



MOLS8212

Proteomics Technologies and Applications

Session 2, In person-scheduled-weekday, North Ryde 2026

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Paul Haynes

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Credit points

10

Prerequisites

Admission to GradDipResFSE or GradCertResFSE or (BMOL6201 or BMOL6432 and Admission to GradDipBiotech or MBiotech)

Corequisites

Co-badged status

Unit description

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 environmental or genetic intervention, or the use of drug treatment. This unit covers the principles and applications of 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; multiplexed reaction monitoring; data independent acquisition; and characterization of protein post-translational modifications including phosphorylation and glycosylation. Students must attend a one week laboratory session during the session break.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals ([UNSDGs](#)) Good Health and Well Being; Quality Education; Industry, Innovation and Infrastructure

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.

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must achieve a total mark equal to or greater than 50%,

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is **11:55 pm**. A 1-hour grace period will be provided to students who experience technical concerns. For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for [Special Consideration](#). For example, if the assignment is worth 8 marks (of the entire unit) and your submission is late by 19 hours (or 23 hours 59 minutes 59 seconds), 0.4 marks (5% of 8 marks) will be deducted. If your submission is late by 24 hours (or 47 hours 59 minutes 59 seconds), 0.8 marks (10% of 8 marks) will be deducted, and so on.

Assessments where Late Submissions will be accepted

Practical report – Yes, Standard Late Penalty applies

Proteomics project – Yes, Standard Late Penalty applies

Assessment release dates

Practical Report – 14/9/26

Proteomics Project – 20/7/26

Special Consideration

The [Special Consideration Policy](#) aims to support students who have been impacted by short-

term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through <http://connect.mq.edu.au/>.

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Practical Report	20%	No	08/10/2026	Individual	Yes	Open
Proteomics Project	40%	No	03/11/2026	Individual and Group	No	Open
Final Exam	40%	No	Exam period	Individual	No	Observed

Practical Report

Assessment Type ¹: Written Submission

Indicative Time on Task ²: 16 hours

Due: **08/10/2026**

Weighting: **20%**

Groupwork/Individual: Individual

Short extension ³: Yes

AI Approach: Open

You must present your work in the format of a manuscript suitable for publication in a specified Proteomics Journal. 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.

Proteomics Project

Assessment Type ¹: Portfolio

Indicative Time on Task ²: 31 hours

Due: **03/11/2026**

Weighting: **40%**

Groupwork/Individual: Individual and Group

Short extension ³: No

AI Approach: Open

You will select a recent research paper in proteomics from a curated list. You will analyse the paper and its broader research context. You will work in a group to present the paper, focusing on critical evaluation and its relevance to the unit content. You will be assessed individually on your analysis and preparation, and as a group on the presentation.

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

Final Exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 31 hours

Due: **Exam period**

Weighting: **40%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

You will undertake a final examination during the formal examination period.

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
- [Academic Success](#) 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.

³ An automatic short extension is available for some assessments. Apply through the [Service Connect Portal](#).

Delivery and Resources

LECTURE, WORKSHOP and PRACTICAL TIMETABLE

Week 1 Classes – As shown below, our first lecture is in week 1 at 11am on Monday July 27th in 25WW A209. Our first workshop is in week 2 at 12 noon on Tuesday August 4th in 01CC 105.

Lectures: Mondays 11 am – 1 pm July 27th - November 2nd, 25ww A209

Workshops: Tuesdays 12 noon – 1 pm August 4th - November 3rd, 01CC 105

NOTE: Lectures are two hours duration and start week 1.

Practicals: Are held in a one-week block during semester break. You must be available for all of September 21st - 25th. Practical classes run about 6+ hours per day, between 9am – 5 pm. This is the equivalent of 3+ hours per week for the whole semester, we just do it all at once.

The practical course includes differential display SDS-PAGE protein electrophoresis, in-gel protein digestion, peptide mass spectrometry (nanoESI - Q Exactive orbitrap), peptide to spectrum matching using programs such as MSFragger, shotgun proteomic analysis using SDS-PAGE protein fractionation, and differential protein quantitation.

Up to date timetable information can be found at publish.mq.edu.au

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

Written work must be submitted through iLearn Turnitin unless specified otherwise. Lectures and workshops will both be recorded and made available via echo 360.

We will communicate with you via your university email or through announcements on iLearn. Queries to the unit convenor can either be placed on the iLearn discussion board or sent via email from your university email address.

Unit Schedule

Lectures Mondays 11-1pm, starting July 27th, 25ww A209

Week	Date	Lecture Title
1	July 27 th	Introductory Lecture - Subject Outline, assessment processes, other important information, tutorial on important concepts
2	August 3 rd	Mass spectrometry fundamentals (1)
3	August 10 th	Protein Identification from MS data (2)
4	August 17 th	2D gels and 2D DIGE (3)
5	August 24 th	Differential display and shotgun proteomics (4)
6	August 31 st	Quantitative proteomics (I) label-free (5)
7	Sept 7 th	Quantitative proteomics (II) isotope labels (6)
8	Sept 14 th	Data dependent acquisition (DDA) and Data independent acquisition (DIA) (7)
Practical: 5 Days, 21st - 25th September (<i>during semester break</i>)		
9	Oct 5 th	– No lecture, public holiday –
Practical report due Thursday October 8th		
10	October 12 th	Multiple reaction monitoring and proteomics validation (8)
11	October 19 th	Protein-Protein Interactions (9)
12	October 26 th	Post-translational modifications (I) - Glycoproteomics (10)

13	November 2 nd	Post-translational modifications (II) Phosphoproteomics (11)
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WORKSHOP TIMETABLE**Workshops: Tuesday 12 noon - 1:00 pm from August 4th, 01CC 105**

Week	Date	Topic
1	July 28 th	– no student presentations
2	August 4 th	MS Fundamentals
3	August 11 th	Protein ID
4	August 18 th	2D Gels and 2D DIGE
5	August 25 th	Shotgun proteomics
6	September 1 st	Label Free quantitation
7	September 8 th	Quantitation with labels
8	September 15 th	Data Independent Acquisition
	<i>Semester Break - <u>September 19th to October 5th</u></i>	
9	October 6 th	- No presentations - Practical report writing session
10	October 13 th	Multiplexed reaction monitoring
11	October 20 th	Protein interactions
12	October 27 th	Glyco-Proteomics
13	November 3 rd	Phospho-proteomics

Q. Why no workshop in week 1?

A. If we had a workshop session on that day, the students presenting their research papers would no time to prepare. If we start workshops in week two, then the first students will have a week 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 \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). 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](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

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

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/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 connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing an](#)

[d maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Academic Success

[Academic Success](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Ask a Study Coach](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the 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

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the [Service Connect Portal](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit <https://students.mq.edu.au/support/technology/service-desk>.

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.

Changes from Previous Offering

Updated lectures, updated list of papers for research presentations, and improved practical class experiments.

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Student feedback from the previous offering of this unit was very positive overall, with students pleased with the clear communications around assessment requirements and the level of support from teaching staff. As such, no major changes to the delivery of the unit are planned, however we will continue to strive to improve the level of support and the level of student engagement.

Unit information based on version 2026.03 of the [Handbook](#)