



ELEC8202

Smart Power Grids and Renewable Energy

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

School of Engineering

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General Information

Unit convenor and teaching staff

Convener/Lecturer

Sara Deilami

sara.deilami@mq.edu.au

Room #2117 , Level 2, 9WW

Wednesdays 12:00 PM - 2:00 PM, by appointment only

Credit points

10

Prerequisites

Corequisites

Co-badged status

ELCT4001

Unit description

This course provides fundamental concepts and necessary skills for designing, analysing, controlling, and operating future energy systems containing large- scale renewable energy sources (i.e., intermittent and distributed generation), energy storage, and new loads such as electric vehicles (EV), in "smart grids". Additionally, it explores the application of the sustainable development goals (SDGs) framework in the energy context. It helps students integrate renewable energy sources into both traditional and modern power systems, enabling them to undertake engineering projects. This course also offers a foundation in classical methods and modern protection schemes, along with engineering practices to protect the safety of the public, personnel, and the power system by detection, isolation, and resolution of electrical faults, enabling the rapid restoration of the system to its normal operation state.

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; Climate Action

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: Critically analyse the operational characteristics of modern power grids, including the components, renewable and nonrenewable energy sources.

ULO2: Evaluate carbon emissions and their environmental impact, assessing the significance of renewable energy sources as viable alternatives.

ULO3: Apply the principles of sustainable development goals to energy systems, and critically analyse the potential impacts and challenges in the context of global and local perspectives.

ULO4: Analyse, simulate and design electrical energy systems incorporating distributed and intermittent (e.g. renewable) energy resources, including energy storage, and Electric Vehicles.

ULO5: Evaluate the significance of protection system for smart power grids and acquire knowledge on different protection schemes and protective equipment.

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

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

- 5% penalty per day: If you submit your assessment late, 5% of the total possible marks will be deducted for each day (including weekends), up to 7 days. Example 1 (out of

100): If you score 85/100 but submit 20 hours late, you will lose 5 marks and receive 80/100. Example 2 (out of 30): If you score 27/30 but submit 1 day late, you will lose 1.5 marks and receive 25.5/30.

- After 7 days: Submissions more than 7 days late will receive a mark of 0.
- Extensions: Automatic short extension: Some assessments are eligible for automatic short extension. You can only apply for an automatic short extension before the due date. Special Consideration: If you need more time due to serious issues and for any assessments that are not eligible for Short Extension, you must apply for Special Consideration.

Need help? Review the Special Consideration page [HERE](#)

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
Assignment	30%	No	18/09/2026	Individual	Yes	Open

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Project assessment	40%	No	06/11/2026	Individual	Yes	Open
Class Quiz	30%	No	20/09/2026	Individual	No	Observed

Assignment

Assessment Type [1](#): Practice-based task

Indicative Time on Task [2](#): 17 hours

Due: **18/09/2026**

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:

- Apply the principles of sustainable development goals to energy systems, and critically analyse the potential impacts and challenges in the context of global and local perspectives.
- Analyse, simulate and design electrical energy systems incorporating distributed and intermittent (e.g. renewable) energy resources, including energy storage, and Electric Vehicles.
- Evaluate the significance of protection system for smart power grids and acquire knowledge on different protection schemes and protective equipment.
- Work effectively in teams by: identifying individual roles and responsibilities, sharing knowledge through peer-led learning, writing technical reports and logbooks, and effective communications.

Project assessment

Assessment Type [1](#): Presentation task

Indicative Time on Task [2](#): 20 hours

Due: **06/11/2026**

Weighting: **40%**

Groupwork/Individual: Individual

Short extension [3](#): Yes

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:

- Critically analyse the operational characteristics of modern power grids, including the components, renewable and nonrenewable energy sources.
- Apply the principles of sustainable development goals to energy systems, and critically analyse the potential impacts and challenges in the context of global and local perspectives.
- Analyse, simulate and design electrical energy systems incorporating distributed and intermittent (e.g. renewable) energy resources, including energy storage, and Electric Vehicles.
- Evaluate the significance of protection system for smart power grids and acquire knowledge on different protection schemes and protective equipment.
- Work effectively in teams by: identifying individual roles and responsibilities, sharing knowledge through peer-led learning, writing technical reports and logbooks, and effective communications.

Class Quiz

Assessment Type ¹: Examination

Indicative Time on Task ²: 12 hours

Due: **20/09/2026**

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:

- Critically analyse the operational characteristics of modern power grids, including the components, renewable and nonrenewable energy sources.
- Evaluate carbon emissions and their environmental impact, assessing the significance of renewable energy sources as viable alternatives.
- Apply the principles of sustainable development goals to energy systems, and critically analyse the potential impacts and challenges in the context of global and local perspectives.
- Analyse, simulate and design electrical energy systems incorporating distributed and

intermittent (e.g. renewable) energy resources, including energy storage, and Electric Vehicles.

- Evaluate the significance of protection system for smart power grids and acquire knowledge on different protection schemes and protective equipment.

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).
- [Protection of Electricity Distribution Networks](#), 3rd edition, by Juan M. Gers, Edward J. Holmes, IET Power and Energy Series 47, 2011, (Digital).
 - Remark: All students are expected to have access to both textbooks.

LECTORIALS

- Lectorials take place twice a week (Weeks 1-7) except for Week 1, which has only one lectorial as per 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 reading materials, brief videos and/or lecture notes are posted in iLearn each week.
 - Students are expected to read any posted notes or materials, try to solve any given examples, and watch any videos prior to attending the Lectorials.
- During Lectorials
 - brief discussion sessions on fundamental principles.
 - plenty of practical examples.
 - interactive problem solving involving students.

LABORATORIES

- Practical activities take place once a week (Weeks 2-6) according to the Unit schedule.
 - *Note! Students must enrol in one of the available weekly Lab sessions.*
 - Interactive Practicals use FESTO equipment, and DigSilent Power Factor y software platform to assist with the Lab experiments.

COMMENCEMENT OF ACTIVITIES

- **Lectorials (online):** Start from Week 1.
- **Practicals (in-person):** Start from Week 3.
- **Projects:** Start from Week 8.

PROJECTS

- Project activities take place once a week (Weeks 8-13) according to the Unit schedule.
 - *Note! Teams must enrol in one of the available weekly Project sessions.*
- The team Project is the core component of this Unit. The Projects cover practical aspects of smart power grids.
- Students are required to form teams and work on the given project topic.
 - *Note! When forming teams, students should agree in which weekly Project session they want to enrol.*
 - *All Project activities are performed in teams;*

TECHNOLOGY

- The laboratory work will rely on the use of FESTO equipment, and DigSilent Power Factor ory software platform.
 - The software platform are available through Web browser and/or Faculty Lab

PCs.

- The Project work will rely on the use of [DigSilent Power Factory](#) software platform.
 - The software can be used on dedicated Lab PCs.

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

- **DigSilent Power Factory support:**
 - <https://www.digsilent.de/en/>

Unit Schedule

For details, please refer to the Unit Schedule on the ELEC8202 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
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	ULO1,ULO2,ULO3,ULO4
	1.3 In-depth understanding of specialist bodies of knowledge	ULO1,ULO2,ULO3,ULO4
	1.4 Discernment of knowledge development and research directions	ULO2,ULO4,ULO5
	1.5 Knowledge of engineering design practice	ULO1,ULO2,ULO3,ULO4
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	ULO2,ULO3,ULO4
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	ULO2, ULO3,ULO4,ULO5
	2.2 Fluent application of engineering techniques, tools and resources.	ULO1,ULO2,ULO3,ULO4

	2.3 Application of systematic engineering synthesis and design processes.	ULO3,ULO4,ULO5
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	ULO3,ULO4
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,ULO4,ULO5
	3.4 Professional use and management of information.	ULO1,ULO4,ULO5,ULO6
	3.5 Orderly management of self, and professional conduct.	ULO3,ULO4,ULO6
	3.6 Effective team membership and team leadership	ULO6

Changes since First Published

Date	Description
22/07/2026	Assessment dates have been updated.

Unit information based on version 2026.02 of the [Handbook](#)