# ELEC8205

## Energy Storage Technologies

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

*School of Engineering*

## Contents

# General Information

Unit convenor and teaching staff

Convener
Sara Deilami
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Room #2117 , Level 2, 9WW
Wednesdays 12:00 PM - 2:00 PM, by appointment only

Convener
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Lecturer
Adithya Ravikumar
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Credit points
10

Prerequisites
40 CP at 6000 level or above including ELEC6201

Corequisites

Co-badged status

Unit description

This unit covers the pivotal role and technologies of energy storage in revolutionising the world's energy landscape. This unit delves into a comprehensive array of energy storage systems, including existing and cutting-edge innovations. This unit equips students gaining expertise in designing, managing, and optimising energy storage solutions, allowing for seamless integration with renewable energy sources and the grid. Students will obtain a profound understanding of the principles, environmental impact, regulatory dynamics, and economic aspects of the existing energy storage technologies such as electromechanical, chemical, thermal, mechanical and biomass energy. Computer solutions, hands-on experience and real-world applications will be used to compare and analyse different storage technologies and provide opportunities to design sustainable, reliable, and efficient energy systems.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Affordable and Clean Energy; 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:** Develop a deep understanding of various energy storage technologies, including their principles, operation, and applications

**ULO2:** Analyse design aspects of energy storage systems tailored to specific needs, considering factors like capacity, efficiency, and safety, while accounting for emerging technologies and sustainable practices.

**ULO3:** Understand the integration of energy storage solutions into complex energy systems, including renewable energy sources, microgrids, and industrial applications, optimising energy flow and grid stability.

**ULO4:** Acquire the ability to make decisions and future development of energy storage projects, considering economic viability, regulatory frameworks, and market dynamics.

**ULO5:** Develop strategies for energy management and the provision of grid services using energy storage technologies.

**ULO6:** Work effectively in teams by: identifying individual roles and responsibilities, sharing knowledge through peer-led learning, writing technical reports and logbooks, and effective communication.

# General Assessment Information

### Grading and Passing Requirement for Unit

- In order to pass this Unit a student must obtain a mark of 50 or more for the Unit (i.e. obtain a passing grade P, CR, D, or HD).
- For further details about grading, please refer below in the policies and procedures section.
- If you receive special consideration for the oral presentation and demonstration of the Project, a supplementary conventional exam will be scheduled by the faculty during a supplementary exam period, typically about 3 to 4 weeks after the normal exam period. By making a special consideration application for the oral presentation and demonstration of the Project you are declaring yourself available for a conventional exam during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to applying. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

### 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 7$^{th}$ day (including weekends). After the 7$^{th}$ 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

In this unit, late submissions will be accepted as follows:

Practical Assignment – YES, Standard Late Penalty applies

Mid-Term Quiz (Class Quiz) - NO, unless Special Consideration is Granted

Project Assessment – YES, Standard Late Penalty applies

**Release Dates for Assessment Activities**

Instructions for assessment tasks will be made available to students by the dates below:

- Practical Assignment: To be released from Week 2 (05/08/2026)
- Project Assessment: To be released no later than Week 8 (16/09/2026)
- Mid-Term Quiz (Class Quiz): To be released no later than Week 7 (09/09/2026)

**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 ask.mq.edu.au.

# Assessment Tasks

| Name | Weighting | Hurdle | Due | Groupwork/Individual | Short Extension | AI Approach |
|---|---|---|---|---|---|---|
| Class Quiz | 30% | No | 17/09/2026 | Individual | No | Observed |
| Project assessment | 40% | No | Week 13 | Individual and Group | No | Open |
| Assignment | 30% | No | 20/09/2026 | Individual | Yes | Open |

## Class Quiz

Assessment Type [1]: Examination
Indicative Time on Task [2]: 15 hours
Due: **17/09/2026**
Weighting: **30%**
Groupwork/Individual: Individual
Short extension [3]: No
AI Approach: Observed

The quiz will assess both factual knowledge and problem solving ability.

On successful completion you will be able to:

- Develop a deep understanding of various energy storage technologies, including their principles, operation, and applications
- Analyse design aspects of energy storage systems tailored to specific needs, considering factors like capacity, efficiency, and safety, while accounting for emerging

technologies and sustainable practices.
- Understand the integration of energy storage solutions into complex energy systems, including renewable energy sources, microgrids, and industrial applications, optimising energy flow and grid stability.
- Acquire the ability to make decisions and future development of energy storage projects, considering economic viability, regulatory frameworks, and market dynamics.
- Develop strategies for energy management and the provision of grid services using energy storage technologies.

## Project assessment

Assessment Type [1]: Presentation task
Indicative Time on Task [2]: 25 hours
Due: **Week 13**
Weighting: **40%**
Groupwork/Individual: Individual and Group
Short extension [3]: No
AI Approach: Open

Students will be assessed on their ability to apply theoretical knowledge to practical scenarios, work collaboratively in teams, and demonstrate innovative problem-solving skills.

On successful completion you will be able to:
- Develop a deep understanding of various energy storage technologies, including their principles, operation, and applications
- Analyse design aspects of energy storage systems tailored to specific needs, considering factors like capacity, efficiency, and safety, while accounting for emerging technologies and sustainable practices.
- Understand the integration of energy storage solutions into complex energy systems, including renewable energy sources, microgrids, and industrial applications, optimising energy flow and grid stability.
- Acquire the ability to make decisions and future development of energy storage projects, considering economic viability, regulatory frameworks, and market dynamics.
- Develop strategies for energy management and the provision of grid services using energy storage technologies.
- Work effectively in teams by: identifying individual roles and responsibilities, sharing knowledge through peer-led learning, writing technical reports and logbooks, and effective communication.

# Assignment

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 20 hours
Due: **20/09/2026**
Weighting: **30%**
Groupwork/Individual: Individual
Short extension [3]: Yes
AI Approach: Open

Students will be assessed based on their ability to perform analysis, modeling and implementation of the practical experiment as well as software tools.

On successful completion you will be able to:

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- Understand the integration of energy storage solutions into complex energy systems, including renewable energy sources, microgrids, and industrial applications, optimising energy flow and grid stability.
- Acquire the ability to make decisions and future development of energy storage projects, considering economic viability, regulatory frameworks, and market dynamics.
- Develop strategies for energy management and the provision of grid services using energy storage technologies.
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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

### UNIT WEBSITE

- The iLearn website for this unit can be found at: https://ilearn.mq.edu.au/login/.
    - *Note! All information and communications relevant to this Unit will be via the iLearn website.*

### TEXTBOOK

- Design of Smart Power Grid Renewable Energy Systems, 3rd Edition, , by A. Keyhani, Wiley, 2019. (Digital ).
    - *Remark: All students are expected to have access to this textbook.*
    - Support Website: https://app.knovel.com/kn/resources/kpDSPGRES3/toc

### LECTORIALS

- Lectorials take place twice a week (Weeks 1-7) according to the Unit schedule.
    - *Note! Students are strongly encouraged to participate in at least one of the two weekly Lectorials.*
- Lectorials are a combination of traditional lecture and tutorial teaching modes and are designed to improve student engagement.
- The Lectorials are organised in a flipped classroom fashion.
- Prior to Lectorials
    - links to E-Text specific sections, brief videos and/or lecture notes are posted in iLearn each week.
    - students are expected to read these E-Text sections, try to solve any given examples, and watch any videos and/or read any posted notes prior to attending the Lectorials.
- During Lectorials
    - brief discussion sessions on fundamental principles.
    - plenty of practical examples.
    - interactive problem solving involving students.

### PRACTICALS

- Practical activities start from Week 2 and take place once a week (Weeks 2-7) according to the Unit schedule.
    - *Note! Students must enrol in one of the available weekly Lab sessions.*
- Interactive Practicals use FESTO equipment, and PLECS Standalone software maybe used to assist with the Lab experiments.

#### PROJECTS

- Project activities take place from Week 8 to Week 13 according to the Unit schedule.
- The team Project is the core component of this Unit. The Projects cover practical aspects of energy storage technologies.
- Students are required to form teams and work on the given project topic.
    - *All Project activities are performed in teams;*

#### COMMENCEMENT OF ACTIVITIES

- **Lectorials (online):** Start from Week 1.
- **Practicals (in-person):** Start from Week 2.
- **Projects:** Start from Week 8.

#### TECHNOLOGY

- The laboratory work will make use of FESTO equipment. PLECS Standalone software may be used for both the laboratory sessions and project activities, and can be downloaded for free from the Plexim website.

#### COMMUNICATIONS

- Students are reminded the University will communicate all official notices by email to official MQ student's account. Students should read their @student.mq.edu.au email regularly or forward it to an account they check regularly.
- All announcements and other communications regarding this Unit will be via iLearn platform.

#### WEB RESOURCES

- **PLECS support:**
    - https://plexim.com/support
        - PLECS videos
        - Application examples
        - Technical solutions
        - Installation help

# Unit Schedule

For details, please refer to the Unit Schedule on the ELEC8205 iLearn webpage.

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (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). 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) 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 and 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

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 clarity around assessment requirements and the level of support from teaching staff. As such, no change to the delivery of the unit is planned, however we will continue to strive to improve the level of support and the level of student engagement.

# Engineers Australia Competency Mapping

| EA Competency Standard | | Unit Learning Outcomes |
|---|---|---|
| Knowledge and Skill Base | 1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline. | ULO1, ULO2, ULO3, ULO4, ULO5, ULO6 |
| | 1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing. | ULO1, ULO2, ULO3, ULO4, ULO5, ULO6 |
| | 1.3 In-depth understanding of specialist bodies of knowledge | ULO1, ULO2, ULO3, ULO4, ULO5, ULO6 |
| | 1.4 Discernment of knowledge development and research directions | ULO1, ULO4, ULO5, ULO6 |
| | 1.5 Knowledge of engineering design practice | ULO2, ULO3, ULO4, ULO5, ULO6 |
| | 1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice. | ULO1, ULO2, ULO3, ULO4, ULO5, ULO6 |
| Engineering Application Ability | 2.1 Application of established engineering methods to complex problem solving | ULO2, ULO3, ULO4, ULO5, ULO6 |
| | 2.2 Fluent application of engineering techniques, tools and resources. | ULO1, ULO2, ULO3, ULO4, ULO5, ULO6 |
| | 2.3 Application of systematic engineering synthesis and design processes. | ULO1, ULO2, ULO5, ULO6 |
| | 2.4 Application of systematic approaches to the conduct and management of engineering projects. | ULO6 |
| Professional and Personal Attributes | 3.1 Ethical conduct and professional accountability. | ULO6 |
| | 3.2 Effective oral and written communication in professional and lay domains. | ULO6 |
| | 3.3 Creative, innovative and pro-active demeanour. | ULO1, ULO2, ULO3, ULO4, ULO6 |
| | 3.4 Professional use and management of information. | ULO6 |
| | 3.5 Orderly management of self, and professional conduct. | ULO6 |
| | 3.6 Effective team membership and team leadership | ULO6 |

Unit information based on version 2026.02 of the Handbook