MOLS7212

Functional Proteomics

Session 2, Weekday attendance, North Ryde 2020

Department of Molecular Sciences

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and ot her small group learning activities on campus for the second half-year, while keeping an online ver sion available for those students unable to return or those who choose to continue their studies onli ne.

To check the availability of face-to-face and onlin e activities for your unit, please go to timetable vi ewer. To check detailed information on unit asses sments visit your unit's iLearn space or consult yo ur unit convenor.

General Information

Unit convenor and teaching staff
Paul Haynes
paul.haynes@mq.edu.au

Credit points
10

Prerequisites
Admission to MRes

Corequisites

Co-badged status

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. Students must attend a compulsory one week laboratory session during the semester break.

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:

ULO1: Process scientific data and prepare written work in formats suitable for publication in peer-reviewed scientific journals.

ULO2: Communicate to their peers a summary of a recent publication in a contemporary

area of proteomics, and produce their own peer-review of that publication.

ULO3: Develop skills in critical thinking and analysis, and written and oral presentation of scientific information.

ULO4: Extract and summarise from the scientific literature information required to develop a research plan within a relevant area of proteomics.

ULO5: Describe the basis of technologies used in proteomics, and exhibit sound knowledge of how to apply proteomics techniques to answer biological questions.

ULO6: Explain the chemical, biochemical and biophysical processes involved in proteomics, and demonstrate proficiency in a range of practical proteomics techniques.

Assessment Tasks

Name	Weighting	Hurdle	Due
Practical Report	20%	No	Monday October 19th
Oral Tutorial Presentation	15%	No	Various dates available
Final Exam	40%	No	To be advised
Mini-Review Essay	15%	No	4th September
Continuing assessment	5%	No	weekly
Mid-semester test	5%	No	week 8

Practical Report

Assessment Type [1]: Lab report
Indicative Time on Task [2]: 16 hours
Due: **Monday October 19th**
Weighting: **20%**

You must present your work in the format of a manuscript suitable for publication in Journal of Proteomics. This will be discussed in detail during the practical session.

On successful completion you will be able to:

- Process scientific data and prepare written work in formats suitable for publication in peer-reviewed scientific journals.
- Develop skills in critical thinking and analysis, and written and oral presentation of

scientific information.
- Extract and summarise from the scientific literature information required to develop a research plan within a relevant area of proteomics.
- Describe the basis of technologies used in proteomics, and exhibit sound knowledge of how to apply proteomics techniques to answer biological questions.
- Explain the chemical, biochemical and biophysical processes involved in proteomics, and demonstrate proficiency in a range of practical proteomics techniques.

Oral Tutorial Presentation

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 14 hours
Due: **Various dates available**
Weighting: **15%**

Choose one publication from a Tutorial Papers List (on a first-come first-served basis), which is found on the iLearn site. Present your critique of the topic as a short Powerpoint seminar. Aim for 10-12 min talking (15 minutes max), and there will be time for questions. We may adjust that schedule depending on class numbers. Participation in all other group's topics contributes to your final mark. Perform your own peer-review of your chosen paper - tell us whether you think this paper should have been published and why. Look up other relevant literature so you can discuss your chosen paper in context rather than in isolation. The presentationcan be submitted as a video presentation uploaded in advance to youtube. It must include figures, graphics, text (and some footage of the presenter).

On successful completion you will be able to:
- Communicate to their peers a summary of a recent publication in a contemporary area of proteomics, and produce their own peer-review of that publication.
- Develop skills in critical thinking and analysis, and written and oral presentation of scientific information.
- Extract and summarise from the scientific literature information required to develop a research plan within a relevant area of proteomics.
- Describe the basis of technologies used in proteomics, and exhibit sound knowledge of how to apply proteomics techniques to answer biological questions.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 22 hours

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

2.5hr exam covering all practical and theoretical components of MOLS7212 Questions are a mix of long and short answer questions.

On successful completion you will be able to:

- Develop skills in critical thinking and analysis, and written and oral presentation of scientific information.
- Describe the basis of technologies used in proteomics, and exhibit sound knowledge of how to apply proteomics techniques to answer biological questions.
- Explain the chemical, biochemical and biophysical processes involved in proteomics, and demonstrate proficiency in a range of practical proteomics techniques.

Mini-Review Essay

Assessment Type [1]: Essay
Indicative Time on Task [2]: 14 hours
Due: **4th September**
Weighting: **15%**

Topic: Compare and contrast the way in which proteomics studies are performed in current literature as opposed to those performed ten years ago. 2000 word mini-review article suitable for publication (not including references, diagrams, tables or figures, all of which are encouraged) Must conform to the Instructions for Authors for a review article submitted to “Journal of Proteomics”. Look up the Journal of Proteomics instructions and follow them. Make sure you read some review articles in the journal before you start writing, because that will give you a good template to work from.

On successful completion you will be able to:

- Process scientific data and prepare written work in formats suitable for publication in peer-reviewed scientific journals.
- Develop skills in critical thinking and analysis, and written and oral presentation of scientific information.
- Extract and summarise from the scientific literature information required to develop a research plan within a relevant area of proteomics.

- Describe the basis of technologies used in proteomics, and exhibit sound knowledge of how to apply proteomics techniques to answer biological questions.

Continuing assessment

Assessment Type [1]: Reflective Writing
Indicative Time on Task [2]: 3 hours
Due: **weekly**
Weighting: **5%**

You will be given 5 minutes at the end of each lecture in which you are required to write down and submit a question concerning the lecture for the the day. This must be relevant to the topic that has been presented.

On successful completion you will be able to:

- Develop skills in critical thinking and analysis, and written and oral presentation of scientific information.

Mid-semester test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 3 hours
Due: **week 8**
Weighting: **5%**

This will typically be a short quiz aimed at helping students assess their areas of strength and weakness prior to the final exam. It will be held after the midsemester break.

On successful completion you will be able to:

- Develop skills in critical thinking and analysis, and written and oral presentation of scientific information.
- Describe the basis of technologies used in proteomics, and exhibit sound knowledge of how to apply proteomics techniques to answer biological questions.
- Explain the chemical, biochemical and biophysical processes involved in proteomics, and demonstrate proficiency in a range of practical proteomics techniques.

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

- We do not work from a textbook, instead we focus on current scientific literature.
- Additional reading material is also included at the end of most lectures. It is your job to look it up.
- The 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.
- This unit is designed to build upon MOLS8211 Protein Discovery and Analysis. There is no prerequisite for entry into MOLS8212 but passing MOLS8211 is strongly recommended.
- Technologies used and required. Lecture notes will be made available on the unit website in iLearn. Notes will be made available a few days in advance of the lecture whenever possible, and it is your responsibility to print them out.
- Technologies used and required. All of the important information during semester will be communicated to you via the unit website on iLearn. It is your responsibility to check it regularly for announcements and other information.
- Technologies 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.
- What is changed? The unit is updated every year with revised lecture content and numerous new tutorial research papers.
- What is changed? the unit will also be offered at 700 level to Masters of Research students.
- What is changed? The research tutorial presentation will 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.
- For 2020, revised and refreshed lecture content based on feedback from the previous year, and updated tutorial paper list. The revised lecture content and numerous new tutorial research papers reflect the rapidly changing state of the field.

Unit Schedule

Lectures Mondays 2-4pm, starting July 27th, *online*

Week	Date	Lecture Title
1	**MONDAY** July 27th	Subject Outline, Introduction and Assessment Process, and General Introduction (1)
1	**FRIDAY** July 31st	Mass spectrometry fundamentals (2) (***in tutorial timeslot***)
2	August 3rd	Protein Identification from MS data (3)
3	August 10th	2D gels and 2D DIGE (4)
4	August 17th	Differential display and shotgun proteomics (5)
5	August 24th	Quantitative proteomics (I) label-free (6)
6	Sept 1st	Quantitative proteomics (II) isotope labels (7)
7	Sept 7th	Data dependent acquisition (DDA) and Data independent acquisition (DIA) (8)
Practical: 5 Days, 21st- 25th September (*during semester break*)		
8	Sept 28th	Multiple reaction monitoring and proteomics validation (9)
9	October 5th	[Public Holiday]
10	October 12th	Protein-Protein Interactions (10)
Practical report due 9am Monday October 19th		
11	October 19th	Post-translational modifications (I) Glycoproteomics (11)
12	October 26th	Post-translational modifications (II) Phosphoproteomics (12)
13	November 2nd	Revision

All written work must be submitted through iLearn Turnitin. In addition, hardcopies may be required, to be confirmed.

MOLS8212 Functional Proteomics

TUTORIAL TIMETABLE

Tutorials: Fridays 1-3pm from August 7th, 9WW 102

Week	Date
1	[*note: July 31st is used for a lecture*]
2	August 7th - MS Fundamentals
3	August 14th - Protein ID
4	August 21st - 2D Gels and 2D DIGE
5	August 28th - Shotgun proteomics
6	September 4th - Label Free quantitation
7	September 11th - Quantitation with labels
	Semester Break - September 12th to September 27th
8	October 2nd – Data Independent Acquisition
9	October 9th - Multiplexed reaction monitoring
10	October 16th - Protein interactions
11	October 23rd - Glycoproteomics
12	October 30th - Phosphoproteomics
13	November 6th - spare

Q. Why is July 31 used for a lecture?

A. If we had a tutorial session on that day, the students presenting their research papers would

have less than a week to prepare. If we start tutorials in week two, then the first students will have two weeks to prepare, which is sufficient time to allow them to do a good job.

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-central). 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.)*

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 help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

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.