhibit a sound knowledge of proteomics technologies and their applications
- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment tasks

- Mid-semester test
- Practical Report
- Final Exam

Learning and teaching activities

- A five day long intensive practical block taught during semester break.

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

- Understand technologies used in proteomics
- Comprehend the chemical, biochemical and biophysical processes involved in proteomics, and how to apply them to answer biological questions
- Exhibit a sound knowledge of proteomics technologies and their applications
- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment tasks

- Continuing assessment
- Practical Report

Learning and teaching activities

- Two hours of tutorial time. Each student will present a 10-15 minute oral presentation on a research paper chosen from an extensive list which is grouped by subject matter. Each tutorial presentation comes 1-2 weeks after the corresponding lecture.
- A five day long intensive practical block taught during semester break.
- The first 15 minutes or so of each lecture is spent addressing the weekly speaker questions from the previous lecture.

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

- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of proteomics
- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment tasks

- Oral Presentation
- Continuing assessment
- Practical Report

- Final Exam

Learning and teaching activities

- Two hours of tutorial time. Each student will present a 10-15 minute oral presentation on a research paper chosen from an extensive list which is grouped by subject matter. Each tutorial presentation comes 1-2 weeks after the corresponding lecture.
- A five day long intensive practical block taught during semester break.
- The first 15 minutes or so of each lecture is spent addressing the weekly speaker questions from the previous lecture.

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

- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of proteomics
- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment task

- Oral Presentation

Learning and teaching activity

- Two hours of tutorial time. Each student will present a 10-15 minute oral presentation on a research paper chosen from an extensive list which is grouped by subject matter. Each tutorial presentation comes 1-2 weeks after the corresponding lecture.
- A five day long intensive practical block taught during semester break.

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 outcome

- Gain hands-on practical experience in a range of proteomics techniques and applications

Assessment tasks

- Oral Presentation
- Practical Report

Learning and teaching activities

- Two hours of tutorial time. Each student will present a 10-15 minute oral presentation on a research paper chosen from an extensive list which is grouped by subject matter. Each tutorial presentation comes 1-2 weeks after the corresponding lecture.
- A five day long intensive practical block taught during semester break.